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Evaluating Users' Willingness to Pay for Private Sector Participation in Water Infrastructure Provision: Evidence from Lagos, Nigeria

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Abstract

The importance of water infrastructure to housing quality, enhanced property values and economic development cannot be overemphasized This study examined the investment potential inherent in private sector participation (PSP) in water infrastructure by evaluating users' willingness to pay for the private provision of water infrastructure in Lagos, Nigeria. The study collected primary data using a closed-ended questionnaire. With a focus on three local government areas in Lagos, 296, 172, and 57 buildings were selected in Ikeja, Surulere, and Shomolu respectively through multistage sampling. Selecting one adult resident in each building, 525 questionnaires were administered, and 450 (85.71%) questionnaires were retrieved and analyzed. Descriptive and inferential statistical techniques were used for data analysis. The results of the gap analysis between the users' satisfaction and accessibility showed a negative mean difference, revealing a low level of satisfaction with the existing water supply options. The users' willingness to pay for the benefits of private water provision showed that better quality of service to consumers (3.84), transparency in charges (3.78), improved service reliability and continuity (3.77), and increase in employment (3.74) were more highly rated than other benefits, suggesting a preference to pay for benefits directly related to the users. Only about 50% of the users are willing to pay a premium of not more than ₦5 per gallon of water. While an understanding of users' willingness to pay for PSP in water supply could help achieve targets such as the Sustainable Development Goals, it could also be used to develop hedonic pricing models to identify how access to water facilities contribute to property value.
Keywords: availability, benefits, cost premium, social goods, users', satisfaction, water supply

Introduction

The economic growth of a country is significantly influenced by the level of infrastructure provision (Luo and Xu, 2018). The importance of water infrastructure to housing quality, enhanced property values (Hsu and Shr, 2023), and economic development (Dangui and Jia, 2002) cannot be overemphasized. Studies have identified the issues of inadequate water supply infrastructure in peri-urban (Maryati and Humaira, 2018) and rural (Bopp et al., 2024) areas. However, increasing population trends, increased water demand, and lack of adequate infrastructure could place most urban areas at severe risk. Thus, given the importance of water provision on quality of life, housing quality, and urban form the need to evaluate water infrastructure provision in urban areas becomes compelling. The provision of water supply involves the allocation of competing scarce resources, and a capital-intensive investment involving high fixed costs. However, increasing infrastructure funding gaps as noted by Agboola et al. (2017), has been identified as a major cause of governments' inability to meet the needs of the populace, particularly concerning water supply.

Issues of the paucity of funds and the absence of realizable government solutions over the years have exacerbated the water supply infrastructure gap across most emerging markets (Tariq et al., 2019). There is a need to bridge the financing gap for water infrastructure, in the face of competing funding options (Borgomeo et al., 2023), and extant studies (Ruiters and Matji, 2016; Shambaugh and Joshi, 2021) have advocated for the involvement of the private sector towards bridging the finance gaps. Milman et al. (2021) noted that main challenges for water infrastructure often arise from aging, increased demand and limited government financing. Thus, the infrastructural gap and the paucity of funds necessitate the need for private sector participation (PSP) in water supply infrastructure provision across most urban areas in developing countries. However, the general expectation of private investors is the ability to generate commensurate returns while minimizing attached risks and uncertainties.

The involvement of the private sector in infrastructure provision such as water infrastructure is no less an investment. The investors will seek to identify the inherent potential investment, especially from the pricing capacity of the end users. Demand backed up with the ability to pay often sets the tone for investment and brings about more attraction to investors. Hukka and Katko (2015) and Doyle (2018) noted that the global water industry faces challenges of underpricing of water services and a growing funding gap for infrastructure rehabilitation and replacement. While the funding gap could be bridged through PSP, the underpricing of the water services could be based on several factors, one of which is the willingness of users to pay for such infrastructure.

Thus, scarcity and need may not be sufficient factors for value creation and sustainability, but effective purchasing power. Value is assessed not only from the perspective of demand but also from the standpoint of acceptability and affordability. Therefore, the investment potential in the private provision of water infrastructure in Lagos State is beyond the assessment and establishment of the supply and/or demand imbalance, but also on the assessment of its acceptability and users' willingness to pay for the services. Thus, there is a need to explore and understand the users' willingness to pay for private water provision. A few extant studies such as Ameyaw et al. (2017), Bopp et al. (2024), and Borgomeo et al. (2023) have focused on issues such as corporate social responsibility, water infrastructural provision, and water supply financing options, with only few studies such Hensher et al. (2005) and Mbata (2006), exits on users' willingness to pay. There exists a paucity of studies across most developing economies investigating users'

willingness to pay for privately provided infrastructure, especially owing to the perception and expectation of citizens that infrastructure provision is a social need that should not be charged or should be charged at a highly subsidized rate, especially utilities like water.

