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A lived experience assessment of public–private partnerships delivering rural water services in Rwanda

Sydney Sapper[a], Isaac Mugabe Hatangimana[b], May Sule[a] and Paul Jeffrey[a,*]

[a] Cranfield Water Science Institute, Cranfield University, Cranfield, Beds, UK
[b] Integrated Development Action Rwanda, P.O Box 49, Muhanga, Rwanda
*Corresponding author. E-mail: p.j.jeffrey@cranfield.ac.uk

PJ, 0000-0001-6618-0815

ABSTRACT

Performance measures of public–private partnerships (PPPs) for water services provision have tended to focus on countable features of the physical infrastructure, ignoring the lived experience of using the water. Using mixed methods, we explore how the PPP model has performed across two managed systems in rural Rwanda using both technical functionality measures and metrics that reflect the experiences of the intended beneficiaries. Findings evidence mixed system performance against both sets of metrics, underpinned by a lack of strong accountability measures. The paper offers actionable evidence in support of policymakers' efforts to design more equitable and impactful PPP schemes.

Key words: public–private partnerships, rural, Rwanda, water services

HIGHLIGHTS

- We use mixed methods to explore the performance of water provision systems from a lived experience perspective.
- Findings demonstrate that functionality performance scores are poor indicators of user experiences.
- Low levels of capacity to monitor and enforce contract delivery compromise PPP performance.

INTRODUCTION

Public–private partnerships (PPPs) for water supply are increasingly common in many parts of the world, especially for rural areas (Lockwood *et al.* 2018; Anh *et al.* 2022). A PPP is characterized as a long-term contract between a private operator (PO) and a government entity for the provision of a public good or service (World Bank 2017a). There are numerous ways in which PPPs can be structured, each with varying levels of risk and involvement. Where an operating function is part of the contract, revenue from tariffs or fees is intended to cover operational and maintenance costs, as well as provide a profit for the PO. Capital expenditures, such as repair and replacement, may be under the purview of the PO or the government entity, depending on the contract type. PPP contracts typically stipulate key performance indicators (KPIs) and other service requirements that POs must routinely report on to the government. There are numerous ways that PPPs can be structured, each with varying levels of risk and involvement. In water service delivery, common types of PPPs are concession, O&M, affermage (under which the PO is responsible for operating and maintaining the utility but not the capital build outlay), management contract, and franchise (Cunha Marques & Oliveira Cruz 2020). Under these PPPs, revenue from tariffs or fees is meant to cover regular O&M costs, as well as provide a profit to the PO (Araújo & Sutherland 2010).

Many governments in low- and middle-income countries (LMICs), including in Sub-Saharan Africa, view PPPs as an attractive way to combat low coverage, quality, and reliability of service as a result of insufficient funding, poor planning and implementation, and inadequate maintenance (Lima *et al.* 2021). In principle, PPPs can lead to higher levels of investment, innovation, and service delivery. PPPs in the water and sanitation sector are much more prevalent in urban areas, although they are expanding to rural areas as the population increases. While the body of literature on PPPs for rural water supply in

LMICs is limited, there are important lessons that can be learned from research conducted on urban water PPPs in such contexts.

Successful implementation of PPPs has been shown to require a number of enabling factors. Strong political will, supportive legislation, functioning accountability measures, and capable government and private sector partners have all been shown to underpin PPP success (Cheung *et al.* 2012; Vale de Paula *et al.* 2024). Very few African nations have the strong legal and institutional framework and political will necessary for these projects (Leigland 2018). Local governments often lack the technical and administrative capacity to effectively manage PPP contracts and monitor performance. Demographic and geographic factors may limit the ability of governments and POs to set tariffs that are both realistic in terms of raising enough revenue to support the service and affordable.

Expansive reviews of water utilities in LMICs reveal a pattern of trade-offs related to the use of PPPs. Private sector participation can deliver higher levels of productivity and efficiency, but can be costly to prepare and manage, and does not necessarily lead to increased investment (Gassner *et al.* 2009; Marin 2009). However, the shared risk and cost savings that governments enjoy also mean that the state has less control over the operation of the water supply systems (Anh *et al.* 2022). Governments embarking on long-term contracts must also invest in specialized expertise, effective contract management, and strong governance structures (Bloomfield 2006). Early experiences with PPPs in the water and sanitation sectors of LMICs were characterized by high rates of different forms of failure (Braadbaart 2005). In addition, the individuals and communities who depend on the service are often left out of the conversation around the cost-benefit of PPPs. Any benefits from improving coverage or increasing efficiency do not always or readily translate to benefits for users. PPPs can improve financial and operational performance, but they may come at a higher cost to consumers (Anh *et al.* 2022).

PPPs in Africa now have an established record, with their introduction having been seen as offering the potential to solve the continent's profound infrastructure and service backlogs. Reviews of their effectiveness and challenges in delivering benefits for governments, contractors, and communities (e.g. Dykes & Jones 2016; Nyanyofio *et al.* 2022) often cite multiple benefits derived from an abstract appreciation of how PPP arrangements should operate. These include, for example, efficiency of construction or service delivery resulting in lower costs for consumers, and revenue for governments without the controversy which accompanies privatization (Farlam 2005). Evaluations of PPP initiatives which make use of KPIs are dominated by functional and operational parameters such as supply pressure, complaint handling, continuity of supply, unaccounted for water, number of access points, and water quality, which preference outputs over outcomes, thereby largely omitting the human experience of water service users and their communities (Lockwood *et al.* 2018; Asian Development Bank 2022).

