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GAP FILLERS OR PIONEERS: INFORMAL WATER SUPPLIERS IN PERI-URBAN AREAS OF THE TECHIMAN MUNICIPALITY OF GHANA

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Abstract

There is continuous expansion and growth of urban and peri urban areas in Sub-Saharan Africa with projections indicating that this will double. Some peri-urban areas such as those in the Techiman municipality of Ghana are experiencing this trend. Nonetheless, the spate of growth of these areas outstrips the supply of utilities by municipal water distribution networks. As a result, some areas have little or no public provision. In order to address the water supply challenge, places with favourable hydrological settings are witnessing the emergence of informal water suppliers as "gap fillers" or "pioneers", providing water services. Noteworthy, however, existing studies about informal water suppliers in peri-urban areas in Ghana lump them together, without considering the water source. This study differs in that it specifically examines the evolution and the features of informal water suppliers who privately and independently abstract and supply groundwater. Additionally, it attempts to understand the nature of informality of the suppliers and the possibility of formalisation. The paper is an exploratory study using the case of private mechanised borehole operators who supply water in their respective areas. The findings showed that in some peri-urban areas in the Techiman municipality, some dwellers constructed and operated mechanised boreholes, which provide in-situ water and utilities to others. They are mostly pioneer water suppliers in some of the areas. Their services are informal by nature because they are largely independent of the formal sector and apply informal arrangements in rendering their services. Seen also as business enterprises, they are not licenced. However, the boreholes are registered with the Municipal Assembly, which indicated some level of formalisation. The study recommended that efforts to formalise them further should focus on improving water quality monitoring for consumption and promoting sustainable abstraction.

Key words: Informal, water suppliers, groundwater, peri-urban, Ghana

Introduction

The world is becoming more urban especially in developing countries as more people are seen to be residing in urban areas. Developing countries will witness this growth up to the year 2050 (Heilig, 2012). Engulfed in this wave, some peri-urban areas in Ghana are fast growing and spreading up to areas that were once considered agricultural lands. As documented elsewhere, "the metropolitan fringes have become a key location…for the elite. There are gated communities that splinter the urban landscape and…enjoy the premium of infrastructure and guaranteed security of tenure" (Roy, 2005:14). Nevertheless, the spate of growth of these urban areas outstrips the supply of utilities by municipal water supply systems. It has been noted that "Sub-Saharan Africa's urban population probably has the world's worst water provision for urban areas. In most small urban centres, there is little or no public provision" (UN-HABITAT, 2003:21). The inability of formal public or private organisations in the

global south to keep up with the water requirements of all urban areas (Njiru, 2003) has seen the emergence of informal water suppliers as "gap fillers", "pioneers" or "sub-concessionaire" providing water services as either dependent or independent of the formal sector (Kariuki & Schwartz, 2005). Patronage of these services shows that in Africa, about half of urban dwellers rely on them for water supply (Solo, 1999) some of which are even outperforming larger formal providers in meeting household water demand (Schaub-Jones, 2008). Globally, these water suppliers have been noted in countries such as Tanzania, Kenya, Argentina, Bolivia, Paraguay, Colombia, Guatemala, Peru, Mozambique, Tunisia, Jordan, Egypt and Ghana.

Some peri-urban areas of the Techiman Municipality of the Bono East Region of Ghana are experiencing limited or no municipal water supply services. Consequently, various informal means of providing water services have emerged. Boreholes with sustainable yields in the municipality (Kortatsi & Quansah, 2004) are mechanised and operated informally in some of these areas by private individuals as groundwater suppliers. While their activities are fast growing, existing studies in the country such as those about Ashaiman (Peloso & Morinville, 2014) do not discuss groundwater suppliers in depth and independently of other sources of informal water supply in order to understand their evolution and rationale for their operations. Similar studies of this sort are noted elsewhere (Ahlers et al., 2013; Angueletou-Marteau, 2008; Dakyaga et al., 2018; Farajalla et al., 2017; Kariuki & Schwartz, 2005; Njiru, 2003; Peloso & Morinville, 2014). Nonetheless, inspired by the study of the evolution of private independent water operators in Latin America with the conclusion that small scale providers may help reach coverage targets faster and more effectively (Solo, 2003), this study attempts to discuss the evolution of informal water suppliers with a specific focus on groundwater as a source to understand their role in promoting water supply coverage in the peri-urban areas of Techiman Municipality.