This study examines the investment potential inherent in private sector participation in water infrastructure by evaluating users' willingness to pay for the private provision of water infrastructure in Lagos, Nigeria. The following research questions are set for the study:
RQ 1: What is the level of users' accessibility and satisfaction with existing water supply options?
RQ 2: To what extent are users willing to pay for the benefits of PSP in water provision?
RQ 3: Is there any relationship between users' demographics and their willingness to pay?
RQ 4: What premiums are users willing to pay for private water provision?

Literature Review

Financing Water Infrastructure

Funding needs have been identified as a major challenge for water infrastructure financing. It is a capital-intensive project requiring substantial capital investment. Borgomeo et al. (2023) noted that estimated global investment needs for water infrastructure range between US$120 to 330 billion/year by 2030. In addition to the finance gap, the water sector faces difficulties due to low returns and high risks, and the social good conception end-users about water infrastructure. Ensuring the quality and efficiency of infrastructure projects has also been another major challenge. Thus, closing the financing gap for water infrastructure projects involves not only spending more but also spending with greater quality and efficiency (Borgomeo et al., 2023).

Increasing budgetary constraints and global concern about water security are driving increased investments in the water sector, and the PPP models are being advocated as mechanisms to ensure fiscal sustainability (Shambaugh and Joshi, 2021). Public Private Partnerships (PPPs) could be leveraged to provide private capital, thereby expediting the provision of public water services across developing countries (Ameyaw et al., 2017), and bridging the limited investment inflows to the water provision. Thus, while PSPs, a variant of PPP, contribute to funding water infrastructure development by accelerating service provision, promoting sustainability, and enabling risk management and financial viability (Trotter et al., 2017), a lack of technical and financial skills, as well as adequate monitoring of the private operators, could pose significant challenges in water infrastructure financing (Ruiters and Matji, 2016).

Extant studies (Ameyaw et al., 2017; Dithebe et al., 2019) have underscored the importance of political commitment, well-designed PPP contracts, thorough planning, transparency, accountability, and a conducive operational environment as critical factors to attract PSP to water provision. However, the willingness of the users measured by their readiness to pay is another crucial consideration.

Factors Influencing Users' Willingness to Pay for Private Water Supply

Users' willingness to pay for water infrastructure is influenced by a range of factors, ranging from socioeconomic factors to locational and accessibility issues. Also, the perception of quality, pricing and level of satisfaction could influence users' willingness.

Socioeconomic Factors

Concerning the influence of socioeconomic factors, Polyzou et al. (2011) found individual social capital to be a significant explanatory parameter of willingness to pay, Thakur et al. (2022) noted that socioeconomic factors such as household income, level of education, and employment status are principal factors influencing willingness to pay for private water connection. Using a contingent valuation approach, Mbata (2006) found that household income, level of education, employment status, and level of consumer awareness were significant factors influencing willingness to pay for private water supply. Corroborating this view, Ali et al. (2024) found that higher income has a statistically significant positive effect on willingness to pay for improved water services. Age and household size were found to be significant in determining users' willingness to pay (Ireri et al., 2024; Thakur et al., 2022). Ireri et al. (2024) found that education was a key factor influencing respondents' willingness to pay for improved water services in Kenya. From a slightly distinct perspective, Wang et al. (2021) found a low correlation between cognition and users' attitude. The study found that users' attitudes cannot be influenced by high or low conceptual knowledge of water infrastructure.

Locational and Temporal Variations

Users' willingness to pay could also be influenced by locational and individual factors (Devi et al., 2009). Users' perceptions and stated willingness can have temporal variation, influenced by geographic and sociodemographic factors (Osman et al., 2019). While Osman et al. (2019) highlighted the importance of temporal variations in influencing users stated willingness to pay for improved water, Yang and Faust (2019) corroborating this view, observed a statistically significant shift in residents stated willingness to pay between surveys. Attitudinal and behavioural factors, such as values, norms, and beliefs, have also been shown to influence residents' valuation and willingness to pay for continuous water supply (Wilson et al., 2021). If the level of consumer awareness is assessed, it could influence their willingness to pay and assist service provider's cost recovery.