Influenced by contemporary Marxist approaches to environmentalism (Loftus 2012), studies of the lived experience of water services provide a focus on the material and experiential in contrast to a legal/institutional or infrastructure perspective. Writing in the context of human rights and access to water, Rodina (2016) notes that a lived experience lens helps us transfer our attention away from questions of policy and service delivery to 'attend to the effects of uneven implementation and realization'. While sociological and psychological studies of water services are, by their very nature, rooted in a desire to better understand the human and community dimensions of related issues, the lived experience approach is phenomenological in nature, emphasizing knowledge as being rooted in experience. The study reported below has been shaped by these ideas and seeks to foreground what it is like to live with a particular water service in contrast to how the performance of that service is measured by those who created and manage it. In this context, it is in the tradition of studies which have sought to bring a similar perspective to the interface of gender, water, and infrastructure (Esha 2024), farmers' perceptions of water crises (Tatar *et al.* 2023), water security (Lemaitre *et al.* 2023), and coping strategies in the face of severe drought (Ching *et al.* 2019).

In the water and sanitation sector, the human experience of a service is often framed in a very limited way as customer satisfaction, with studies reporting correlations with (*inter alia*) bill payment and service expansion (van den Berg & Danilenko 2011). Public monopolies, such as utilities, often do not view customer satisfaction as an important metric, and it is rarely explored by literature in the business, marketing, or water-related industries (Anh *et al.* 2022). For many utilities, customer satisfaction is only tracked to comply with regulations (Donkor 2013). Lack of competition and monopolistic provision make it even more important to include customer satisfaction as an indicator of sustainability and for comparison between systems, operators, or delivery models. As noted elsewhere (dos Reis & Gomes 2023), while scholars have explored public value creation and appropriation concerning services delivered by PPPs, such studies are often limited to measuring value for money and economic performance criteria.

The purpose of this study is to use a novel grouping of indicators to contrast how PPPs perform through multiple lenses, including the lived experience of end-users. By doing so, we hope to illuminate a too often ignored dimension of PPP-mediated service delivery and enrich the debate on the advantages and disadvantages of different models of rural water services provision. The relationships between the physical characteristics of networked infrastructures and the socio-economic services that such networks provide are not well understood, and this deficiency is particularly acute in the context of being able to ensure commensurability between the metrics we use to portray desirable features of networked infrastructure and those we use to express required service provision performance. Both researchers and practitioners should be wary of potential incongruities between the technical and broader social goals that infrastructure systems aspire to. Consequently, capturing the lived experience of water services provides a useful counterweight to what are essentially measures of the engineering success of water provision projects.

Studies that report the voices of individuals have brought a range of perspectives to bear on the challenges of water services provision in LMICs and demonstrated the added value of lived experience studies. These have included insights within the context of WASH experiences during flood events (Aryee 2024), equitable access to services (Raut & Rajouria 2023), and water security (Collins *et al.* 2019). There has, perhaps unsurprisingly, been much more attention given to sanitation (Alda-Vidal *et al.* 2024) than to water supply itself. Chapman *et al.* (2020) noted that provision frequently lacks both sustainability and documentation and that the burden of ensuring access and system maintenance falls predominately on local actors. Related contributions include that by Deal & Sabatini (2020), who recorded metrics across both the engineered and human aspects of private water services provision, found that customers enjoyed significantly improved quality, annual reliability, and satisfaction compared with control households but were also more reliant upon multiple water sources to meet domestic needs and suffered from lower affordability scores. They warn that some people will be unwilling or unable to take advantage of the PPP model. Arguably, the most striking recent contribution in this genre comes from Ngben & Yakubu (2023) who, using both participant observations and in-depth interviews, exposed a series of understandings and behaviours among water service customers which illuminate the contingency and uncertainties of piped supply. As they powerfully observe, their approach enabled them to 'access experiences and practices that are absent in statistical declaration of improved access to water'.

The context for the study is rural Rwanda, and the contextual information below has been acquired from a number of GoR documents with ground truthing checks conducted during fieldwork. Following a 2004 study, which found that more than 50% of rural water supply schemes (RWSS) were not fully functional due to poor management and cost recovery, the Government of Rwanda (GoR) introduced a legal and institutional framework to encourage the transition from community-based management to public–private partnerships (MININFRA 2019a). The Rwandan Water and Sanitation Corporation (WASAC) is a government-owned limited liability corporation responsible for the growth and development of the water and sanitation sector in the country. It is responsible for water supply and sanitation services in urban areas and, with some oversight, for rural areas. Through its Rural Water and Sanitation Services Department (RWSS), it collects and maintains databases on all rural water supply networks in the country. By 2010, 28% of Rwanda's RWSS were managed through a PPP mechanism (Prevost *et al.* 2010), rising to 60% by 2016 (MININFRA 2019a).

