Discovering the core stakeholders in the Nigerian urban water supply system

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Abstract

Core stakeholders' engagement and involvement are now a sine qua non of resources administration and management. This followed the emergence of pluralistic forms of governance, which call for greater democracy and emphasises transparency, accountability, inclusivity, and engagement as credentials for sustainable resource management. Nigeria has embraced these pluralistic forms of governance in its water sector as part of efforts to promote sustainable water resource management. However, to successfully engage and involve core stakeholders in the face of myriad urban water supply challenges and achieve optimal outcomes remain a challenge as it is unclear who the core stakeholders are. This study examines Nigerian's urban water supply system and the extent of the interests of the stakeholders to identify the core stakeholders as an input towards facilitating sustainable water resources management in the country based on a survey of urban water supply experts in the country. The study finds 15 core or primary stakeholders out of 25 stakeholders and note that their core stakeholder status is linked to their direct involvement or connection with the water supply system and its successful running, which is rooted in them being customers or investors or regulators and enforcers of regulation, funders, supervisors, and the need to respect community and social interests. The study concludes that whilst the engagement of all stakeholders is good for sustainable water resources management in Nigeria, engagement, and involvement of the 15 core stakeholders is paramount to the sustainable and successful operations of the country's urban water supply system.

Keywords Nigeria · Stakeholder · Sustainable · Urban · Water supply

Introduction

Relevant development theories such as the Maslow motivation and Basic Needs theories acknowledge that access to clean and safe water and sanitation is a fundamental human need and a basic right (Bowler 1987; White 2020). The United Nations (UN's) Sustainable Development Goals (SDGs) demand for access to water and sanitation for all per SDG6 (UN 2021) reinforces the relevance of clean and safe water and sanitation in sustainable socio-economic progress. However, it is estimated that 2.1 billion, an equivalent of some three in 10 people, worldwide lack access to safe and readily water at home, whilst 6 in 10 people amounting to some 4.5 billion, lack safely managed sanitation (World Health Organisation WHO 2017). This situation is far more

challenging in Sub-Saharan Africa (SSA), where it is estimated that 319 million people almost half of the region's population is without access to improved reliable drinking water sources (WHO 2015). Compounding the problem is a range of factors, such as climate change, which is affecting water availability and resilience of water infrastructures culminating in varying levels of impacts across the world, including increases demand for water particularly in cities and the inability of governments to respond appropriately (Akpabio and Ansa 2013; Organization for Economic Cooperation and Development (OECD) 2015), the burgeoning water-related disasters, big infrastructure projects and competing water demands (OECD 2015).

Accordingly, there has emerged a new socio-political trend and policy reforms for better water governance and management. These include the need for integrated water resources management (IWRM), development of water-related policies as in the case of Europe and the emergence of the UN's SDGs requiring new standards, regulations and aspirational goals paying greater attention to adaptive

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governance; and innovation and technologies to stimulate greater connectivity and new relationships (OECD 2015). These imperatives have motivated the need for greater democracy and inclusiveness in water-related decision-making and policy or project implementation. Thus, the future economic, social, climate, urban and technological issues confronting water governance and management and the inadequate capacity of governments to redress them call for multi-stakeholder solutions with emphasis on the role of stakeholder engagement across the public, private and non-profit sectors (OECD 2015).

Nigeria is one country in Sub-Saharan Africa (SSA) with enormous urban water and sanitation problems (Akpabio and Ansa 2013). It is estimated that one out of three Nigerians does not have clean water close to home, whilst two in three of them do not have a decent household toilet resulting in the deaths of nearly 60,000 children under five each year of diarrhoeal illnesses caused by dirty water, poor sanitation, and hygiene (WaterAid 2018). Consensus in the literature suggests the need for improved water governance and management, including the reliance on and acknowledgement of multi-stakeholder solutions and the role of stakeholder engagement (Akpabio and Ansa 2013; Aluta 2017). Nigeria's water delivery projects and programmes such as the Water Supply and Sanitation Sector Reform Programme (WSSRP) commenced in 1997 (Ahmad et al. 2009), the Concern Universal water-based projects across Cross River State since 2001 (idz1 insights 2007) and more recently the National Plan of Action towards water and sanitation, a significant political milestone to achieving the UN SDG 6 (WaterAid 2018), recognise the need for multi-stakeholder solutions and the role of stakeholder engagement.

Successful deployment of multi-stakeholder engagement and solutions requires strategies to be formulated to promote stakeholders' awareness and enthusiasm towards better water governance and management as well as a mechanism crafted to improve communication and cooperation among them (Lee 1996; Ryberg-Webster and Kinahan 2014; Wang et al. 2019). Furthermore, stakeholders need to recognise their core relevance to finding lasting solutions to the water governance and management challenges and build healthy relationships with clear lines of role and responsibilities (Wang et al. 2019). However, as a starting point, there is a need to identify the core stakeholders in the urban water and sanitation delivery system clearly and an assessment of their stake in the system undertaken. It is now widely acknowledged that early identification of stakeholders around a natural resource is critical to the meaningful management of the resource (Leventon et al. 2016). Nevertheless, although several water and sanitation programmes and projects, as well as relevant studies (Ibem 2009; Akpabio and Ansa 2013; Ogbazi 2013; Aluta 2017; Baffour Awuah and Morenikeji 2017; Baffour Awuah 2018), have underscored the critical

role of stakeholders in sustainable urban water governance and management in Nigeria, there is still a dearth of in-depth work on the extent of the stake of the several stakeholders to determine the core ones to inform optimal strategy formulation and implementation towards stakeholder engagement and management.

The primary purpose of this work is to analyse the extent of the stake of the several stakeholders in Nigeria's urban water supply system to identify the core stakeholders to facilitate sustainable urban water governance and management. In doing so, the work initially discusses the global crave for sustainable water governance and management and the need for stakeholder engagement. This is followed by an interrogation of the concept of stakeholders and its implications for this work. Thereafter, Nigeria's urban water supply system is discussed to further contextualise the work and identify or map the several stakeholders from the literature standpoint following which the methodology is prescribed. Findings from the study and their discussions are then presented before conclusions are drawn.

Water governance and the need for stakeholders' engagement

The relevance of water and the daunting tasks facing the water sector in terms of achieving sustainable management have fundamentally occasioned the need for better management practices (OECD 2015). These challenges and other drivers for better management, according to OECD (2015) include:

1. The effect of climate change on water availability and resilience of water infrastructure with different levels of impacts across the world; economic and demographic trends will drive water demand and particularly in cities, and its adverse impact on the capacity of governments to respond (that is, their ability to mobilise public funds);
2. The emergence of socio-political trends, including the concept of IWRM; and recent developments in European water-related policies;
3. Post-2015 SDGs and their effect on setting new standards, regulations and aspirational goals paying greater attention to adaptive governance;
4. Innovation and technologies requiring stimulation of greater connectivity and new relationships, related to web-based communication avenues; and
5. Conjunctural drivers, which are greatly influenced by changing circumstances and situations, such as water-related disasters, policy reforms, big infrastructure projects, competing water demands and greater democratic pressure, which are pushing for more inclusiveness in

water-related decision-making and policy/project implementation.

Based on the above imperatives, there is now a demand for open governance in the water sector. This idea calls for greater democracy, which partly emphasises transparency, accountability, and inclusiveness and engagement (Carothers and Brechenmacher 2014) and hinges on the notion that representative democracy by itself has failed to improve the quality of state performance, educate, and empower citizens and make reasonably good use of scarce public resources (Wampler and McNulty 2011; Fung and Wright 2001, 2003; Santos 2005). Therefore, there is a need for additional efforts to revise institutions and enhance the quality of democracy, social well-being, and the state (Wampler and McNulty 2011). This, in essence, has made stakeholder engagement central in the new approach to water governance and management, which is accentuated by the water sector's highly decentralised and fragmented nature, with multiple, interdependent players at different levels (OECD 2015). Furthermore, stakeholder engagement based on systemic, inclusive, and foresighted approaches in water governance is established to achieve better outcomes and returns on investment in time and money (OECD 2015; Akhmouch and Clavreul 2016).

Stakeholders and stakeholder engagement

Although the term stakeholder might have been in existence long ago, but as a concept applied in management and governance, it emerged at the inception of the quest for open government and public governance in the 1980s. Freeman's work on stakeholder theory in 1984 is credited as being the first in mainstream strategic management (Yang et al. 2009). However, there seem not to be a clear consensus on the definition of a stakeholder. At best, the definitions available can be described as a set or subset of one or the other depending on the definitions under consideration. For example, Dinsmore (1999) described stakeholders as the "ones who hold the beef" or have interest in an enterprise, whilst Aas et al. (2005) cited in Wang et al. (2019) defined a stakeholder as a person or an organisation equipped with the right and capacity to participate in a certain process. Conversely, Clarkson (1995) understood stakeholders to mean constituencies, which are affected positively or negatively by the operation of a corporation irrespective of whether they are directly or indirectly linked through contracts. Earlier, Freeman (1984) referred the term stakeholder to any group or individual who can affect or is affected by the achievement of the firm's objectives. It is, thus, clear that despite the variations in the definitions, all the other definitions can be subsumed in Freeman's definition, which is very broad in nature.