Availability and Accessibility of Water Supply Options

Generally, underinvestment in infrastructure hampers economic growth and productivity. Unavailability and inaccessibility to infrastructural facilities have attendant implications for industries, national competitiveness, and household costs (ASCE, 2016). Thus, the long-term impact of underinvestment in water supply infrastructure due to the paucity of funds by the government and/or users' low willingness to pay for infrastructural provision can be significant. Water supply infrastructure is a single-sector investment with a high and diverse impact on many sectors of the economy. Heil (2011) noted that there could be severe financial and economic consequences arising from availability and accessibility due to aging infrastructure. Rising water costs, combined with stagnating income levels, could particularly affect poor households, exacerbating water accessibility and availability issues (Cardoso and Wichman 2022). Virjee and Gaskin (2010) highlighted that underinvestment in water infrastructure can lead to inadequate and deteriorating service levels, impacting the quality, accessibility, and availability of water supply services. Underinvestment can also result in increased water scarcity risks, affecting local communities and potentially leading to environmental and public health hazards (Aslam et al., 2018). A major implication of underinvestment in water infrastructure resulting in unavailability is a reduced level of users' satisfaction and increased household costs on alternative water sources.

Other Factors Influencing Users' Willingness to Pay

Highlighting the importance of users' perception, del Saz-Salazar et al. (2016) found that positive perceptions of drinking water quality positively impact users' willingness to pay, while negative perceptions and economic crises lead to lower willingness to pay. Similarly, Kim et al. (2021) submitted that high-level satisfaction with water supply services and positive price perception of water bills result in a higher willingness to pay. Other factors such as the quality of water and services provided and preference for privatization of the water utility could influence users' willingness to pay (Guerrini et al., 2018). Willingness to pay for private water delivery could also be influenced by risk perceptions and external information provided by water service providers (Tanellari et al., 2015). Others include the level of water scarcity, demand factors, potential long-term losses (Tanellari et al., 2015; Wilson et al., 2021; Ireri et al., 2024), and perception of water quality vis-a-viz health impacts (Thakur et al., 2022; Ali et al., 2024). Tariq et al. (2003) argued that awareness of water contamination events increases users' willingness to pay for improved water quality.

The foregoing presupposes that users' willingness to pay for private water provision is influenced by a complex interplay of factors including socioeconomic, demographic, temporal, and regional considerations, perception of the benefits of PSP in water supply and availability and users' satisfaction with existing options. Thus, understanding the factors that influence the value that users attach to the private provision of water services based on their willingness to pay could provide insights into the economic implications for private service providers. There is a need for increased attention to issues of financing and investing in water supply infrastructure, especially due to the impact on communities and the ability to stimulate economic activity. The severity of the infrastructural deficit in water supply provision in most urban areas has been exacerbated by years of underinvestment, infrastructure and management challenges, and perhaps inadequate pricing of services by end users. An evaluation of users' willingness to pay thus comes to the fore and this study achieves this aim by evaluating users' willingness to pay for the private provision of water infrastructure in Lagos, Nigeria.

The Study Area: Lagos, Nigeria

Lagos is Nigeria's commercial heartbeat. It is one of the most populated cities in Nigeria and on the continent of Africa (Healy et al., 2020). At a growing rate of 3.5% pa, Lagos is currently one of the fastest-growing cities globally (Faisal et al., 2021) and has been predicted to become the world's largest megacity by 2100 (Olabode and Comte, 2024). As at 2018, Akinbode (2018) noted that the daily water demand of 540 million gallons exceeded the Lagos Water Corporation (LWC) production capacity, leaving a huge deficit of up to 320 million gallons. The current realities still suggest that the state has been unable to meet the increasing water supply demand and faces an acute shortage of safe and affordable water supply due to issues such as rapid urbanization, increasing demographics (Olabode and Comte, 2024), dilapidating infrastructure, and low budgetary provisions (Iniobong, 2024). Thus, the water supply challenges in the state present a huge gap in terms of water infrastructure provision by prospective institutional and/or private investors. Given that investors are driven by profit motives, this study seeks to provide information on the level of willingness of users to pay. This will aid potential private investors' decisions as regards investing in water infrastructure. Meanwhile, there is a dearth of information in extant studies as regards the willingness of the users to pay for infrastructure privately provided owing to the "social benefit" expectation of most citizens. Simões (2017) argued that users of water services have

historically considered water provision as a public service, and a major function of the state. Thus, users believe that water infrastructure provision is a social good that should not be commodified, and if levied, this should be at a very subsidized rate.

Research Method

The study adopted primary data sourced from a field survey. The population studied were the residential water infrastructure users in Lagos State, Nigeria. The latest house numbering project conducted by the Lagos State Signage and Advertisement Agency (LASAA) in 2012 puts the number of residential houses in Lagos State at 1,194,525.