A national framework lays out operational standards for RWSS and sets a nationwide tariff for each type of connection. User fees are expected to cover costs of operations and maintenance (O&M), including 'major repairs and replacement of electro-mechanical equipment, but not asset depreciation' (MININFRA 2019a). Where full cost recovery through the current tariffs is not viable, subsidy arrangements may be considered. Local government (Districts) fund major repairs and replacement of equipment through monthly royalties in escrow accounts. Monthly royalties also pay for general renewal, upgrades, and expansion of infrastructure, as well as the administrative costs of the District Water Boards. New infrastructure and major rehabilitation are funded by the GoR and Development Partners.

Problems with the PPP-delivered services became evident in 2016 when a study found that 35% of RWSS managed by private contractors were non-functional (African Water Facility 2016). A 2018 sector-wide strategic plan (GoR 2018) identified major challenges with PPPs, partially attributed to skills gaps and short length of contracts, and recommended that an assessment be carried out to further explore the PPP model (MININFRA 2016). Despite these challenges, currently, nearly all of Rwanda's RWSS are managed through PPPs. There are 17 private operators licensed for rural water supply in the country. Delegated management contracts are competed for through open solicitation (tender) and signed between the PO and the District. Under these contracts, the District is the asset owner, the District Water and Sanitation (WATSAN) Officer is the asset manager, and the PO is the service provider (MININFRA 2019b). Management of public water points, such as

public taps and kiosks, is subcontracted to tap managers. Each public water point has a Water User Committee (WUC) elected by end-users within the community. Under the PPP model, WUCs serve to represent end-users' interests, monitor service delivery and functionality, and report problems and complaints to relevant actors. In addition, WUCs are responsible for the O&M of any non-system water points – such as protected or improved springs – within the water service area (WSA) of an RWSS. These water points are often constructed by non-governmental organizations and do not fall under the delegated management contract. Recent work has demonstrated that the performance of PPP systems in Rwanda can be improved through interventions that strengthen the licensing system for POs, the reporting mechanism, and modify the conditions of the royalty payment strategy (Ogata *et al.* 2024).

In the study reported below, we explore how the PPP model has performed in a rural region of Rwanda using a collection of measures with a particular emphasis on metrics that reflect the lived experiences of the intended beneficiaries. In doing so, we have expanded traditional measures of performance by selectively integrating measures from multiple frameworks and bringing in the lived experience dimension. We argue that this provides a more rounded perspective on the strengths and weaknesses of PPP-based water services provision. The study pursues three objectives: (i) to identify a compound set of performance metrics which reflect institutional objectives, independent service performance measures, and the lived experience of PPP services, (ii) record the performance of two PPP schemes across the compound set of metrics, and (iii) compare and contrast the performance of each service against the compound set of metrics. Our research design does not involve hypothesis testing about the causes of performance differences between the two systems we study (see below). We are, however, perhaps more usefully, able to compare and contrast how the lived experience of access to water services plays out in each case.

METHODS

In order to generate a more nuanced view of PPP performance, we evaluate two case studies on how well they perform against three collections of indicators: firstly, performance data reported by the PO or government; secondly, an inventory of 15 customer satisfaction measures drawn from the principles of the SERVQUAL approach (Parasuraman *et al.* 1985); and thirdly, a list of indicators which help us understand features of lived experience, extracted from four well-established existing indicator frameworks. This third set of indicators is taken from the World Bank Rural Water Metrics Global Framework (World Bank 2017b; Banks *et al.* 2020), the National Water Supply Policy (MININFRA 2016), the National Guidelines for Sustainable Rural Water Supply Services (MININFRA 2019a), and the Sphere standards (Sphere Association 2018). A simple tally of the water supply service indicators listed in all four publications was sifted to remove duplication, and the remaining items were reviewed to assess their relevance to the experience of a water service in contrast to those which purely relate to the physical features of the infrastructure or resource inputs such as energy and labour. A list of the adopted indicators, target values, and data sources used in this study can be found in Table 1. Four of these reflect PO performance expectations as stated in Rwanda's Ministry of Infrastructure *Delegated Water Management Model Contract* (2019) and the Utilities Regulatory Agency's *Regulations on Minimum Required Service Level for Water Service Provision* (2013). Two additional indicators on RWSS functionality rate and charges collection efficiency collected at the national scale and not available for the individual systems studied here complete a list of six indicators which, for the purposes of this study, we consider as conventional measures of PO water supply performance.

Stakeholder interviews, focus group discussions, and access to government documents allowed us to assess the existence, or not, of feedback mechanisms, preventative maintenance schedules, PO compliance with legal requirements, record keeping, and professionalization and training of PO staff. Customer ability to pay (ATP) and desire for the service were qualitatively assessed through the household survey, drawing on responses to follow-up questions about the proportion of monthly income spent on the service and using narrative analysis to extract customer positions on each indicator.