There are several classifications of stakeholders. The concept has also been studied in diverse perspectives, such as educational level, culture, spatial distance from projects, profession, gender, and the wide range interest of stakeholders (Yang et al. 2009; Oppong et al. 2017). Stakeholders can be classified as shareholders, employees, creditors, suppliers, consumers, competitors, and others, such as local governments, social organisations, and media among others from the perspective of a company (Carroll 2004; Wang et al. 2019). From the same company perspective, other authors undertake the classification using the extent of their influence on enterprise production with emphasis on stakeholders holding stocks in the company, groups having economic contact with a company, and other external stakeholders being concerned with social interests of the company (Hannan and Freeman 1984). However, within the water governance genre, some relevant studies have sought to classify stakeholders into core stakeholders and newcomers (OECD 2015) although there exist several other classifications, such as primary and secondary stakeholders, which may be akin to the core stakeholders and newcomers, respectively.

What is noteworthy is that the classification of stakeholders in any enterprise is often preceded by their identification, which is fundamentally steeped in the stakeholder definition and explanation. Thus, whether an individual or entity has a stake or interest be it positive or negative in an enterprise, activity and process among others will determine if the individual or entity is a stakeholder. From the combination of the definitions in the preceding paragraph, it can be concluded that the stake relates to:

- Role of individuals, groups or entities in a given enterprise;
- Financing responsibilities of individual, groups or entities in a given enterprise;
- The influence of individual, groups, or entities in terms of decision-making in relation to a given enterprise;
- The benefits of a given enterprise to individuals, groups, or entities; and
- Adverse impact of a given enterprise no individuals, groups, or entities (Oppong et al. 2017).

Stakeholder engagement also needs to be preceded by stakeholder identification, after all stakeholders must be known before, they are engaged (Leventon et al. 2016). Stakeholder engagement is defined severally. Equally, there are various insights and typologies of the concept. The Association of Project Managers (APM 2021) defines stakeholder engagement as the systematic identification, analysis, planning, and implementation of actions designed to influence stakeholders. Deloitte (2014) also describes it as the process used by organisations to engage relevant stakeholders to achieve accepted outcomes. However, within the

water sector, relevant studies (OECD 2015; Akhmouch and Clavreul 2016) explain stakeholder engagement as an all-encompassing term that connotes an organisation's efforts to ensure that individuals, groups, and organisations could participate in the decision-making processes and policy/project implementation that will affect them, or in which they have interest. The authors suggest it refers to a wide range of inclusive processes, with different intensions and inputs to the decision-making process, and contrast it with stakeholder participation, which simply means the involvement of individuals and groups in the design, implementation, and evaluation of a project or plan (Akhmouch and Clavreul 2016).

Furthermore, several considerations/approaches have been proposed for effective stakeholder engagement/management depending on the discipline (Mok et al. 2015; Dansoh et al. 2020 for construction-related projects; Tom Dieck and Jung 2017 for management of cultural heritage sites; Shi et al. 2016 for big data and cultural heritage; Nwachukwu et al. 2017—restoration of built heritage assets). Stirling (2008) building on Fiorino (1990) also noted that effective stakeholder engagement may be dependent on the reasons for the engagement, which ultimately will determine the areas for emphasis. The study identified three main reasons as follows: normative, which is to achieve democratic ideals by focussing on the process of inclusion; substantive, which is to harness knowledge and risk perceptions from stakeholders to improve outcomes; and instrumental, which is to increase the legitimacy of pre-defined decisions and, therefore, increases effectiveness.

Nevertheless, OECD (2015) noted the formal and informal within the water sector for stakeholder engagement. The study further established that the fundamental and foremost consideration for effective stakeholder engagement is identifying stakeholders who have a stake in the outcome or are likely to be affected by the subject enterprise, which is termed stakeholder mapping. The other considerations are definition of the ultimate line of decision making, the objectives of stakeholder engagement and the expected use of inputs; allocation of proper financial and human resources and sharing needed information for result-oriented stakeholder engagement; regular assessment of the process and outcomes of stakeholder engagement to learn, adjust and improve; embedding engagement processes in clear legal and policy frameworks, organisational structures/principles and responsible authorities; and customising the type and level of engagement to the needs and keeping the process flexible to changing circumstances (OECD 2015; Akhmouch and Clavreul 2016). The foregoing implies that, to promote sustainable multi-stakeholder engagement in Nigeria's water sector, the first port of call is to identify, or map stakeholders based on the five factors mentioned in the second paragraph of this subheading.

Nigeria's urban water supply system

Nigeria's formal urban water supply system can be traced to the epoch of the British colonial rule at the turn of the nineteenth century. Water supply services were initiated to cater to the colonial administration and expatriate workers (Adibe et al. 2018). The colonial government established the first modern water supply scheme in 1915 in Lagos, which increased to 28 by 1953 (Boge 2019; Hoelzel 2021). Thus, in addition to installing the water supply schemes on an incremental basis, the colonial government performed supervisory responsibilities for technicalities and infrastructural maintenance in towns and cities until 1960. This activity followed the quest to increase water provision to meet the needs of the then growing population. Even so, until the creation of regional governments, portable water supply was limited to cities and towns, such as Calabar, Lagos, Ibadan, Abeokuta, and Enugu Ijebu-Ode and Kano (Ishaku et al. 2011; Aliyu and Dankani 2016; Hoelzel 2021). Presently, water supply schemes and management including water provision services in urban areas are carried-out by water boards or corporations or agencies. These water boards/corporations/agencies are established across states and the federal capital territory of the country (Macheve et al. 2015; Bello et al. 2021).

The establishment of the boards/corporations/agencies and their functions as well as other related water provision activities are steeped in several pieces of legislation and policy frameworks among others. Excepting the country's national (federal) constitution, which is the foundation of all other laws or pieces of legislation, one of the important water resource management laws is the Water Resources Act (Decree 101 of 1993). The law empowers the Federal Ministry of Water Resources (FMWR) to make regulations and develop plans and policies as well as approved licenses for all water resource exploitation in Nigeria. However, since 2000, there have been other key policy and strategy documents, guidelines, and model laws. These include National Water and Sanitation Policy 2000, National Water Policy 2004, National Water Sanitation Policy 2006, and National Water Resources Strategy 2006. The National Water and Sanitation Policy 2000, which hinges on the national constitution and international conventions and protocols signed by the country, is now the primary policy and regulatory instrument for managing water supply and quality. The policy seeks to guarantee the efficiency in potable water supply and adequate, affordable, and sustainable sanitation through a participatory and collaborative approach from the three tiers of government, the private sector, and beneficiaries (Habila and Kehinde 2003).

Recently, the federal government has been seeking to promulgate a law to harmonise the four laws governing

the water sector, which states draw their policies for urban water supply (Adeoti 2020; Ngene et al. 2021). These laws are (1) the water resources Act, (2) the River Basin Development Authorities Act, (3) the National Water Resources Institute Act and (4) the Nigeria Hydrological Services Agencies Act. The proponents of the bill for harmonisation of the water laws believe that the national water bill will guarantee effective management of the national water resources and meet the present administration's declaration of a state of emergency in the water sector if passed by the national assembly and signed into law (Adeoti 2020; Adeniran et al. 2021). Apart from the formulation of pieces of legislation and policy frameworks, the urban water supply system in Nigeria has benefitted from several reform programmes, such as the first, second and third national urban water sector reform programmes, which occurred between 2003 and 2013, 2005 and 2016, and 2015 and 2020, respectively (Obani 2020; Ngene et al. 2021).