Lagos State is divided by the Independent National Electoral Commission (INEC) into three senatorial districts, Lagos East and Lagos Central, each comprising five (5) Local Government Areas (LGAs) and Lagos West, which comprises ten (10) LGAs. Learning from Ahmed (2024), the study adopted multi-stage sampling technique based on the division of the study area into 3 clusters. In Stage One, one LGA is purposively selected in each of the three senatorial districts, based on the LGA with the highest level of perceived need for water infrastructure. These LGAs include Shomolu (Lagos East), Surulere (Lagos Central), and Ikeja (Lagos West). It is expected that users in the chosen LGAs will exhibit a significant level of knowledge for water supply infrastructure.

In the second stage, the study used the records of LASAA 2012 house numbering project to obtain the number of streets in the selected LGAs. The number of streets is 55, 167, and 286 in Shomolu, Surulere, and Ikeja respectively, making a total of 508 streets. The study employed systematic sampling for on-field selection of every 5th street (that is, 20%) from the list of streets in each selected LGA. If the fifth street selected systematically has no residential properties, consideration was given to the next street. A total number of 101 streets, comprising 11 in Shomolu, 33 in Surulere and 57 in Ikeja, were thus selected.

The third stage entailed the selection of buildings from the selected streets. Based on the records of LASAA 2012, there are 572, 1,716 and 2,964 buildings in the selected streets of Shomolu, Surulere, and Ikeja, respectively. The study adopted a systematic sampling of every 10th building (that is, 10%) from the selected streets in each LGA. Where the tenth building systematically selected is not a residential building, consideration was given to the next building. The study selected 57 buildings in Shomolu, 172 in Surulere and 296 in Ikeja, making a total of 525 buildings. Consequently, a total of 525 respondents were sampled. One adult resident in each residential building was selected for questionnaire administration. Prior to administering the survey, the instrument was evaluated by three senior academics to ascertain clarity and internal consistency of the variables. The feedback received was used to refine the final survey instrument. The questionnaire featured questions on respondents' socio-economic characteristics, level of accessibility and satisfaction with existing water supply options, users' willingness to pay and the premiums users are willing to pay for private water provision in Lagos State. The respondents' willingness to pay for private water provision was rated on a 5-point Likert scale, from 5 - Very much willing to 1 - Not at all willing. The reliability of the scales used to measure the users' willingness to pay for the benefits associated with private water provision was analyzed using Cronbach Alpha. The Cronbach alpha value of 0.975 was considered adequate. DeVellis and Thorpe (2012) noted that Cronbach alpha values greater than 0.7 show an adequate level of internal consistency and reliability.

From a total of 525 questionnaires administered to residents in the study area, 450 questionnaires (85.71%), were suitably filled and analyzed. In analyzing the data, the study employed descriptive methods such as frequency, percentages, and mean rating. Inferential statistical methods such as paired sample tests, and Kruskal Wallis, a non-parametric test, were also employed. The significance level was set at $p \leq 0.05$.

Results and Discussion of Findings

Respondents Socio-Economic Characteristics

The analysis of the socio-economic characteristics of the respondents (Table 1) showed that respondents from Shomolu accounted for 12.2%, Surulere, 32.9% and Ikeja, had the highest number of respondents with 54.9%. The age distribution of the users indicates that most of the respondents are between the ages of 31 and 50 years (74.4%). This shows that most of the respondents are within the highly active age bracket; thus, the convenience linked to an efficient water supply system should be important. The analysis shows a predominance of male respondents 72.4%, with 76.0% being married. Regarding respondents' educational qualifications, the result shows that 87.6% are educated up to the tertiary level. This might influence users' level of knowledge of the information contained in the questionnaire, thereby supplying informed answers. Educational status could also impact on the respondents' knowledge of the level of hygiene and the importance placed on the water supply. The result of household size shows that the majority (50.2%) were of 4 to 6 household size. This suggests a possible high demand for water supply and the likelihood of more exposure to water supply issues amongst these groups of households collectively. Users' response to the type of accommodation shows that 95.6% of the respondents occupy one to three-bedroom apartments. The collective demand and usage of water amongst these groups of respondents is likely to be high.

The result on the property ownership status indicated that 363(80.7%) were tenants, it is expected that basic amenities such as water supply systems are available within the accommodation to enhance tenants' satisfaction. Hence, the responses should be clear of any bias or attachment concerning the water needs in the property and area. The results show that 373(82.9%) users are employed in the formal sector, suggesting that the users should have some level of financial capacity to accommodate expenditure on essential services such as water. Users' income level as measured by their monthly income shows that respondents earning between ₦50, 000 to ₦500, 000 sums up to about 85.5%. This suggests that the users are expected to be able to accommodate the extra premium associated with private water provision, as this may likely cost more than public provision.