The geographical context for this study is one of the districts in the western region of Rwanda, characterized by high mountain ranges with steep slopes and lush valleys. Average annual temperature is 18 °C, and annual precipitation varies between 1,200 and 1,500 mm. Agriculture and livestock farming constitute the backbone of the local economy with, in addition to small subsistence farmsteads, commercial activities producing cassava, maize, bananas, beans, potatoes, and coffee/tea for export. The poverty rate was recently reported at close to 50% (against a national average of 39%), with almost half classified as being in extreme poverty (NISR 2023). Our case studies are two rural water systems, labelled System A and System B for the purposes of the study, each managed by a different PO, selected because they are comparable in features and population

Table 1 | Indicators and target values used in this study, together with data sources

Indicator	Target value	Data source
Time to fetch water, roundtrip[a]	<30 min	HS
Monthly reporting	100%	WASAC
Feedback mechanisms between (consumers, operators, regulators) in place, known, and used	Yes	SI
Percentage of households using <5% of their monthly income to buy water for drinking and domestic use	100%	HS
Customer ATP	High	HS
Percentage of people who collect drinking water from a protected source[a]	100%	HS
Overall level of customer satisfaction	90%	HS
Customer desire for the service	High	HS, FGD, SI
Breakdown response time[a]	<24 h	HS
Proportion of water points functioning[a]	100%	DO, LG
Preventative maintenance conducted at 6-month intervals	Yes	FGD, SI
PO record keeping	Yes	DO, SI
PO compliance with legal requirements	Yes	SI, WASAC
Professionalization and training of PO staff	Yes	SI
Awareness of the company	100%	HS
Presence and awareness of WUCs	100%	HS
Gender balanced workforce	50% female	HS
Community meetings and participation	75%	HS

[a]Indicators that reflect conventional PO performance expectations.
Data sources: DO, direct observation; HS, household survey; FGD, focus group discussion; LG, local government; SI, stakeholder interview; WASAC, Water & Sanitation Corporation.

Table 2 | Number of assets per system

Asset	System A	System B	Total
Chambers[a]	22	39	61
Reservoirs	9	16	25
Sources	11	14	25
Water points[b]	60	138	198
Total	**102**	**207**	**309**

Source: WASAC (2019).
[a]Chambers includes air release, break pressure, collection, starting, valve, and washout chambers.
[b]Water points include household, kiosk, and public taps.

served. Both systems are gravity-fed and are located within a single district, a predominately rural area with a few clustered settlements. Each system comprised one or more water sources together with the associated piped distribution network and access points. Each system is hydraulically independent of the other. Table 2 shows the number of assets within each system.

Table 3 breaks down the number of water points by type and by system. Water supply coverage within the district's sectors ranges from 55 to 90%, although less than 70% of households in the study area reported using an improved source of water in the latest census (NISR & MINECOFIN 2012). While the geographic area covered by the survey is served by the two PPP systems, some residents do not make use of the provided supply points for reasons highlighted below and obtain water from alternative sources within the WSA.

We employ a cross-sectional mixed methods approach using stratification and a blend of purposive and random sampling. Although it is rare to combine methods of sampling in the same study (limitations can include poor alignment of sampled populations and increased complexity of data interpretation), the limited time and narrow scope of this study made this the best choice for analysis and is in line with similar studies conducted in Malawi (Chowns 2014), Nigeria (Ojikutu

Table 3 | Distribution of water point types per system

Water point type	System A	System B	Total
Household	28	120	148
Kiosk	5	3	8
Public tap	27	15	42
Total	**60**	**138**	**198**

Source: WASAC (2019).

2017), and the Democratic Republic of Congo (Jimenez-Redal *et al.* 2018). Purposive sampling was used to ensure that respondents were residents in the designated zones of coverage for the two systems. This was especially important as many systems run in parallel and close to one another. Purposive sampling was also helpful in creating a sample size that was appropriately representative of the different types of users accessing a system using geographically diverse water points. Random sampling was used to select households for the end-user survey (Teddlie & Yu 2007). End-users accessing each system were divided into four groups based on the nature of their access to the supplied water: household/private connection, public tap, kiosk, or 'other'. The 'other' category was used for should-be users of kiosks and/or public taps who instead fetch water from points that are not owned or monitored by the District.

According to records held by the District, System A serves a population of about 1,530 households and System B serves about 1,730 households. For a margin of error of 10% and a confidence level of 90% (assuming a 50% response distribution), the minimum sample size for the household survey was calculated as 65 and 66 for Systems A and B, respectively. The total number of completed household surveys was 325. During data cleaning, seven cases were removed as the respondent lived within another system's zone of coverage, giving a final sample size of 318. Fieldwork was conducted over 6 weeks during June and July 2022 with the help of three enumerators and comprised a household survey ($n = 318$), semi-structured interviews with stakeholders ($n = 12$), focus group discussions (two of), and field observations (78 locations) (see Table 4). Although the overall total number of respondents (n) is 156 for System A and 169 for System B, the n varies between variables due to the exclusion of non-responses. A response of 'Unsure/Don't Know' is not considered a non-response for the purpose of our data analysis.

Templates for the household survey and stakeholder interviews were developed in English and translated into Kinyarwanda (the principal language of the district). Pilot testing of the surveys ensured reliability and validity and was conducted in three rounds with three individuals, each of whom was randomly selected. After each round of piloting, modifications to the survey instrument were made. Examples of changes made during the piloting period include updating question formats, improving translations, reordering questions, and shortening the length. Those who participated in the piloting of the questionnaire and their responses are not included in the data set reported below. Although digital survey recording methods were considered to reduce any inconsistencies, missing responses, and errors during data collection and speed up data entry, limited battery life and long distances between households meant that paper and pen were deemed the best option for the recording of respondent data.