The arrangements for urban water supply in Nigeria are primarily government-designed processes, including the establishment of networks of pipes from the treatment plants and reservoir to the various consumers or installing public water points, where consumers can access water (Adeoti 2020; Adeniran et al. 2021). This has culminated in the creation of several institutions and engagement of other players in the sector. These institutions and players are far more expansive if those of the informal water supply system, which has emerged due to the challenges of the sector (through government-centred approaches), are included. The informal system or sector comprises non-state actors who provide water to consumers for profit-making. Fundamentally, the provision of potable water to the populace in Nigeria is the constitutional responsibility of the three tiers of government—federal, state, and local governments (Chukwuma et al. 2018). Although urban water supply is a state responsibility, it is part of the national water resource management. Through the state ministries of water resources, the state governments work in line with the FMWR as the national custodian of the country's water resources. The FMWR, being the national coordinating body of the water sector, initiates the national water policy and the national policy for water supply and sanitation. The states use the statements and objectives of the policy to develop their local laws and policies, leading to the establishment of their water boards/corporations/agencies. The urban water supply procedure is also regulated by independent commissions, such as the state water regulatory commissions. Thus, the urban water supply system involves a complex functional relationship among various regulatory, financial, and operational actors. The government bears most of the burden through their various agencies, such as the FMWR and the state water agencies. Apart from the FMWR and its

subsidiary agencies, other government bodies such as ministries of agriculture, transport, health, and environment are participants in the urban water supply system. There are also non-governmental or donor/aid/development agencies and partners, such as Community Based Organisations (CBOs), WaterAid, European Union, World Bank and United Nations International Children's Emergency Fund (UNICEF) (Akpor and Muchie 2011; Adeoti and Fati 2020; Chikagbum et al. 2020). Table 1 presents a list of stakeholders of the urban water supply system in Nigeria and the nature of their stake.

Despite all the interventions and government's continued efforts at improvement, the Nigerian urban water supply system faces a myriad of challenges. Whilst the country is blessed with abundant water resources that can adequately serve the urban population, the urban water supply coverage is below the standards set by the United Nation's sustainable development goals. Thus, the system faces various issues that tend to affect the quality and quantity of water supply and its sustainability (Shiru et al. 2020; Ighalo and Adeniyi 2020; Eyankware and Ephraim 2021). Across the country, it is estimated that one out of three people does not have clean water close to home, whilst two in three of them do not have a decent household toilet resulting in the deaths of nearly 60,000 children under five each year of diarrhoeal illnesses caused by dirty water, poor sanitation, and hygiene (WaterAid 2018). This has partly resulted from the high politicisation of development without concrete long-term plans that transcends many regimes (Akpabio 2012). Furthermore, the government has signed many international treaties, conventions and protocol but has failed to properly domesticate them to reflect the country's constitution and the aspirations of the Nigerian citizens (Eneh 2011; Onomrerhinor 2016).

There is also massive non-compliance with water-related regulations and policies, weak water management database, corruption, poor state of water infrastructure, the adverse effect of climate change on existing water bodies, growth in demand for water services due to urbanisation and low rate of costs recovery as water supply is often unmetered or rates charged for services are meagre (Adah and Abok 2013). Closely aligned to these is the lack of clarity on the jurisdictional functions of state governments regarding water sector policy formulation. However, the states continue to develop their local water policies, and some have gone ahead to develop sector implementation plans. For example, in collaboration with other subsidiary agencies in 2016, the Kaduna State Ministry of Water Resources developed a sector implementation plan regarding its infrastructure master plan and then reorganised the State Water Corporation to improve the urban water supply through integrated and strategic planning. Another fundamental issue to the water supply problem is the inadequate management of stakeholder relationships and resources. As espoused in the previous

Table 1 Stakeholders in Nigerian urban water supply system

Stakeholders	Role	Financing responsibility	Influence in decision-making	Benefits	Adverse Impact
The Federal Ministry of Water Resources	The Coordinating Ministry for national water resource management. They are involved in the formulation of policies, collection of data, coordination, and monitoring of water resources development at the national level (National water policy 2004). It is charged with the responsibilities of policy advice at the national level (Chukwuma et al. 2018; Okoye 2015)	Their funding role is within the budgetary specification according to the role in the management of water resources	This includes planning, development, and usage of Nigeria's water resources, ensuring quality, quantity, distribution, use and management of water, ensuring application of appropriate standards and techniques for investigation, use control, protection, management, and administration of water resources, facilitating technical assistance and rehabilitation for water supplies	The benefits are intangible, such as enhancing government image for the impact on the end users	Inter-ministry arguments as to whose responsibility is to set water quality standards
The River Basin Development Authorities (RBDAs):	The RBDA system as established is the implementation of irrigation development policies of the federal government River basin development and Dam management (Adeoti 2021)	There is no defined financial obligation to supply water	The RBDA is responsible for managing water basin across the regions in the country. They support state governments in dams construction and management	As a government institution their benefits is measured from the impact and achievement of targets against government spendings. They are also interested in creating a good image for the government	The challenges face in terms of funding and technical capacity affects the quality of the service they provide
The National Water Resources Institute	Promote and Develop Training Courses in Water Resources	There is no defined financial obligation to supply water	This is the foremost Institution for Capacity Development for Sustainable Water Resources Management in Nigeria and internationally. The institution is involved in practical training of sector stakeholders to develop their capacities and equip them with skills for implementing Integrated Water Resources Management	The benefits are mostly intangible but necessary for measuring their impact	Funding challenges and technological constraints
The state Ministry of Water Resources	It is the custodian of state water resources and responsible for policy formulation	They manage the funds allocated for water resource management but do not have any obligation outside state budgetary provisions	Coordinating government agencies for water sector planning and management	The benefits are intangible, such as enhancing government image for the impact on the end users	Increasing pressure due to high population and demand for water

Table 1 (continued)

Stakeholders	Role	Financing responsibility	Influence in decision-making	Benefits	Adverse Impact
The federal ministry of Environment	Coordinating environment protection and standards. They are not directly responsible for water supply but play a role related to providing a safe environment	There is no defined financial obligation to supply water	Even though, they are not providing water to the users, they support in managing the environment and ensuring that the water sources are safe	The benefits are intangible, such as enhancing government image for the impact on the end users	The problem of interagency relations. Access to funding and technological constraints
The State Water Agencies	Responsible for urban, semi-urban, and rural water supplies. They are the agency directly involved in the storage, processing, distribution of water supply in addition to water rate collection for government revenue	There is no defined financial obligation to supply water but manage the funds allocated and revenue generated	It is at the centre of the operations and maintenance of water supply. They have access to the information on the consumer characteristics for planning the water supply system	The benefits are intangible, such as enhancing government image for the impact on the end users. The effective delivery of water to consumer and rate collection are measures of benefits	High level of revenue water due to illegal connections and pipe leakages
State water regulatory agencies	It is agency created for independent water supply regulation	There is no defined financial obligation to supply water	They are empowered by law to ensure compliance by all stakeholders	The benefits are intangible, such as enhancing government image for the impact on the end users	Political will of political office holders and undue interference
Community-Based Organisations	They are organisations advocating for adequate quality and affordable water supply and sometimes support government to achieve targets	Community contributions from individuals to address urgent water need, but they are not under any financial obligation to supply water	They are mostly involved in advocacy on behalf of the users of water. This is enhancing a link between the water providers/government and the consumers	Their benefits are achieved when water supply is according to high quality, quantity, and affordability	Increasing politicisation of issues affects their role resulting in trust issues
Water AID, European Union, World Bank and UNICEF	Technical and financial support	Apart from the three tiers of government, these non-governmental organisations are also visible in terms of funding water projects and direct provision of boreholes to both urban and rural areas (Ayeni et al. 2013)	They may not be involved in administrative functions but plays a significant role to Influence funding and technical support	These agencies may meet their target for international recognition and influence	Political climate of host countries may view them with suspicion
Urban development boards	Planning approval for all developments. They are not water agencies but their have a role of ensuring all plans are according to specifications	There is no defined financial obligation to supply water	Their impact in making plans for development. All plans are ratified by urban planning developments boards to enhance compliance by all actors	Achieving compliance to plans made to improve government image	Conflict among professional for influence
Lands use management agency	Land allocation and issuance of certificate of occupancy. They are not directly providing water but providing land resources when applicable	There is no defined financial obligation to supply water	They are also part of the planning process, since all developments connect to the use of the land	Achieving compliance to plans made to improve government image	

Table 1 (continued)

Stakeholders	Role	Financing responsibility	Influence in decision-making	Benefits	Adverse Impact
The National Agency for Food and Drug Administration and Control (NAFDAC), a parastatal of the FMOH,	General regulatory and control body for food, drugs and water-related items. It also sets national standards	There is no defined financial obligation to supply water	They are part of setting standard for quality and enforcement of the standards. They are not directly involved in the provision of water supply but also monitor water that is packaged in bottles and sachet	The benefits are intangible, such as enhancing government image for the impact on the end users. They are also measured by compliance from industries and individuals	Entrepreneurs of illegal water services are growing with influence due challenges of regulation
Standards Organisation of Nigeria (SON)	Standards Monitoring of quality of products	There are no defined financial obligations	Enforcement of standards and quality. Their influence is not directed at water supply but to monitor the quality of materials and other products manufactured	The benefits are intangible, such as enhancing government image for the impact on the end users. They are also measured by compliance from industries and individuals	Non-compliance by individuals
The Local Government council	Administration of local government areas. They are also known to collaborate with relevant agencies	The are responsible for funding water projects of small town and rural water supply	They are involved in administrative as well a physical development of their territory	Meeting the targets for the government	Low level of autonomy for planning
Water consumers	Users of water for domestic, industrial, and commercial use	Payment of tariff and supporting to protect water infrastructure; however, they are not under any obligation for fund the provision of water supply	The water consumers, being end users of water supply system, their needs are considered for provision of services	When there is adequate water supply and related services	The shortages of supply, polluted sources, and inadequate payment systems are experienced by water consumers in most areas
Water consultants and experts	Providing expert advice to government and public interest related to water	There is no defined financial obligation	They are only involved when required by government or relevant agencies	Consulting services they offer for a price	Low level of inclusion in planning and implementation
Built environment professionals	They provide expert advice	There is no defined financial obligation	They are only involved when required by government or relevant agencies	Consulting services they offer for a price	Low level inclusion in planning and implementation