Furthermore, since the British anthropologist, Keith Hart coined the term 'informal' about economic activities of northern Ghanaian migrants in southern urban Ghana (Hart, 1973), subsequent discussions in this regard followed globally. However, these usually focus on urban settlements in terms of slums development on squatted lands or street vendors, labour migration and illegally employed and exploited workers (Porter et al., 2011). As in Ghana, the existing literature largely points in the direction of the informal economy of labour/employment (petty traders, street vendors, head porters) and urban planning (slums dwellers and other activities considered illegal)(Obeng-Odoom, 2011). It is, therefore, not surprising that the state interprets the informal economy as a source of congestion and filth (Bob-Milliar & Obeng-Odoom, 2011). However, this study differs in that it discusses the nature of informal groundwater suppliers who are filling the void of formal or municipal water supply systems and whose operational activities are within locations outside the ambit of slums. It attempts to understand the nature of informality of water supply in the peri-urban landscape inhabited by both high/middle income earners/elites (gated houses) and low-income earners (traditional mud/blockhouses) with the latter depending on the former for water supply but the land tenure of both is considered legal.

Lastly, there are arguments for the formalisation of the informal economy including water supply services. This is because informality is considered problematic and illegal and associated with dead capital. Championed by Hernandez de Soto (De Soto, 2000) and the World Bank, this has culminated in the adoption of series of sector reforms in countries like Tanzania, Peru and Botswana regarding land (Porter et al., 2011) and waste management in Egypt (Assaad, 1996). In the water sector, discussions of this sort have also been noted (Foster et al., 2012; Foster and Vairavamoorthy, 2013; Njiru, 2003; Schaub-Jones,

2008; Solo, 1999) with water supply in Maputo, Mozambique (Ahlers et al., 2013; Cheng, 2014) as an example. It is, however, argued that formalisation may result in a form of enclosure and dispossession and may deepen inequality. Situating the paper between the formal (formalisation) and informal debates, the study further attempts to understand the implications to formalise these informal water suppliers in the Techiman Municipality.

The goal of this paper is thus, to understand the nature of operations of informal groundwater suppliers and the possibility of formalisation. Mechanised boreholes providing water for in-situ water supply and utility services in some selected peri-urban areas of Techiman are considered. Following this introduction, the rest of the paper is structured in four parts: firstly, it looks at the existing literature and the methodology for approaching the paper. It further looks at the evolution of informal water supply in the study area. It then discusses the informal nature of the water suppliers (enterprises). Lastly, the paper considers what formalisation means especially for informal groundwater supplier and if it is feasible.

Informal Water Suppliers and Peri-urban Areas: Definitions and Nature

Several terms have been assigned to informal water suppliers. These include small scale water providers, small scale water enterprises, water vendors and others. As noted, 'formal' means having a statutory or legal recognition, owned by the state or an incorporated private entity and frequently uses modern technology and network while 'informal' means all other modes without legal status (Misra, 2014). Kajri Misra emphasised that the major distinction here is about 'legality' which I agree with because the other features that describe formal water providers sometimes are absent and or are rather embedded in them. Therefore, informal water suppliers are suppliers who finance, develop and manage the delivery of small scale services to their clients and who take the form of small handcart vendors, standpipes, tankers and private network connections (Baker, 2009).

A study of them in 49 developing countries showed the existence of more than 10,000 mostly independent operators specializing in drinking water (Kariuki & Schwartz, 2005) with customer satisfaction indicating that even without any external subsidies they are outperforming larger formal providers in meeting the demand for household connections (Schaub-Jones, 2008). These suppliers provide water to low income households in urban areas that are difficult to serve using the conventional network (Cave & Blanc, 2012). They have different skills, background and capacity but able to adapt to local conditions in order to build up their customer base (Schaub-Jones, 2008). They have significantly influenced water supply (Kariuki & Schwartz, 2005) as their prices may even be lower than public providers even when they are competing for a market share (Solo, 1999). Their operations are also flexible and innovative (Ahlers et al., 2013). These suppliers are found in peri-urban areas. Considering what a peri-urban is, Willis defined it as "a zone around the built up area of a city, its perimeter or edge the ' rural-urban fringe ' where city and country land uses overlap" (Willis, 2007:80*)*. In another view, "the peri-urban zone begins just beyond the contiguous built-up urban area and sometimes extends as far as 150 kilometres from the core city (Webster et al., 2009:282).