Stakeholder interviews and focus group discussions could only be undertaken on an *ad-hoc* basis due to time and travel constraints. This element of the fieldwork can be seen as more ethnographic in style, informed by writings on the use of informal conversations and group discussions to ascertain data from concrete settings (Gobo 2008). Both activities were conducted with the assistance of a translator with field notes and (where agreed to) audio recordings taken for transcription and reference. Field notes from these encounters were used to enrich our understanding of the context and circumstances of the fieldwork, populate the evidence base for a number of the indicators listed in Table 1, and explore the alignment of PPP behaviours with their performance commitments.

A total of 78 site visits were conducted. Global Positioning System (GPS) coordinates and details from the asset inventory provided by the District Office were loaded into ArcGIS to assist with navigation. Data and information on each inspected asset were added to the publicly accessible mWater database (https://www.mwater.co/) and included functionality reports, operational status/issues, photos, GPS coordinates, and any other notable details. Discrepancies between the asset inventory and site visit observations were recorded in a field notebook. Secondary data were obtained from WASAC, the District Office, and the Rwanda National Institute of Statistics. Following the collection, all data were reviewed, coded, and entered into an

Table 4 | Data sources and acquisition methods

Method	System A	System B	Total
Household surveys	151	167	318
Refusals	6	3	9
Completed	156	169	325
Removed	(5)	(2)	(7)
Stakeholder interviews	7	5	12
Government officials (District, Sector, Cell)	2	2	4
Water point caretakers	2	2	4
Private operator employees	2	0	2
End-users	1	1	2
Focus groups	2	0	2
Government officials	1	0	1
End-users	1	0	1
Site visits	43	35	78
Chambers	3	2	5
Reservoirs	3	5	8
Sources	2	3	5
Households/private connections	5	4	9
Kiosks	5	2	7
Public taps	15	9	24
Handwashing stations	3	3	6
Non-PPP water point	7	7	14
Document analysis	Access to documents available from the Rwandan Ministry of Infrastructure https://www.mininfra.gov.rw/water-and-sanitation		

Excel spreadsheet. Before cleaning, 10% of all surveys were checked for data entry accuracy. Once cleaned and checked, the data were analysed using the Statistical Package for Social Sciences (SPSS).

Ethical approval for the fieldwork was secured from the Cranfield University Research Ethics System (CURES/16377/2022). Participants in the study were not given compensation or a reward for their time. Informed consent, obtained orally, visually, and/or in writing, was gained before beginning and after concluding surveys and interviews. Due to the potentially sensitive nature of some findings and procurement processes, information regarding study location, PO names, and system names and sources has been redacted, anonymized, or generalized as much as possible.

RESULTS

Household surveys were collected from all 24 villages within the WSAs. Fifty-nine per cent of respondents were female. The median household size was 5, and the median household monthly income was RWF 3,000 (£2.37). Per district office records, if all public water points are functioning, the number of users per water point is 343. Forty-seven per cent of all respondents reported using a PPP-managed access point for their main source of water. Within the PPP systems, the most common type of reported connection was household/private connections (49%), followed by public taps (30%), and kiosks (21%). For those not utilizing a PPP water point, the most common sources were protected sources (65%), such as protected springs, and unprotected sources (20%), such as rivers, runoff, and unprotected springs. No respondents reported harvesting rainwater. One participant stated that they purchase water from a vendor, and three reported using a private source, although the nature of the source is unknown. No respondents had water piped into their homes. All household connections are located in the yard or within the plot. Those who do not have access to water within their home or yard make an average of 13 24-min

return trips per week to collect water. Respondent estimates of how much water they use each day differed only slightly between households served by System A and System B (13 and 17 litres per person per day, respectively). We report results against the three sets of indicators noted above, grouping the evidence for the final set across four headings: to characterize the lived experience of the water service; Supply and Demand, Reliability, Equity and Inclusion, and Governance and Compliance.

Assessing the performance of the PPP mechanism in this district through traditional infrastructure metrics, such as the functionality rate and collection efficiency as reported by the PO or found in government records paints a positive picture. The asset inventory maintained by the district shows a functionality rate of 80% (District Asset Inventory), a marked improvement over the global RWSS functionality rate of 65% (Hutchings *et al.* 2015). MININFRA reported 99.5% charge collection efficiency in 2019–2020, up from 99% in 2018–2019 and 96% in 2017–2018 (MININFRA 2020). The data collected through this study, however, evidences patchy performance against the target measures for both systems (Table 5). Customer desire for the service is high for System A and System B, but that is the only metric for which both systems meet expectations. The only other targets met are for Workforce Gender Balance (System A), with System B coming close to meeting metrics on time to fetch water (roundtrip), and the percentage of people who collect drinking water from a protected source. Particularly, poor performance was found against multiple features of the service, including breakdown repair time (24-h target met in 34 and 17% of the time with an average repair time of >1 month), an average across both systems of 31% of water points not functioning, and very low awareness levels among users of the PPP company. We also found that the proportion of functioning water points was reported to be much higher through official reporting compared with the direct observations we made in the field. Unsurprising, then, that the proportion of users expressing satisfaction with the service was only 48%. Levels of user satisfaction across a wider range of parameters indicated that System A, which performs (marginally) better on some of the engagement metrics such as customer awareness of the PPP company, presence and awareness of the WUC, and community meetings and participation (Table 5), has higher levels of satisfaction than System B (Figure 1).