Source: Extracted from the literature

discussions, the planning and implementation of water policy do not consider the interest of various stakeholders, such as consumers, water companies, international organisations, community groups, academia, water professionals and government agencies (Imonikhe and Moodley 2018). Achievement of a people-centred water policy is essential considering the principles of governance. It means that legislation and policy development must be innovative and inclusive to meet water demand for domestic, commercial, and industrial uses. This can be achieved through a process of engaging the relevant stakeholders properly with interest and influence. However, numerous water provision agencies have been established without clear stipulation of their roles and responsibilities resulting in duplication of functions and conflict over jurisdictions in operations, a situation which hinders collective approach to problem-solving. Water and sanitation have no specific institutional domain (Adah and Abok 2013; Balogun et al. 2017). Different ministries and agencies assume relevance and arrogate responsibilities for their respective ministers without a precise coordination mechanism. There are further fragmentation and division of authorities at the state and local government levels to the extent that what emerges is inter-agency competition between agencies of each state and between States and the Federal Government agencies (Adah and Abok 2013). This lack of harmony leads to parallel drinking water projects in some areas and communities and duplication of responsibilities. Indeed, the lack of harmony in functions indicates an apparent lapse in the policy development process as documents are framed as parallel instruments from different government agencies without proper coordination (Oseke et al. 2020).

The government's dominant role in the provision of water as a social responsibility has not adequately transmitted to efficiency or sustainability of the utility (Ajibade et al. 2021; Gbadegesin, and Olayide 2021). This is because the mere allocations from government funds and aids without revenue from water tariffs and charges cannot cover service provision costs (Akpor and Muchie 2011). Although in principle, state water agencies (SWAs) should be financially independent with water tariff collection from water consumers, the problems of the unmetered tariff system, low priced water, and high non-revenue water (NRW) have resulted in insufficient operating revenue (Olagunju et al. 2019). Furthermore, most interventions in the water sector have been centrally driven, and local participation and ownership of the processes that ensure sustainability (in conformity with the principles of integrated water resources management) are missing (Obosi 2020). It is, therefore, within the context of the foregoing that this study is set.

Research methodology

The fundamental purpose of this study was to identify the core stakeholders in Nigeria's urban water supply system based primarily on the extent of their interest to help promote better stakeholder engagement and facilitate multi-stakeholder solutions to the country's urban water challenges. Accordingly, drawing on insights from Lelea et al. (2014) and Leventon et al. (2016), the relevant literature on stakeholders, the constitution of stakeholder interest or stake, stakeholder engagement and stakeholder identification among others was reviewed. This led to an understanding of the nature and composition of stakes in any given enterprise as well as the design of a five-point criteria or indicators for the determination of stakeholders' stake. Subsequently, the literature on Nigeria's urban water system was examined applying the indicators (Table 1). The idea of the later literature review was not only to put the study in a specific geographical context and establish its relevance, but also to identify the stakeholders based on the indicators and describe their stake clearly from the standpoint of the literature. This led to the development of a list of the stakeholders and their stake (Table 1).

Following the above, a questionnaire survey was conducted with experts in Nigeria's urban water supply system between March and May 2021. The idea of the questionnaire survey was to solicit the opinions of the experts on the extent of the stakeholders' stake based on the five indicators identified in the literature and analyse the outcomes together with the findings from the literature and draw inferences to address the fundamental aim of this study. Ordinarily, it would have been useful to undertake the survey with all the stakeholders. However, it is known from the literature that the water sector is highly decentralised and fragmented, with multiple and interdependent players at different levels (OECD 2015). It was, therefore, difficult if not impossible to know the extent of the stakeholder population and reach their samples as much as possible, even more so during this COVID-19 pandemic period. Consequently, recourse was made to experts in the field as a more practical and feasible option. The reliance on experts for the survey was also to ensure that well-informed opinions are obtained, because the experts are well-versed with the relevant issues. Given the lack of a reliable sample frame, the experts were purposively drawn from the literature, databases and websites of government and quasi-government water organisations, research institutions, professional bodies, Non-Governmental Organisations (NGOs), and international development agencies among others.

The questionnaire covered issues, such as background of respondents, and the different types of stakes in

Nigeria's urban water supply system. The questions relating to the stakes were designed using Likert scales. The questionnaire was pre-tested prior to its administration. This was to ensure that it passed face and content validities tests. Eight questionnaires were sent to people within the Nigeria's urban water supply system to evaluate the questionnaire with respect to whether it covered what it sought to achieve, and the effectiveness of how the research variables were to be measured. The outcome of the pre-test showed the research variables were appropriate and that the questions set for the survey were clear and understandable. The questionnaires were administered online using the survey monkey.

One hundred and fifty (150) questionnaires were administered to the respondents and a response rate of 83.5% was obtained. The data obtained was first entered in Microsoft Excel spreadsheets and thereafter coded and transferred to (SPSS). Descriptive statistics—mean, median and percentages—were predominantly used to analyse the data on the background of respondents. The data on the extent of the stakeholders' stake was obtained based on a five-point Likert scale. Details of the Likert scale are: (1 = Very low, 2 = Low, 3 = Medium, 4 = High and 5 = Very high). The responses were analysed with the consensus/agreement around the mean analytical framework identified by Tastle and Wierman (2007), and subsequently modified by Tastle et al. (2009) to allow for consensus around a given target. The target used in this instance was five, the highest score on the Likert scale. The formula used is as follows:

$$\text{Agr}\,(X|5) = 1 + \sum_{i=1}^{n} pi\log_2\left(1 - \frac{|X_i - 5|}{2d_X}\right)$$

where Agr = The level of agreement on evaluation of an attribute; X = The scores; 5 = The highest score; X_i = Each score; and d_X = The range of $X (d_X = X_{max} - X_{min})$.

The above formula is designed to cater for the ordinal nature of the Likert scale scores, and it ranges between zero and one. One signifies complete agreement. Conversely, zero indicates a complete lack of agreement. Thus, the measure in this research calibrates the extent of the respondents' agreement towards the last option on the Likert scale (5 on a scale of 1–5). Given that five was the highest and the target score, if all the respondents, for example, rated their feeling of influence of stakeholders on decision making for urban water supply in their communities as very high by selecting five on the Likert scale, then the consensus measure will result in one. However, if they rated it very low by choosing one on the scale, then the consensus measure will be zero. The scores obtained from the analyses of the consensus/agreement around the mean were thereafter synthesised with the findings from the literature to determine consistencies and divergences, and then discussed further using insights from the stakeholder theory to draw inferences to address the aim of the study. Figure 1 summarises the research process.

Findings

Finding from the questionnaire survey are discussed in two sections. The first section summarises the respondents' information according to the knowledge and experience in the urban water supply sector. The second section reports the analysis of the responses related to the five indicators for the stakeholder identification. Out of the 150 questionnaires administered to the respondents, 128 of them representing 83.5% responded. The respondents were contacted through a purposive sampling approach due to the unavailability of a sampling frame for urban water supply experts. The sample size and response rate (83.5%) were, therefore, considered appropriate as they compared favourably with similar studies, such as Agbelade et al. (2016) and Hamma-adama and Kouider (2019).