The (In) formal Economy, Informality and The Water Sector

Discussions about the informal economy have been summed up in four perspectives: the dualists, structuralists, legalists and voluntarists (Chen, 2012). Chen explained that (i) the Dualists attribute the informal economy to marginal activities which are distinct and not related to the formal sector. The poor are employed here and it serves as a safety net in times of crisis. (ii) The Structuralists see the informal economy as comprising subordinated economic units and workers whose aim is to reduce

input and labour cost and increase the competitiveness of large capitalist firms. Popularised by Hernando de Soto, (iii) the Legalists see the informal economy as a composition of micro-entrepreneurs who choose to operate informally in order to avoid the costs, time and efforts of formal registration while (iv) the Voluntarists who do not see any connection between the two economies argue that the informal economy exists because people just volunteer to engage in it but not because of any cumbersome registration processes.

Regarding informality, it is noted that it is not "outside" formal systems but created by formal structures which relate to them (Porter et al., 2011). It is further noted that "informality does not imply a lack of structure or predictability. It simply means that the structures and predictability are achieved through a different set of rules and norms other than those associated with formal institutions" (Assaad, 1996:117).

Within the water space, a binary of two economies as formal and informal suppliers have also been noted. The two are distinguished in terms of organisational characteristics such as legality, size/scale, structure, capital intensity, kind of technology, skills levels, ease of entry and ownership even though some of these markers have been questioned (Misra, 2014). However, it is realised that a service delivery modality may contain both formal and informal elements. Besides, informal water suppliers may not be subjected to state regulations but they do not function in complete isolation of the state. Noteworthy, however, users within the formal water supply system are usually celebrated as legal, respected/recognised and legitimate while informal users are labelled as illegal, criminal and dangerous (Ahlers et al., 2013).

Therefore, recent times have seen a renewed interest in the informal economy and informality worldwide (Chen, 2012). The discussion here is, therefore, important for the understanding that informality is diverse and the informal sector is evolving, producing new features and taking new taking new forms in other aspects as will be seen in the case of the Techiman municipality. Guided by Farajalla et al. (2017), informality in this paper denotes the activities, actions, transactions, interactions and processes that occur at various stages of the water sector but outside the domain of what the state limitedly defined as legitimate/legal.

The Formalisation Debate and The Water Sector

According to Chen (2012), formalisation represents different things, that is shifting informal workers to formal wage jobs or registering and taxing informal enterprises, informal employees gaining access to legal and social protection among other things. Notably, Hernandez de Soto argued for the formalisation of informal property rights (De Soto, 2000), as "informality is correlated with undesirable ends of the spectrum and formality is positioned as the desired goal thus creating formalisation as the 'solution' to informality" (Porter et al., 2011:122). Within the water economy, it is argued that formalisation will increase efficiency as full cost recovery will be achieved with minimal waste of water. Furthermore, formalisation will contribute to addressing constraints like social discrimination, unfair competition, unclear regulations, technical skills and capacity, financial resources among others (Njiru, 2003). Hence, a lot of policy reforms were introduced in the water sector across Africa including Ghana (Obeng-Odoom, 2016).

This notwithstanding, it is realised that formalisation does not necessarily generate benefits especially for the poor or lead to improved services delivery. Furthermore, there is no evidence that formalisation will influence the welfare of society. Rather the process will stifle informal water suppliers especially their flexible and dynamic nature. It will also insignificantly protect the interests of consumers who are dependent on these suppliers (Ahlers et al., 2013). Furthermore, Kariuki and Schwartz (2005) argued that having already endured a hostile legal environment attempts to

formalise informal water suppliers will only create constraints for them. On the other hand, citing Saliasahi in India, Misra (2014) noted that informal water supply systems are more effective which create little room for political demand for additional water services.

Urban Water Supply in Ghana

The Ghana Water Company Limited (GWCL) Act, 1999 (Act 461) mandates the GWCL to be responsible solely for the provision, distribution and management of urban water supply and other functions. Also, the Public Utilities Regulatory Commission (PURC) established by Utilities Regulatory Commission Act 1997 (Act 538) is concerned with tariffs for water, electricity and gas utilities. The Ghana Standards Board is charged with the responsibility of developing and setting quality standards for drinking water. The Water Resources Commission (WRC) is responsible for the regulation and management of the utilisation of water resources while the Environmental Protection Agency (EPA) is to ensure that environmental quality laws are enforced and pollution of water bodies controlled. In terms of performance, it is realised that the PURC is concerned with regulating only the activities of GWCL and excludes the informal water sector dominated by the small-scale water providers that serve as the main service providers in the disadvantaged urban areas (Ainuson, 2010).