Table 5 | Summary indicator metrics

Indicator	Target value	System A value	System B value
Time to fetch water, roundtrip[a]	<30 min	71.9%	92.2%
Monthly reporting	100%	0%	18.2%
Feedback mechanisms between (consumers, operators, regulators) in place, known, and used	Yes	No	No
Percentage of monthly household income used to buy water for drinking and domestic use, not to exceed 5%	100%	58.0%	72.2%
Customer ATP	High	Low	Low
Percentage of people who collect drinking water from a protected source[a]	100%	85.6%	94%
Overall level of customer satisfaction	90%	59.8%	36.6%
Customer desire for the service	High	High	High
Breakdown response time[a]	<24 h	34.5%	16.7%
Proportion of water points functioning[a]	100%	63.3%	74.6%
Preventative maintenance conducted within 6 months	Yes	No	No
PO record keeping	Yes	No	No
PO compliance with legal requirements	Yes	No	No
Professionalization and training of PO staff	Yes	No	No
Awareness of the company	100%	32.2%	21.1%
Presence and awareness of WUCs	100%	30%	16.7%
Gender balanced workforce	50% female	56.7%	15.8%
Community meetings and participation	75%	27.7%	22.0%

[a]Indicators that reflect conventional PO performance expectations.

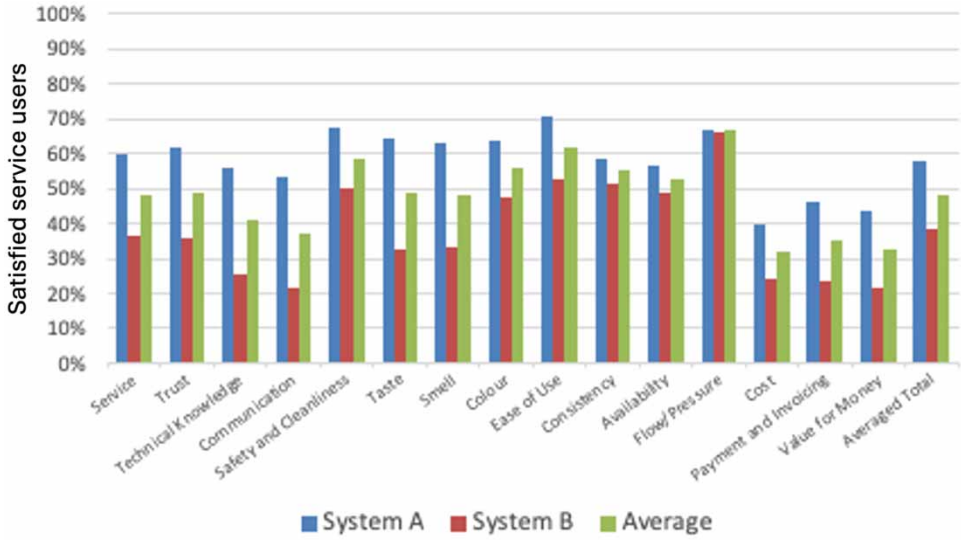

Figure 1 | Water service user satisfaction levels. Measured by responses to direct questions about satisfaction with each parameter (except 'Trust', where the question was 'Do you trust the water company?').

Less than a quarter of PPP-supplied households (21%) reported having access to water all day, every day. The most common reasons given for no supply were seasonal variation, insufficient/low supply, or a locked or closed water point. Sixty-one per cent of users reported fewer than three access point breakdowns within the last 6 months. In the event of a breakdown, more than half (54%) of repairs took 1 month or longer. Twenty-eight per cent report repairs completed within 24 h. Site visits observed an 80% access point functionality rate. However, most public water points were closed or locked at the time of observation. Of those that utilize PPP-managed public water points, 25% of respondents stated that there is no water point caretaker. End-users also reported low levels of community engagement and participation. Twenty-three per cent of respondents were aware of a WUC in their community. Of those, only 25% said that someone in their household is a member of or participates in the WUC. A quarter of respondents state that someone in their household has attended a community water meeting in the past year.

Forty-seven per cent of respondents report paying for water. PPP users are subject to Pay-As-You-Fetch (PAYF)/Pay-Per-Use (PPU) tariffs. Users with household connections must also pay a connection fee and any costs for the materials, construction, installation, and repairs to the connection from the main water line. Users of non-PPP public water points, such as unprotected and protected springs, do not pay for water consumption, but may be asked to contribute to the cost of repairs when they arise. The median rate paid for water by respondents was RWF 1,000 (£0.79) per m^3. Thirty-four per cent of users spend more than 5% of their monthly salary on water. Sixty-five per cent of end-users say the tariff is too high. When asked what a fair price for water would be, the most common response was RWF 250 (£0.20), about 75% less than the current price.

Semi-structured interviews, focus group discussions, and site visits revealed that no contracts are in place between the POs and their employees, subcontractors, or customers. No operational or financial records were observed during site visits. None of the PO employees or subcontractors reported any instance of job training or support over the life of the contract. Based on information provided during end-user surveys, only System A has a gender balance of water point caretakers. Only 26% of those surveyed in the WSAs, and almost none of the water point caretakers, were familiar with or knew the name of the PO.