Respondent background

The academic qualification of the respondents shows that they all had formal education and training. Most of the respondents (50%) had a bachelor's degree/HND or higher. However, only 3.1% had a doctoral degree, compared to about 43.85% who had a Master's degree, whilst I3.1% had either a Nigerian Certificate in Education (NCE) or a National Diploma (ND). It is important to state that the level of literacy of the respondents was significant to the
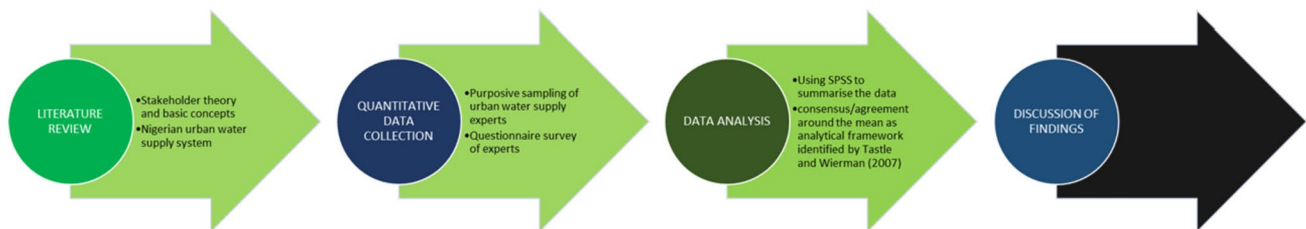

Fig. 1 Research process

reliability of the results. The level of literacy made it easy for the understanding of the questions and the requirements from them. Regarding the nature of practice, most respondents work for government organisations (59.4%) compared with 21.9% who work for private organisations. A further 3.1% work in private practice (on their own), whilst 15.6% work for local and international NGOs or civic societies interested in urban water-related issues. The respondents' positions in the various organisations were also enquired. Almost 47% of them were middle-level executives compared with 25% who were senior executives in their various organisations. The remainder was 15.6% and 12.5% for low-level executive and ordinary employees, respectively. Most of the respondents (34.4%) had between 10 and 14 years of experience in the water sector compared with 12.5% who had less than 5 years of experience in the water sector. Therefore, about 87.5% had more than 5 years of experience in the water sector, which was very relevant to the understanding of the activities of the urban water supply system by the respondents.

Stakeholders' interest/stake

The extent of stakeholders' role

Twenty-five (25) stakeholder categories were identified from the literature. As indicated in Table 2, the household water supply users appear to have a major role with the built environment professional bodies, such as the Nigeria Institute of Architects having the least role. This is reflected in the household users being rated very high with respect to the subject indicator compared with the Institute of Architects which was rated low. Ordinarily, urban water supply is a government responsibility (Samuel et al. 2021), and it was expected that the relevant federal and state agencies like the FMWR will have the highest rating. However, this was not so probably because of the inadequacy of formal water supply due to the challenges highlighted in the literature discussion. This has meant that most individual households must arrange for alternative water supply, which they do through, for example, constructing bole holes and water wells

Table 2 Role of stakeholders

Category of stakeholders on role of stakeholders	Mode	Median	Minimum	Maximum	Frequency (%)					Consensus agreement $\mathrm{Agr}(X\|5)$
					1	2	3	4	5	
Household users	3	4	2	5	0.00	11	33.1	26.8	29.1	0.736406
Water Board/Agency/Corporation	5	4	1	5	2.4	19.7	22	24.4	31.5	0.704106
WaterAid	4	4	1	5	3.1	12.6	23.6	47.2	13.4	0.694686
USAID	4	4	1	5	1.6	14.2	29.9	37	17.3	0.692339
UNICEF	4	4	1	5	1.6	15	29.9	36.2	17.3	0.688455
WORLD BANK GROUP	3	3	2	5	0.00	13.4	39.4	33.9	13.4	0.680307
Federal Ministry of Water Resources	5	4	1	5	7.9	20.5	21.3	10.2	40.2	0.673942
Community-Based Organisations	3	3	2	5	0.00	16.5	44.9	28.3	10.2	0.647248
Industrial users	3	3	1	5	1.6	26	35.4	12.6	24.4	0.636505
State Water Regulation Agency	5	3	1	5	7.9	26	18.9	19.7	27.6	0.628308
AFRICAN DEVELOPMENT BANK (AfDB)	3	3	1	5	1.6	20.5	44.1	21.3	12.6	0.62093
Federal Legislature	2	3	1	5	6.3	29.1	20.5	18.9	25.2	0.618188
National Water Resources Institute	5	3	1	5	10.2	26	16.5	18.9	28.3	0.61681
Urban Development Board/Agency	3	3	1	5	2.4	29.1	39.4	9.4	19.7	0.597048
Business Organisation	3	3	1	5	2.4	31.5	34.6	15.7	15.7	0.588559
Standards Organisation of Nigeria (SON)	3	3	1	5	13.4	13.4	36.2	18.9	18.1	0.588485
Water consultants	2	3	1	5	4.7	33.9	26	22	13.4	0.572842
The National Agency for Food and Drug Administration and Control (NAFDAC)	3	3	1	5	15	18.1	27.6	23.6	15.7	0.567254
State Legislature Local Government Authority	2	3	1	5	6.3	39.4	18.1	15	21.3	0.565821
National Environmental Standards and Regulations Enforcement Agency (NESREA)	3	3	1	5	11.8	22.8	33.1	15.7	16.5	0.559777
Nigerian Institute of Town Planners	3	3	1	5	8.7	25.2	31.5	27.6	7.1	0.558219
State Land Use Development Agency	2	3	1	5	10.2	31.5	29.1	9.4	19.7	0.545523
River Basin Development Authority	2	3	1	5	19.7	27.6	16.5	11.8	24.4	0.524639
The Nigerian Society of Engineers	3	3	1	5	16.5	22	31.5	18.1	11.8	0.520219
The Nigerian Institute of Architects	2	2	1	5	19.7	30.7	29.1	11.8	8.7	0.451324

(Balogun et al. 2017). Indeed, Bature et al. (2021) established that most of the 90% of the households with improved water and sanitation facilities in Nigeria constructed such facilities privately. This, may, thus, be a possible reason for the rating for the household water users.

NGOs /aid/development organisation, such as WaterAid, United State Agency for International Development (USAID), United Nations International Children's Emergency Fund (UNICEF), and the World Bank were also rated higher than the Federal Ministry of Water Resources (FMWR) (Table 2). This finding may be due to the impact of the various water supply intervention projects undertaken by the NGOs/aid/development organisations across the country.

Financing responsibility

The ratings for financing responsibility are summarised in Table 3. The respondents rated aid/development organisations and NGOs above all the other stakeholders. All aid organisations/development partners were rated very high

except for the African Development Bank (AfDB), which was rated high (Table 3).

This is quite understandable given the financial resources including technical assistance pumped into the urban water supply sector by these organisations in Nigeria in the face of huge financial challenges as even expressed by the FMWR (Obosi 2020; Oloruntoba et al. 2016). For example, in June 2021, USAID supported the efforts of UNICEF to improve water, sanitation, and hygiene (WASH) services in Kebbi, Sokoto and Zamfara States in north–west Nigeria with a grant of US$9,978,800 (Adeniran et al. 2021).

The extent of influence of stakeholders in decision-making

Decision making is an essential component of any urban water supply system, the situation of Nigeria not being an exception. It is integral to the governance of the urban water supply system in terms of the creation and operation of sustainable processes and practices (Samuel et al. 2021). The

Table 3 Financial responsibility

Category of Stakeholders on Financing responsibility	Mode	Median	Minimum	Maximum	Frequency (%)					Consensus agreement $Agr(X|5)$
					1	2	3	4	5	
UNICEF	5	4	1	5	3.1	9.4	19.7	33.1	34.6	0.759733
World Bank Group	3	4	1	5	1.6	9.4	33.9	26	29.1	0.729476
USAID	5	4	1	5	5.5	7.1	28.3	26.8	32.3	0.727772
WaterAid	4	4	1	5	3.1	11.8	26.8	33.9	24.4	0.712451
Federal Ministry of Water Resources	5	4	1	5	9.4	18.1	12.6	28.3	31.5	0.676456
African Development Bank (AfDB)	3	3	1	5	3.1	17.3	29.9	28.3	21.3	0.673079
Water Board/Agency/Corporation	3	3	1	5	6.3	15.7	33.9	22	22	0.647463
Household users	3	3	1	5	7.9	18.9	37	11	25.2	0.61809
Industrial users	2	3	1	5	6.3	25.2	25.2	23.6	19.7	0.616072
Business Organisation	2	3	1	5	3.1	37.8	29.1	14.2	15.7	0.564557
Community-Based Organisations	2	3	1	5	3.9	37.8	23.6	23.6	11	0.561276
Federal Legislature	5	3	1	5	17.3	26	19.7	10.2	26.8	0.549289
State Water Regulation Agency	2	3	1	5	13.4	28.3	21.3	25.2	11.8	0.537156
National Water Resources Institute	3	3	1	5	8.7	30.7	37.8	8.7	14.2	0.531188
River Basin Development Authority	2	3	1	5	15.7	31.5	22	15	15.7	0.509202
Urban Development Board/Agency	2	3	1	5	11.8	35.4	34.6	11.8	6.3	0.475627
State Land Use Development Agency	2	3	1	5	16.5	33.1	27.6	11.8	11	0.473276
State Legislature Local Government Authority	2	3	1	5	15.7	33.9	31.5	7.1	11.8	0.468719
The National Agency for Food and Drug Administration and Control (NAFDAC)	2	2	1	5	22.8	33.9	15	21.3	7.1	0.438845
National Environmental Standards and Regulations Enforcement Agency (NESREA)	2	2	1	5	22	33.1	26	15.7	3.1	0.417403
Nigerian Institute of Town Planners	2	2	1	5	17.3	43.3	26.8	10.2	2.4	0.402515
The Nigerian Society of Engineers	2	2	1	5	22.8	43.3	20.5	9.4	3.9	0.375204
Standards Organisation of Nigeria (SON)	2	2	1	5	25.2	36.2	31.5	1.6	5.5	0.368719
Water consultants	2	2	1	4	21.3	49.6	15.7	13.4	0	0.359701
The Nigerian Institute of Architects	2	2	1	5	27.6	44.9	15.7	9.4	2.4	0.336276

level of influence in decision making varies with characteristics of stakeholders and the stage of supplying water. Traditionally, the government is the primary driver of pipe-borne water networks in Nigeria. It is responsible for connecting individual households and businesses to water supply (Musa et al. 2021). However, given the complexity associated with the traditional top–bottom approach to decision-making, where the central government is the sole decision-making body, a lot more stakeholders are getting involved directly or indirectly and depending on their characteristics as part of the adoption of pluralistic forms of governance to address the problem.