Table 1: Respondents' Socio-Economic Characteristics

Demographic Variables		Frequency	Percentage
Location	Shomolu	55	12.2
	Surulere	148	32.9
	Ikeja	247	54.9
	Total	450	100.0
Age	30 years and below	32	7.1
	31 to 40 years	132	29.3
	41 to 50 years	203	45.1
	above 50 years	83	18.4
	Total	450	100.0
Gender	Male	326	72.4

	Female	124	27.6
	Total	450	100.0
Marital Status	Married	342	76.0
	Single	85	18.9
	Divorced/Widowed	7	1.6
	No response	16	3.6
	Total	450	100.0
Educational Status	Secondary Education	56	12.4
	Tertiary Education	394	87.6
	Total	450	100.0
Household size	1 to 3	124	27.6
	4 to 6	226	50.2
	7 to 9	52	11.6
	No response	48	10.7
	Total	450	100.0
Accommodation Type	1 Bedroom	156	34.7
	2 Bedrooms	113	25.1
	3 Bedrooms	161	35.8
	4 Bedrooms and above	20	4.4
	Total	450	100.0
Property ownership status	Owner	87	19.3
	Tenant	363	80.7
	Total	450	100.0
Employment Sector	Formal	373	82.9
	Informal	77	17.1
	Total	450	100.0
Income Earned per month (in naira)	Below ₦50,000	52	11.6
	₦50,000 to below ₦150,000	235	52.2
	₦150,000 to below ₦500,000	150	33.3
	₦500,000 and above	13	2.9
	Total	450	100.0

NB: 1 USD = NGN 1650 as at November 2024

Level of Users' Accessibility and Satisfaction with Existing Water Supply Options

The study assessed the users' level of accessibility and satisfaction with existing water supply options and subsequently conducted a gap analysis to assess the difference between the level of accessibility and satisfaction. A negative gap analysis, that is, lower satisfaction levels, might suggest users' disenchantment with the existing options and indicate a higher level of willingness to pay for private water infrastructure provision, and vice versa.

Accessibility to Existing Water Supply Options

The result of the mean rating for the level of accessibility (Table 2) shows that the Borehole water supply option was considered the most accessible (mean - 4.46). Users rated water vendors moderately high (mean - 3.69). The high mean score of the water vending supply option suggests that the respondents are conversant with private water provision on a small-scale basis. Other water supply options were lower than the benchmark mean score of 3.00. Hand-dug well and rainwater supply options had mean values of 2.98 and 2.87 respectively. The mean scores also indicate that public water and surface water supply options were the least accessible in the study area with mean values of 1.90 and 1.81 respectively.

From the result, borehole water was considered the most accessible in the study area. However, cost implications, concerns about water quality, likely environmental issues and maintenance needs may affect the level of satisfaction derivable by users. With the low level of accessibility to other water sources in the study area, the satisfaction level may be low, and users are likely willing to accept PSP in water infrastructure provision.

Satisfaction with Existing Water Supply Options

The results in Table 2 show that only the borehole water supply has a mean score above the benchmark mean of 3.00, having a mean score of 4.10. Falling slightly below the benchmark are water vendors (mean - 2.89) and rainwater (mean - 2.72). The least rated in terms of users' satisfaction are hand dug wells, public water supply and surface water at mean values of 2.19, 1.63 and 1.49. This suggests that users are dis-satisfied with these sources of water supply.

The result suggests that the borehole water source was the only supply that users were satisfied with in the study area. Users' dissatisfaction with public water supply can be connected to its inaccessibility. This suggests that users in the study area may be willing to accept PSP in water infrastructure provision as the users may perceive improved satisfaction with the high prevalence of water infrastructure provision in the study area. In addition, the attendant challenges of borehole water and users' exposure to some measure of self-provision and small-scale commercial provision, which may be sometimes inefficient, may suggest the users will prefer PSP water infrastructure provision.

Gap Analysis between the Rated Level of Accessibility and Satisfaction

An examination of the gap analysis between users' satisfaction and the level of accessibility, based on the paired sample t-test (Table 2), showed that the users' level of satisfaction across all the water supply options was lower, as evidenced by a negative mean difference (MD). The water supply options with the highest mean difference values are hand dug well (-0.79) and water vendor (-0.79). Followed by borehole, commercial water tankers and surface water, with mean difference of -0.36, -0.39 and -0.32, respectively. The result showed that all the mean values of the paired differences were significant at $p \leq 0.05$. The analysis of the paired samples correlation (significant at $p \leq 0.05$) showed that most of the pairs had high positive correlation values, suggesting a strong correlation between the pairs. This suggests that the level of accessibility directly influences users' satisfaction with available water supply options. The low level of satisfaction could imply that users will be willing to pay market premiums for the private provision of water infrastructure in the area.