Using the indicators and targets listed in Table 1 and the data collected during this study, a performance summary can be generated (Table 5). Values represent the extent to which a target has been obtained, represented by 'yes' or 'no' for binary indicators and percentages for all non-binary indicators. The only indicator fully met was a gender balanced workforce by System A, due to the relatively high number of females that serve as water point caretakers.

We structure the final component of the results around four important influences on the lived experience of water services provision: supply and demand, reliability, equity and inclusion, and governance and compliance.

Supply and demand

For utilities and businesses alike, demand – the actual and perceived need by the consumer for a product or service – is essential. Demand for clean, safe, and reliable water is high in both WSAs. Residents of these areas are aware of the health benefits of consuming safe water and desire easy access. Nearly all respondents expressed a willingness-to-pay (WTP), but ATP is a major barrier. There were a number of respondents who were aspirational users and former users of the systems but are no longer customers due to cost, abandoned or locked water points, and breakdowns. End-users turn to alternative water points, such as protected springs, unprotected springs, and surface water. The catchment plan covering both WSAs predicts that if no changes are made to the approach to water services provision and use of water, the catchment will have declining groundwater levels and recharge rates to sustain the predicted population size through 2040 (Rwanda Water Resources Board 2020). At a national level, the movement from Community-Based Management to PPPs has not led to increased levels of water consumption (Rwanda Water Resources Board 2020), despite high demand and WTP.

Reliability

A reliable PO would be expected to provide a consistent, dependable service and to honour commitments. Reliability also extends to administration, such as accurate record keeping and invoicing. Neither system demonstrated reliability. End-users reported that commitments made by the POs have gone unfulfilled. Site visits and stakeholder interviews found no evidence of record keeping or accurate billing by the PO. None of the water point caretakers kept any records and had no way of tracking the amount of water distributed, the amount of money collected, profits, or details of supply interruptions and breakdowns. Receipts are given at the time of charge collection, but they are not itemized and rely on the collection agent's readings of metres. The lack of record keeping is accompanied by reports of overcharging and PO employees pocketing the extra cash. Many end-users felt that the dependability of PO employees, particularly with respect to repairs and maintenance, varied greatly based on geographic location and personal relationships.

Equity and inclusion

The PPP mechanism has not fostered equity and inclusion. Under the PPPs, little to no community engagement occurs. Despite the legal requirements for each water point to have a WUC, the District was unaware of any WUC within the WSAs, and only 30% of System A and 16.7% of System B respondents had knowledge of a WUC in their community. Actual gender balance within the PO workforces is unknown; however, gender balance was measured by asking the gender of the water point caretaker. Fifty-seven per cent of System A users reported their water point caretaker as a woman, much higher than the 15.8% in System B.

Patterns of accessibility, proximity, and affordability were all exposed through direct observation and data from WASAC, indicating that, in both WSAs, those who lived closest to the sources had the least amount of access to piped supply. Despite their proximity to both the distribution infrastructure and the water source, almost all of these households were using unprotected sources for their water supply. Household connections require a significant investment upfront of about RWF 30,000 (£23.70) plus any repair costs. Those who are able to afford one receive a more favourable tariff rate. Water supplied to household connections is charged at RWF 338 (£0.27) per m^3. Those who fetch water from a public tap or kiosk are charged RWF 10 per 20-litre jerrycan, equating to £0.40 per m^3. Public tap and kiosk users make an average of 13 trips each week to collect water, with trips averaging 24 min in duration. End-users with household connections consume more litres of water per day, but the average consumption across both System A and System B (of 15 litres per person per day) still falls below the WHO-recommended minimum of 20 litres per person per day to take care of drinking, cooking, food hygiene, handwashing, and face washing (Howard *et al.* 2020).

The distribution of water assets is clustered around small town centres, rather than across the WSA. There are some villages without any water points at all. Water points in both systems are not accessible for individuals with disabilities, the elderly, or children due to long distances, hilly and rocky terrain, and the frequent absence of a caretaker. Those who are closest to the sources have the least access. Indeed, there are rarely any water points and no household connections in the communities that live in the immediate vicinity of the sources.

Governance and compliance

The goals of the 2016 National Water Supply Policy have not been met because there is not 100% rural water supply coverage, monitoring, training, or reporting; nor is there a pro-poor approach. Site visits, focus group discussions, end-user surveys,

interviews, and desk research uncovered high levels of non-compliance with regulations. Although the GoR has put forth policies, guidelines, and templates that explicitly detail roles, responsibilities, and regulations, none of these documents seemed to be used or their content adhered to. Neither PO issued contracts to employees, subcontractors (water point caretakers), or customers. Public records were inaccurate and incomplete. After fieldwork had been completed, it was discovered that one of the POs was blacklisted by the GoR in September 2020, yet they continue to operate. National policy dictates that POs must submit monthly reports on performance and quality. According to the WASAC delegated management portal, PO A had not submitted a single monthly report. PO B had submitted only 12% of the required reports. At the time of this study, PO employees had not been paid in over 3 months, with no explanation provided. District records are consistently incorrect, and site visits revealed a number of discrepancies and multiple abandoned water points. Reported coverage rates are incorrect and high – those that use non-PPP sources are counted as served under public taps and kiosks. Despite the intention of PPPs to professionalize RWSS, it is still operating in a very informal fashion. Customers often find themselves exposed to the whims of caretakers and technicians and report both bullying and price gouging. PO employees and caretakers had not been provided with any sort of job training or support. The majority of caretakers had not been taught how to read a water meter. Several caretakers stated they had no way of getting in contact with the PO, so decision-making, advice, response to breakdowns, etc., had to wait until a manager visited the location to collect charges.