Table 4 catalogues the ratings of the respondents on the influence of the stakeholders relating to decision-making concerning the urban water supply system. Individual household water users were rated the highest followed by Water Board/Agency/Corporation, NGOs, such as UNICEF, CBOs, the World Bank Group and USAID in that order. Professional bodies such as the Nigerian Institute of Town Planners, the Nigerian Society of Engineers, and the Nigerian Institute of Architects were the least rated. A possible reason for the above findings could be the value of the contribution of the stakeholders to the water supply system in terms of role, financing responsibility and demands as end users of the product of the system among others.

The extent of benefits enjoyed

The benefits enjoyed by the stakeholders is viewed in tangible and intangible terms. The tangible terms are related to water consumers and the quality and quantity of service enjoyed from the water supply system. Individual households, business organisations/premises, and industries are the fundamental beneficiaries under the tangible terms. Conversely, intangible terms refer to the achievement of the objectives of various stakeholders who may not use the services but are satisfied with the outcome of the process. For example, water agencies/ministries and funding agencies are classified as part of those who benefit when the water supply system performs according to expectation as it signifies the achievement of their goals and enhances their image.

From Table 5, it is evident that government bodies (such as Water Board/Agency/Corporation, FMWR, Federal Legislature, State Water Regulation Agency in that order) came on top of the ratings followed closely by industrial users. The Nigerian Institute of Architects was the least rated stakeholder, the only stakeholder, which was not rated high or very high. Ordinarily, one would expect the individual households, business premises and industrial users to top the list. However, the responses could be attributed to the inadequacy of water supply to the various households who usually use alternative sources outside the government provision.

The extent of negative impact

The negative impact for stakeholders in the urban water supply can occur in diverse ways. It can be due to the shortage of water supply to consumers, inadequate revenue system for the water utility (non-revenue water), inadequate funding for operations and maintenance, illegal connection, and vandalisation of public installations. Stakeholders are affected directly and indirectly. For example, the visible and usually most talked about negative impact is the one that affects consumers. The negative impact on the consumers includes shortage or unreliable water supply, polluted water supply and inadequate water rate metering. From Table 6, the consensus agreement shows that household water users are the most negatively affected by the urban water supply system. This is closely followed by State Water Regulation Agency, industrial users, and the Water Board/Agency/Corporation.

Discussion of findings

The literature review identified twenty-five (25) categories of stakeholders. However, the fundamental issue for this study apart from determining the extent of stakeholders' interest is to identify the core stakeholders in the Nigerian urban water supply system. From the standpoint of stakeholder theory, this is not an issue of the "principle of who or what really counts" (Freeman 1984) or "to whom or what do managers pay attention" (Mitchell et al. 1997; Benn et al. 2016). Rather, it resonates with entities without whose participation an organisation cannot survive often referred to as primary stakeholders as opposed to others such as secondary stakeholders who are considered to influence or affect, or influenced or affected by an organisation, yet they are not engaged in transactions with the organisation and, therefore, not critical to its survival (Clarkson 1995; Kenny 2014; Benn et al. 2016). Thus, identifying the core stakeholders in Nigeria's urban water supply system is not a straightforward issue depending on the perspectives viewed from even with the five set of indicators developed for such purpose. For example, from the questionnaire survey results (Fig. 2) it is clear that the Federal Legislature was not rated highest even once across the five indicators although it is the body responsible for the passage of federal laws relating to urban water supply based on which other organisations such as the federal and state ministries for water resources, water boards, local authorities and urban development boards among others depend to execute their functions, including initiating and managing water projects. Thus, the results need to be interpreted carefully noting that from stakeholder theory perspective, the determination of core or primary stakeholders is also heavily steeped in stakeholder networks and relationships.

Table 4 Influence in decision making

Category of Stakeholders on influence in decision making	Mode	Median	Minimum	Maximum	Frequency (%)					Consensus agreement Agr(X|5)
					1	2	3	4	5	
Household users	3	4	2	5	0	11	33.9	29.1	26	0.728655
Water Board/Agency/Corporation	5	4	1	5	1.6	19.7	25.2	21.3	32.3	0.704797
UNICEF	4	4	1	5	3.1	16.5	29.1	33.1	18.1	0.672577
Community-Based Organisations	3	3	2	5	0	15.7	48.8	25.2	10.2	0.642458
WORLD BANK GROUP	3	3	2	5	0	23.6	33.9	30.7	11.8	0.640135
USAID	4	3	1	5	3.1	25.2	25.2	28.3	18.1	0.639018
WaterAid	4	4	1	5	5.5	22.8	20.5	37	14.2	0.634038
Federal Ministry of Water Resources	5	3	1	5	13.4	20.5	19.7	7.1	39.4	0.631555
State Water Regulation Agency	5	3	1	5	10.2	21.3	21.3	18.9	28.3	0.628758
Industrial users	3	3	1	5	2.4	28.3	38.6	8.7	22	0.607141
Federal Legislature	2	3	1	5	7.9	29.9	21.3	11.8	29.1	0.607121
AFRICAN DEVELOPMENT BANK (AfDB)	3	3	1	5	2.4	28.3	34.6	20.5	14.2	0.60101
Business Organisation	3	3	1	5	1.6	28.3	40.2	14.2	15.7	0.597905
National Water Resources Institute	5	3	1	5	15	25.2	14.2	12.6	33.1	0.595917
State Legislature Local Government Authority	2	3	1	5	5.5	37	18.1	12.6	26.8	0.594718
Urban Development Board/Agency	3	3	1	5	4.7	31.5	33.1	6.3	24.4	0.589893
Water consultants	2	3	1	5	6.3	35.4	22	21.3	15	0.564621
The National Agency for Food and Drug Administration and Control (NAFDAC)	3	3	1	5	15	20.5	25.2	22.8	16.5	0.562483
Standards Organisation of Nigeria (SON)	3	3	1	5	17.3	17.3	26.8	20.5	18.1	0.558971
National Environmental Standards and Regulations Enforcement Agency (NESREA)	3	3	1	5	14.2	23.6	26	16.5	19.7	0.558279
State Land Use Development Agency	2	3	1	5	15.7	26.8	26	7.1	24.4	0.539689
River Basin Development Authority	2	2	1	5	18.9	33.9	7.9	14.2	25.2	0.52099
Nigerian Institute of Town Planners	3	3	1	5	14.2	26	30.7	22.8	6.3	0.510362
The Nigerian Society of Engineers	3	3	1	5	23.6	18.9	29.1	18.9	9.4	0.478659
The Nigerian Institute of Architects	3	3	1	5	26	22.8	33.1	10.2	7.9	0.428372