Table 2: Paired Samples Analysis of Accessibility and Satisfaction with Water Supply Options

						Paired Sample T-Test				
		Accessibility	Satisfaction	Correlations		Paired Differences				
Water Supply Options	N	Mean(SD)	Mean(SD)	Correlation	Sig.	MD	SD	t	df	Sig. (2-tailed)
Public water supply	450	1.90(0.900)	1.63(0.717)	0.702	0.000	-0.27	0.647	8.742	449	0.000
Hand-dug Well	434	2.98(1.315)	2.19(1.084)	0.665	0.000	-0.79	1.004	16.489	433	0.000
Borehole	388	4.46(0.875)	4.10(1.072)	0.490	0.000	-0.36	0.998	7.121	387	0.000
Commercial water tanker	385	2.65(1.080)	2.26(1.134)	0.630	0.000	-0.39	0.954	8.012	384	0.000
Water vendor	437	3.69(1.237)	2.89(1.033)	0.536	0.000	-0.79	1.108	14.978	436	0.000
Rainwater	421	2.87(1.344)	2.72(1.072)	0.205	0.000	-0.15	1.538	2.060	420	0.040
Surface water	408	1.81(1.063)	1.49(0.895)	0.290	0.000	-0.32	1.174	5.524	407	0.000

Users' Willingness to Pay for Private Provision of Water Infrastructure

Having established the level of users' satisfaction with existing water supply options, the study subsequently evaluated users' willingness to pay for private water provision. This was determined using two approaches. The first is based on the users' mean score rating of their willingness to pay, measured on a five-point Likert scale. The other was assessed based on users' rated willingness to pay for the benefits associated with PSP in water provision.

Mean Rating of Users Willingness to Pay for Private Water Provision

Analysis of the respondents' willingness to pay for private water provision was assessed. The results gave a mean value of 3.37 and a standard deviation value of 1.178. On a 5-point scale, the result suggests an average level of willingness by users to pay for private water provision. Thus, while the users experienced low levels of satisfaction with existing water supply options, the willingness to pay may not yet justify private investment in water provision.

Users' Willingness to Pay for Benefits Associated with Private Water Provision

The users' willingness to pay for the benefits associated with private water provision was analyzed by investigating the extent to which users prioritize and hence are willing to pay for the listed benefits of PSP in water infrastructure provision. The result is presented in Table 3. The respondents were asked to indicate their willingness to pay for each of the benefits on a five-point Likert scale, 1 - not at all willing to 5 - very much willing. The results showed that the three top-ranked benefits that users were willing to pay for are better quality of service to consumers (mean = 3.84), transparency in charges (mean = 3.78) and improved service reliability and continuity (mean = 3.77). This result corroborates the report of Harris (2003) who found that improved performance in quality of service leading to improved service reliability and continuity are major benefits of PSP to consumers. Respondents appear to be willing to pay for benefits from which they will gain. Hence. the consideration for the ranking on the willingness to pay for the benefits. This reasoning is in line with the Technology Acceptance Model (Davis, 1989) stating that factors that are linked to direct benefit that users will profit from are considered to create more influence.

Users have a relatively low willingness to pay for the availability of resources for investing in expansion and reduction in infrastructure prices. These have mean ratings of 2.95 and 2.06, respectively. The availability of resources for investing in expansion does not provide short-run benefits to the users; however, it will benefit the users subsequently. From the aggregate result, the users' willingness to pay for the benefits of PSP in water infrastructure attracted a mean value of 3.41, suggesting that users are willing to pay for these benefits.

Table 3: Users' Willingness to Pay for the Benefits of Private Water Provision

Benefits	Mean	Std. Deviation	Rank
Better Quality of Service to Consumers	3.84	1.193	1
Transparency in Charges	3.78	1.122	2
Improved Service Reliability and Continuity	3.77	1.211	3
Increase in Employment	3.74	1.077	4
Productivity and Efficiency in Service Delivery	3.65	1.259	5
Improved Quality of Product Supply	3.64	1.177	6
Safety and Security of Service Supply	3.58	1.211	7
Expansion of Service Delivery	3.52	1.116	8
Increased Accessibility to Infrastructure Services	3.52	1.112	9
Increase in Wages and Salaries	3.47	1.145	10