DISCUSSION

In both case examples, performance against the adopted measures was patchy, irrespective of the metric's provenance. Several features of the data endorse findings from previous work and lend additional support to the view that there are systematic weaknesses in the deployment of water and sanitation PPPs in Africa. As noted above, Chapman *et al.* (2020) reported that provision frequently lacked both sustainability and documentation and that the burden of ensuring access and system maintenance fell predominately on local actors. These are a core element of the day-to-day experience of the two systems we investigated, with the service provider failing to submit required reports and their local representatives playing a significant role in mediating users' access to and payment for water services. The experiences we recorded reveal that, as noted by Deal & Sabatini (2020), some are unable to take advantage of the benefits offered by a PPP. Locational (distance to a supply point), reliability (supply downtime), and local profiteering (price gouging) all serve to impede access to services for some parts of the community. Whether or not there is any attempt to monitor or police PO performance, service users seem to be exposed to a poor level of provision, exacerbated by relationships with PO employees which are reminiscent of the exploitative behaviours identified by early evaluators of PPP interventions (Braadbaart 2005). Effective and equitable water user engagement with, and participation in, system management has frequently been flagged as significant for sustainable water service provision (most recently by Callejas Moncaleano *et al.* (2024)). The lack of any effective participation by served communities in the running of their water supply (via WUCs or alternatives) in the systems we studied is therefore of concern with regard to their future.

The poor alignment of practice with regulations described above, as well as the patchy quality of service experienced by users, offers some support for the view of the Asian Development Bank (ADB 2022) that functioning accountability measures, as well as capable government and private sector partners, are critical to PPP success. Interestingly, a similar finding was reported by Nelson *et al.* (2021) in a review of 73 papers covering WASH interventions across 29 countries. However, their conclusion was related to the role that communities (rather than delivery institutions) should play in being responsible for the outcomes of WASH interventions. Rwanda has both a committed government and a strong underpinning of WASH legislation. Despite this, levels of accountability are weak, and we found little evidence of capable private sector partners. We have noted that ineffective accountability is a challenge to the realization of benefits from PPPs across multiple sectors (e.g. Mutiganda *et al.* 2021; Cao & Wang 2023), and this study provides evidence to support the view that legal frameworks that seek to create an enabling environment for PPP implementation are perhaps necessary but not sufficient in order to deliver intended benefits for citizens. While accountable organizations (in both a cultural and a legal sense) have an inherent incentive to deliver compliance with regulations, there has been little academic engagement with the relationship between accountability and compliance in a WASH context. The discussion regarding the Accountability Triangle in SIWI/UNICEF (2020) is, however, useful in this context as it draws out the significant roles played by compliance and enforcement in delivering accountability.

Despite the weaknesses in the performance of our two PPPs as described above, it is worth remembering that problem-free changes to water supply infrastructure and system management would be a challenge within any jurisdiction. In this context, the far-reaching transformation being attempted in rural Rwanda is perhaps understandably yet to deliver fully on its potential. The provision of wider support for the transition to paid for supplies, as called for by Deal & Sabatini (2020), would seem desirable where additional financial and/or advisory resources are available. We would argue that there is also a strong case, based on the findings of this study, for investing in building public sector capacity for specifying and more closely monitoring the implementation of PPP contract conditions. The disconnect we found between PPP ambition and lived experience, a gap identified by a growing number of studies (e.g. Ngben & Yakubu 2023), evidences a need for greater attention to be paid to the translation of plans into actions.

CONCLUSIONS

This research examined two case studies of RWSS PPP mechanisms as a way of evaluating the implementation and sustainability of the model. Findings from this work improve our understanding of PPPs, but it is not representative of all PPPs. This research examines only two systems managed by two POs within one district and one country. Despite their immense popularity with donors and governments, there is relatively limited evidence demonstrating that PPPs deliver on their promise of increased investment in and delivery of high-quality services while improving efficiency and profitability. The existing literature around the sustainability of PPPs, both in and beyond the water sector, by and large omits the perspectives of end-users, instead focusing on inputs from government officials and private operators. Long-term success of any business relies on the continued use by and value to users. Without the voice of consumers, assessments of sustainability are arguably incomplete.

In the two PPP-operated systems we studied in Rwanda, the promises of the PPP model have not been realized. Persistent problems exist in terms of system functionality, quality of service, perception of responsiveness, inclusion and participation, increased costs to consumers, increased distrust and poor professionalization, expansion of access, and preventative maintenance. We argue that a lack of accountability is driving poor compliance and constitutes the underlying reason for the disappointing performance reported above. Few Sub-Saharan African nations have the necessary legal and regulatory elements required to successfully implement PPPs (Leigland 2018), but Rwanda is widely recognized as benefiting from an extremely robust legal and regulatory framework for PPP and rural water supply and a very high 'rule of law' index score (World Justice Project 2021). This begs the question, if it is not working in Rwanda, where will it work?

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DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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