Table 5 Benefits enjoyed by stakeholders

Category of Stakeholders on benefits enjoyed	Mode	Median	Minimum	Maximum	Frequency (%)					Consensus agreement Agr(X|5)
					1	2	3	4	5	
Water Board/Agency/Corporation	4	4	2	5	0	2.4	19.7	40.2	37.8	0.824521
Federal Ministry of Water Resources	5	4	1	5	3.9	11.8	8.7	34.6	40.9	0.778224
Federal Legislature	4	4	1	5	3.1	18.1	7.9	36.2	34.6	0.743744
State Water Regulation Agency	3	4	1	5	3.9	4.7	34.6	26.8	29.9	0.733899
Industrial users	4	4	1	5	1.6	16.5	17.3	34.6	29.9	0.733661
State Legislature Local Government Authority	3	4	1	5	1.6	10.2	35.4	29.1	23.6	0.711854
National Water Resources Institute	3	4	1	5	5.5	11.8	29.1	26	27.6	0.694124
Urban Development Board/Agency	4	4	1	5	5.5	20.5	15.7	34.6	23.6	0.674179
Household users	5	3	1	5	3.9	22	25.2	17.3	31.5	0.673907
River Basin Development Authority	5	4	1	5	10.2	16.5	17.3	22	33.9	0.671935
Business Organisation	3	3	1	5	3.9	21.3	30.7	18.9	25.2	0.652744
The National Agency for Food and Drug Administration and Control (NAFDAC)	4	4	1	5	7.9	15	26.8	30.7	19.7	0.648917
Standards Organisation of Nigeria (SON)	4	4	1	5	11	14.2	22.8	35.4	16.5	0.630889
National Environmental Standards and Regulations Enforcement Agency (NESREA)	4	3	1	5	7.1	22	23.6	27.6	19.7	0.628705
UNICEF	4	3	1	5	5.5	21.3	28.3	29.1	15.7	0.627055
Community-Based Organisations	2	3	1	5	2.4	29.9	26.8	25.2	15.7	0.61348
WaterAid	4	3	1	5	7.9	23.6	23.6	31.5	13.4	0.602343
USAID	3	3	1	5	9.4	18.9	31.5	26.8	13.4	0.595479
State Land Use Development Agency	3	3	1	5	11.8	22	27.6	12.6	26	0.594001
African Development Bank (AfDB)	3	3	1	5	7.9	23.6	28.3	28.3	11.8	0.589001
World Bank Group	4	3	1	5	7.9	25.2	26.8	29.1	11	0.582836
Water consultants	3	3	1	5	9.4	18.9	35.4	25.2	11	0.582375
The Nigerian Society of Engineers	3	3	1	5	3.9	28.3	39.4	19.7	8.7	0.56763
Nigerian Institute of Town Planners	3	3	1	5	7.1	25.2	40.2	15	12.6	0.562384
The Nigerian Institute of Architects	3	3	1	5	7.1	28.3	37	18.9	8.7	0.547132

Nonetheless, on the face of the results (Fig. 2), it could be surmised that from the standpoint of role, apart from the Land Use Development Agency, the River Basin Development Authority, and the professional bodies [the Nigerian Institute of Architect and the Nigerian Society of Engineers], all the other stakeholders were rated high or very high. In the case of financing responsibility, 11 stakeholders, namely, UNICEF, the World Bank Group, USAID, FMWR, AfDB, Water Boards/Agencies, Household Users, Industrial Users, Business Organisations, and CBOs, were rated high or very high. In terms of wielding influence in decision-making, all the stakeholders were rated high or very high except for the five stakeholders mentioned under role. Excepting the Nigerian Institute of Architects, all the other stakeholders were rated high or very high in connection with positive impact or benefits from the water supply system. Conversely, for negative impact, 13 stakeholders were rated high or very high compared with 12, which were rated medium or much lower.

Five stakeholders, namely, Household Users, FMWR, CBOs, Business Organisations, and the Water Boards/Agencies/Corporations, were rated high or very high across all the five indicators. However, on average Household Users were the highly rated followed by the Water Boards/Agencies/Corporations and the FMWR in that order. Business Organisations and CBOs were virtually at par in terms of the overall rating. Ten other stakeholders were rated high or very high across four of the five indicators. A disaggregation of this result shows that the rating of five of the 10 stakeholders related to all the indicators except negative impact. The five stakeholders are WaterAid, USAID, UNICEF, the World Bank Group and AfDB. On Average, the UNICEF was rated highest amongst them. The average ratings for WaterAid, USAID and the World Bank Group were virtually the same, whilst AfDB was the least rated. What is striking about this group of stakeholders is that except for AfDB, they were all rated very high for financing the water supply system. Only the rating of Industrial Users out of the 10 stakeholders was not either high or very high with respect to influence in decision making. The remaining four stakeholders, namely, State Water Regulation Agency, Urban

Table 6 Negative impact suffered by stakeholders

Category of Stakeholders on Negative impact suffered	Mode	Median	Minimum	Maximum	Frequency (%)					Consensus agreement Agr(X|5)
					1	2	3	4	5	
Household users	5	4	1	5	9.4	5.5	29.1	15.7	40.2	0.717685
State Water Regulation Agency	3	3	1	5	3.9	11	36.2	23.6	25.2	0.690704
Industrial users	5	4	1	5	4.7	15	29.1	21.3	29.9	0.68948
Water Board/Agency/Corporation	4	4	1	5	8.7	7.1	28.3	32.3	23.6	0.685177
Business Organisation	2	3	2	5	0	26	25.2	24.4	24.4	0.672106
Community-Based Organisations	3	3	1	5	8.7	22	31.5	16.5	21.3	0.601301
State Legislature Local Government Authority	3	3	1	5	9.4	22.8	26.8	22.8	18.1	0.596246
Urban Development Board/Agency	3	3	1	5	9.4	21.3	33.1	16.5	19.7	0.592407
River Basin Development Authority	3	3	1	5	15	17.3	29.1	15.7	22.8	0.581672
Water consultants	3	3	1	5	7.9	17.3	48	13.4	13.4	0.578661
State Land Use Development Agency	2	3	1	5	12.6	26.8	22	15.7	22.8	0.570723
The Nigerian Society of Engineers	3	3	1	5	5.5	21.3	48.8	15.7	8.7	0.567787
Federal Ministry of Water Resources	2	3	1	5	13.4	31.5	16.5	12.6	26	0.559653
National Water Resources Institute	2	3	1	5	10.2	37	17.3	17.3	18.1	0.541984
Federal Legislature	2	3	1	5	17.3	31.5	10.2	19.7	21.3	0.533122
Nigerian Institute of Town Planners	3	3	1	5	9.4	28.3	40.2	11	11	0.52607
Standards Organisation of Nigeria (SON)	2	2	1	5	16.5	33.9	14.2	16.5	18.9	0.514412
The Nigerian Institute of Architects	3	3	1	5	8.7	33.1	36.2	13.4	8.7	0.5125
National Environmental Standards and Regulations Enforcement Agency (NESREA)	2	3	1	5	19.7	27.6	20.5	15.7	16.5	0.500524
The National Agency for Food and Drug Administration and Control (NAFDAC)	2	3	1	5	19.7	27.6	24.4	10.2	18.1	0.494933
WaterAid	3	3	1	4	13.4	33.1	36.2	17.3	0	0.457987
African Development Bank (AfDB)	3	3	1	5	16.5	31.5	32.3	17.3	2.4	0.454023
WORLD BANK GROUP	3	3	1	5	21.3	22.8	36.2	17.3	2.4	0.448828
USAID	2	2	1	5	16.5	37.8	26	17.3	2.4	0.437451
UNICEF	2	2	1	5	15	41.7	26	15	2.4	0.430438

Fig. 2 Concensus Agreement on Rating of Stakeholders
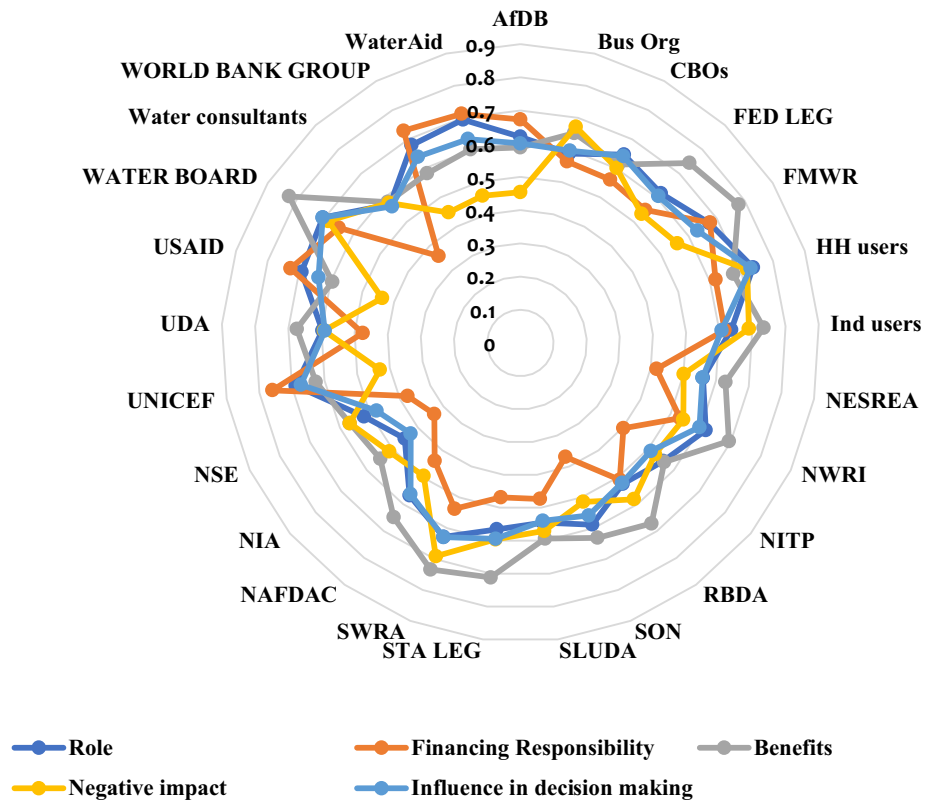
Development Board, Water Consultants, and State Legislature or Local Government, scored high for all the indicators except for financing responsibility. On average, the State Water Regulation Agency recorded the highest score, followed by Urban Development Board, then State Legislature or Local Government and Water Consultants.