Managerial Expertise	3.44	1.183	11
Increased Investment in Infrastructure Services	3.40	1.024	12
Technical/Operational Competence	3.36	1.017	13
Effective Revenue Collection of User Fees	3.18	1.031	14
Reduced Financial Losses	3.17	1.211	15
Reduction of Leakages and Wastages	3.15	1.199	16
Reduced Need for Back-Up Facilities	3.14	1.455	17
Sustainable Pricing Policies	3.10	1.413	18
Efficient Personnel Management	3.06	1.101	19
Availability of Resources for Expansion	2.95	1.069	20
Reduction in Prices of Infrastructure Services	2.06	1.360	21
Overall	3.41	0.922	

Relationship Between Demographic Characteristics and Willingness to Pay

The analysis as shown in Table 4 reveals that most of the factors had a statistically significant influence on users' willingness to pay for private water supply. An examination of the locational variation showed a statistical significance at $p < 0.001$. The mean rank showed that respondents in Ikeja had the highest willingness to pay, perhaps owing to the high social class of residents in this area. This corroborates the findings of Osman et al. (2019) who noted that users' willingness to pay is influenced by geographic and sociodemographic factors. Similar to the findings of Ireri et al. (2024), the results showed that age had a statistical significance at $p < 0.05$. Respondents in the 31 to 40-year-old age group showed the least willingness to pay. While gender and marital status were also statistically significant, the result showed that males and the single group of respondents were more willing to pay for private sector provision of water supply. The outcomes on educational status ($p < 0.001$) affirm extant studies (see, Mbata, 2006; Thakur et al., 2022) showing that educational status had a significant relationship with users' willingness to pay for private water provision. While household size, accommodation type, employment sector and income earned were also significant at $p < 0.001$, the result showed that property ownership status had no statistically significant relationship with users' willingness to pay.

Table 4: Kruskal Wallis Test on Users' Demographic Characteristics and Willingness to Pay

Demographic Characteristics		N	Mean Rank	Kruskal-Wallis H	df	Asymp. Sig.
Location	Shomolu	55	242.67	73.956	2	<.001
	Surulere	148	155.45			
	Ikeja	247	263.65			
	Total	450				
Age	30 years and below	32	247.23	36.659	3	<.001
	31 to 40 years	132	238.12			
	41 to 50 years	203	243.73			
	above 50 years	83	152.48			
	Total	450				
Gender	Male	326	242.01	21.647	1	<.001
	Female	124	182.09			
	Total	450				
Marital Status	Married	342	209.90	7.890	2	0.019
	Single	85	249.45			
	Divorced/Widowed	7	200.71			
	Total	434				

Educational Status	Secondary Education	56	67.90	106.626	1	<.001
	Tertiary Education	394	247.90			
	Total	450				
Household size	1 to 3	124	174.67	41.716	2	<.001
	4 to 6	226	195.84			
	7 to 9	52	290.08			
	Total	402				
Accommodation Type	1 Bedroom	156	155.96	106.072	3	<.001
	2 Bedrooms	113	221.04			
	3 Bedrooms	161	279.47			
	4 Bedrooms and above	20	358.70			
	Total	450				
Property ownership status	Owner	87	230.61	0.189	1	0.663
	Tenant	363	224.27			
	Total	450				
Employment Sector	Formal	373	244.02	50.192	1	<.001
	Informal	77	135.78			
	Total	450				
Income Earned per month (in NGN)	Below ₦50,000	52	45.52	133.490	3	<.001
	₦50,000 to below ₦150,000	235	237.87			
	₦150,000 to below ₦500,000	150	262.44			
	₦500,000 and above	13	295.50			
	Total	450				

Cost Premium Users are Willing to Pay for Private Water Provision

To further reinforce the users' willingness to pay for private water provision, the cost premiums users were willing to pay for PSP in water supply were investigated. Table 5 shows the cost premium users were willing to pay. A total of 27(6%) respondents were willing to pay "not more than ₦1 per gallon". Another 234(52%) respondents were willing to pay "above ₦1 but not more than ₦5 per gallon". A total number of 82(18%) respondents were willing to pay "above ₦5 but not more than ₦10 per gallon" and 13 (3%) were willing to pay "above ₦20 per gallon".

The analysis showed that a total of 79.11% (356 respondents) were willing to pay a particular cost premium, while 20.89% (94 respondents) were not willing to pay any premium cost. As the majority (52.00%) of the users were willing to pay "above ₦1 but not more than ₦5 per gallon", potential investors are expected to assess the amount most of the users were willing to pay to determine the economic viability.

Table 5: Cost Premium Users are Willing to Pay for Private Water Provision

Cost Premium	Frequency	Percentage
Not at all willing	94	20.89
Not more than ₦1 per gallon	27	6.00
Above ₦1 but not more than ₦5 per gallon	234	52.00
Above ₦5 but not more than ₦10 per gallon	82	18.22
Above ₦10 but not more than ₦15 per gallon	0	0.00
Above ₦15 but not more than ₦20 per gallon	0	0.00
₦20 and above per gallon	13	2.89
Total	450	100.00

NB: A gallon is approximately equivalent to 4 litres (standard measurement)

The results indicate a fair willingness to pay for PSP in water infrastructure provision. The users' fair willingness to pay relative to the users' significant preference for PSP in water infrastructure in the study area may be inferred from users considering they may not be able to accommodate the likely increased or high prices that may come from the provision. This corroborates with Harris's (2003) report inferring that some users may not be willing to pay for the increased price of privately provided infrastructure service because they cannot afford the service. This was also supported by Jensen and Blanc-Brude (2005) who identified low tariffs, government opposition to an efficient increase in tariffs and the market willingness to pay as reasons only a few investors are attracted to infrastructure investment in the water sector. While it may be expected that users' willingness to pay should be inferred from users' preferences, Tussupova et al. (2015) found that out of 95% of the rural respondents willing to be connected to water systems only about 50% were willing to pay. In other words, users' preference does not always imply willingness to pay, as was seen in the study area.

Conclusions

The study investigated the users' willingness for PSP in water infrastructure provision. The analysis of the socio-economic characteristics of the respondents revealed that the respondents represent mostly educated active-middle-income earners. While the borehole water source was the most satisfactory, the gap analysis between the users' satisfaction and accessibility reveals a low level of satisfaction with all the existing water supply options. The predominant availability of borehole water and water vendors in the study area suggests that most users are impelled to seek alternatives through self-provision and some other commercial private provision occasioned by low-level coverage and some inefficiencies of public water infrastructure.

The users' willingness to pay for the benefits of PSP seems to be hinged on benefits related to direct benefits such as job creation and sustainable pricing, enhanced service quality and infrastructure delivery, and transparent pricing. However, users' willingness to pay for the benefits of PSP in water infrastructure provision did not directly translate to actual willingness to pay economic premiums for private water provision. Only about 50% of the users are willing to pay a premium of not more than ₦5 per gallon of water. This perhaps could have been occasioned by concerns of future increases in price, low affordability and probably the perception that water provision is the duty of the government. However, the cost premium the users were willing to pay is expected to be assessed by the potential investor to determine its economic viability. The study concluded that factors that are linked with direct benefits to users are significant in influencing the users' willingness to pay. If properly harnessed, these factors may lead to improvement in cost premiums that users are willing to pay for water services. Thus, to reinforce the role of PSP in water infrastructure provision, identifying and evaluating factors influencing users' willingness to pay for private water provision is germane. This helps stakeholders to make informed decisions. Also, the improved services and quality provision could make users more receptive to PSP in water infrastructure provision, encouraging public support.

While the assessment of private investment in the provision of water supply infrastructure is based on users' willingness to pay, private sector involvement should not be limited to financial gains. Involvement in some form of CSR could change the users' perspective about private investment in infrastructural provision. Also, the factors that are linked with direct benefits users can profit from are significant in influencing the users' willingness to pay. Thus, benefits linked directly to the users, especially those related to efficient management should be the primary tone of the awareness creation to influence users' willingness to pay for PSP in water infrastructure provision. Also, inadequate users' willingness to pay for water supply services could be a barrier to targets such as

the Sustainable Development Goals. Users need to be willing to bear a part of the costs for sustainable water supply (Hukka and Katko, 2015). The underinvestment in water infrastructure due to the low willingness to pay can lead to a growing funding gap in the rehabilitation, renewal, and replacement of ageing water infrastructure, which is estimated to exceed $1 trillion over the next 20 to 25 years (Cardoso and Wichman, 2022).

Access to dependable, safe, and affordable water is a fundamental amenity that directly influences property desirability and, consequently, property market value. In areas with inadequate public water provision, property owners and tenants incur added costs for alternative water sources and purification systems. These costs and inconveniences are capitalized into property values. The results of this study, quantifying the amount users are willing to pay for water infrastructure, can help assess the perceived value of such improvements. The results could be further used to develop hedonic pricing models to identify how access to water facilities contribute to property value.

There are yet limited studies on private sector participation in water infrastructure than other infrastructure in the global south. This study however inquired only into users' willingness to pay for PSP in water infrastructure provision, the considerations of the private investors were not evaluated. Thus, while private investors amongst other stakeholders have been identified as critical stakeholders to PSP in water infrastructure implementation in Nigeria, further studies examining supply assessment can conducted to provide information that will enhance private sector investment in water infrastructure in emerging economies.

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