Apart from a single score for the benefit indicator of one of them, five stakeholders were rated high across three indicators: role, influence in decision-making and benefit indicators. These stakeholders are Federal Legislature, National Water Resources Institute, Standard Organisation of Nigeria (SON), National Agency for Food and Drugs and the National Environmental Standard and Regulations Enforcement Agency (NESREA). Their average score in terms of the highest rated corresponds with how they have been listed above. Conversely, four stakeholders were rated high across two indicators, whilst in total, only one stakeholder was not rated either high or very high across all the five indicators. The four stakeholders are River Basin Development Agency, Nigeria Society of Engineers, Nigeria Institute of Town Planners and State Land Use Development Agency, and single stakeholder is the Nigeria Institute of Architects (Fig. 1).

It can, thus, be inferred from the results that whilst the respondents perceived the Nigeria Institute of Architects as not a critical stakeholder in the country's urban water supply system, they considered Household Users, FMWR, CBOs,

Business Organisations, and the Urban Water Boards as very critical (core) or primary stakeholders of the urban water supply system. This is understandable, because these stakeholders are at the heart of the water supply system. In other words, they are directly involved in the transactional issues of the system (Clarkson 1995; Benn et al. 2016). For example, Household Users remain one of the prominent targets if not the core target of the water supply system meaning both depend on each other, a situation that creates direct and somewhat social contractual relationship between them. For the FMWR and the Urban Water Boards, although they are not necessarily responsible for the passage of the relevant water supply laws, they have a fundamental role of formulating policies that feed into the laws or underpin them and ensure their enforcement thereby promoting respect for the rules of the game and standards among others. As observed by authors such as Bloch (1995) and Hult et al. (2011) such enforcement of regulation could introduce additional cost and may also compel the water supply system to become more proactive hence constitute part of the core or primary stakeholders. The CBOs, apart from contributing to water supply policy formulation and implementation also invest in the actual supply of water just as the Business Organisations especially in the peri urban informal communities making them very critical as the Business organisation in the water supply system. This indeed ties into the reality that organisations that ignore community and social interests risk losing

consumer support, which could result in boycotts, thereby negatively affecting the firm's reputation and performance (Benn et al. 2016). In summary, the respondents' assessment for the above five stakeholders is consistent with the stakeholder theory.

The 10 stakeholders although were not rated high or very high for all the five indicators, but four could also be considered as core or primary stakeholders based on the propositions of the stakeholder theory and the decentralised nature of the water supply system. Fundamentally, government through bodies such as the FMWR, Water Board/Agency/Corporation and Local Government Authorities are supposed to provide financing for at least the infrastructure for the water supply system. However, due to funding gap, government has over the years not been able to do so (Adams et al. 2020) and international aid and development organisations/partners such as the WaterAid, USAID, UNICEF, the World Bank Group and AfDB have often provided the financial resources for the construction and operation of the water supply system (Mitropoulos et al. 2020; Samuel et al. 2021). They also provide technical assistance implying that not only are they directly involved in the running of the system, but they wield influence in terms of decision-making relative to the water supply system and, therefore, make them very critical stakeholders. Although Industrial Users were not rated high or very high for influence in decision-making, they are one of the targets of the water system and can be considered as one of the customers who have a direct link to the system and require respect for their values if the system must work effectively. For State Water Regulation Agency, Urban Development Board, Water Consultants and Local Government, their primary stakeholder status lies in either being a regulator of an aspect(s) of the system or supervisory role over it (them). Furthermore, the activities of the adjudged core stakeholders are central to addressing the problems of the urban water supply system such as inadequate funding, lack of infrastructure and poor service delivery and coordination of functions of institutions identified in the literature discussions.

The next set of five stakeholders, namely, Federal Legislature, National Water Resources Institute, Standard Organisation of Nigeria (SON), National Agency for Food and Drugs and the National Environmental Standard and Regulations Enforcement Agency (NESREA), which were fundamentally rated high across three of the indicators by the respondents could only be considered as not too critical. This is because they are not directly connected to the urban water supply system and the system's success does not primarily or directly connect to them. Their relationship with the urban water supply system is one of advisory or detached. For example, apart from its core function of passing laws that may impinge the water supply system, the Federal Legislature is far detached from the actual establishment and running of the system. This same reasoning applies to the four highly rated stakeholders across two indicators.

Whilst the categorisation of stakeholders under the then Uzbekistan's proposed Water Supply and Sanitation Services Improvement Investment Programme (WYG International Ltd, 2009) was somewhat different, it bears some similarities with this present study. The study identified four main stakeholder groups, but reclassified them into primary (core), groups who are affected positively or negatively by the programme and secondary, groups who are essential intermediaries in the delivery of the programme. Like the present study, WYG International Ltd (2009) identified individuals, households, families, and private businesses as primary stakeholders. However, unlike the present study they have low influence. Furthermore, executing agencies were considered as secondary stakeholders with a strong interest in implementing the programme with responsibilities, such as programme coordination and liaison with funding agencies and Government ministries. Although not all executing agencies were considered as secondary stakeholders in the present study, there are clear differences in findings from both studies. These differences signify that apart from theory, there may be a need for categorisation of stakeholders within the water delivery sector to consider geographical context and the scale of activity as the two studies occurred in two different countries with different socio-economic, cultural, and institutional among others' arrangements, and whilst the Uzbekistan study focussed on a single programme, the present study is on a whole country's system.

Excepting the above, the present study has brought to the fore the expansive nature of the urban water delivery sector with multiple and varied stakeholders who come from various sectors, such as the built and natural environments, finance, and investment among others. In addition, as concluded by Hoolohan et al. (2018) in their work on engaging stakeholders to resolve the water-energy-food (WEF) nexus challenges, a transdisciplinary approach to stakeholder research, identification, engagement, and management of stakeholders is essential. More importantly, the present study presents several characterisations of stakeholders, including their goals and interests, responsibilities, and strategies. These, as noted in the literature discussions and findings from studies like Tilman et al. (2001) and Megdal et al. (2017) are fundamental to sustainable stakeholder engagement and management as well as policy direction in terms of sustainable water governance. Indeed, Tilman et al. (2001) in their study established that analysing relevant stakeholders' underlying characteristics, goals, and strategies provides a ground for estimating the efficacy and potential risks of past and current engineering and management concepts.

Conclusions

Following the emergence of pluralistic forms of governance in resource administration and management, engagement, and involvement of stakeholders in water supply systems and indeed sustainable water resources management have become essential. However, the starting point to such stakeholder engagement and involvement is the identification of the core or primary stakeholders. This study interrogated the Nigerian urban water supply system with the view to analysing the extent of interest of stakeholders to identify the core stakeholders as an input towards facilitating sustainable water resource management in the country. From the extant literature, the study assembled a list of numerous potential stakeholders and developed five set of indicators for analysing and identifying the core stakeholders. Subsequently, a survey of urban water supply experts was undertaken using the set of indicators and based on a Likert scale to obtain data, which was analysed with the consensus/agreement around the mean analytical framework. The results obtained were further discussed and evaluated with the insights from the stakeholder theory.

Twenty-five (25) distinct stakeholders were overall identified. However, 15 of them were adjudged to be core (very critical) or primary stakeholders of Nigerian urban water supply system. Five out of the 15 stakeholders, namely, Household Users, FMWR, CBOs, Business Organisations, and the Urban Water Boards, were rated as high or very high across all the five indicators, whilst the remaining 10 of them were rated high or very high across four indicators. Beyond that these stakeholders were found to be directly involved or connected to the urban water supply system, which connection was steeped in them being customers or investors or regulators and enforcers of regulation, funders, supervisors, and the need to respect community and social interests implying that they are linked directly to the success of the system making them core stakeholders from the stakeholder theory perspective. Excepting the Nigerian Institute of Architects, which was regarded as not critical stakeholder, the remaining stakeholders who were rated high across three and two of the indicators were considered not too critical (not core), because they are not directly connected to the urban water supply system and their relationship with the urban water supply system is detached or one of advisory. The foregoing implies that whilst it will be good to engage and involve all stakeholders in the Nigerian urban water supply system as part of the pluralistic governance arrangements towards the sustainable management of water resources in the country, the engagement and involvement of the 15 core stakeholders should always be a priority as they lie at the heart of the successful operation of the system.

Declarations

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