Regarding the reality of water supply in the country, the National Water Policy, 2007 indicated that the GWCL currently runs 82 urban systems with an average daily output of 572,012 m^3/day as against a daily demand of 1,049,306 m^3/day. A few customers in the urban areas get a 24 hour supply of water as many depend on water rationing. The situation of water supply is more a challenging issue in peri urban areas and those places that are highly populated as these places tend to receive water supply just once a week or no supply at all (Ministry of Water Resources, Works and Housing, 2007).

On account of the current national water coverage rate, it is noted that the rapid pace of urbanization has outstripped the capabilities of GWCL to cope with the increasing demand for water for domestic use, industry and commerce. The total daily demand for water in urban areas is about 1,076,526.00 m^3 while daily production is about 687,949.61m^3, at 75% capacity utilization (Ministry of Water Resources, Works and Housing, 2010).

It is evident that the current urban water demand is increasing while supply is not increasing correspondingly. As such, reliance on municipal water supply services to meet domestic water supply target may not be possible to achieve in the short term thus, the emergence of informal water suppliers.

Methods, Data and Study Area

Data Source and Collection Methods

This is a qualitative study meant to provide in-depth knowledge and understanding of informal water suppliers who depend on groundwater as their water source to render their services. To get more insights into the topic being studied from the perspectives of the respondents an exploratory research design was adopted. The study was conducted between April and October 2019. To address the research objectives, primary data were obtained through individual and key informant interviews. The areas studied in the Techiman municipality included Abosso, Fante New Town, Brigade, James Town and Hansua. These places were chosen because apart from them being peri-urban, there is the presence of the activities of informal water suppliers whose sources of water are mechanised boreholes and their services are highly patronised by the peri-urban dwellers. A face-to-face interview with the head of the Water and Sanitation Section of the Techiman Municipal Assembly who was considered a key informant in this study was conducted in his office. All the 11 independent commercial informal water suppliers were also studied. 90 conveniently sampled respondents were

interviewed. The sites of the interviews were the homes of the people and boreholes sites. Two research assistants conducted the interviews in the local language and transcribed them in English.

Primary data were also generated through direct observation of water storage and supply facilities at the dwellings/operational points of both the operators and the users to ascertain the delivery of domestic water. The kind of water vessels used in transporting/carrying water and the means of doing so was also observed. To further understand the quality and efficiency of pay-as-you-go services provided directly at the sites of the standpipes particularly with regards to crowding, observation was again used. To enhance the validity and reliability of the primary data, respondents were given the opportunity to comment on the interview transcripts. The study also extensively drew literature from secondary sources about the debates of informal and formal, and the argument for the formalisation of the water economy in order to critically present a picture of the situation in the municipality. Data were analysed manually and presented in themes.

Study Area

Techiman municipality is one of the municipalities in the Bono East Region. The capital of the municipality is Techiman with this capital also serving as the capital of the newly created Bono East Region as seen in Figure 1. The Techiman Municipality shares boundaries with. It shares boundaries with districts/municipalities such as Techiman North, Wenchi, and Nkronza Municipalities and Offinso-North. The Techiman Municipality has a land surface area of around 649 km. About 64.5% of the population live in urban areas. According to the 2010 Population and Housing Census, the municipality covers a land surface area of 669.7km^2. The Techiman municipality has a population of 147,788 with a density of 256.72 persons per square kilometres. The topography of the Techiman Municipality is low lying and gently undulating. The Techiman Municipality is drained by rivers like the Tano, Subin, Kar, Brewa, Taifi, Kyini and Fia. The Tano River is dammed at Tanoso to provide pipe-borne water to the people in Techiman and for irrigational purposes. The climate of the Techiman Municipality is semi-equatorial and tropical conventional or savannah climates and associated with moderate to heavy rainfall. The relative humidity is usually high throughout the year. The vegetation zones of the area are the guinea-savannah woodland located in the Northwest, the semi deciduous zone in the South and the transitional zone which stretches from the Southeast and West up to the North of the Municipality. Hydro-geological studies have been conducted by Kortatsi and Quansah (2004) which indicate that the Techiman Municipality is underlain by Sandstones of the Upper Voltain rocks. The yields of standard boreholes here range from less than 0.2m^{3}h^{-1} to about 29.0m^{3}h^{-1} with a median value of 8.5m^{3}h^{-1}. Adequate groundwater, therefore, exists here which is exploited to augment municipal water supply. In terms of quality, apart from pH and total hardness, all major chemical constituents are within the limits of WHO, 1993 guidelines for drinking water. Bacteriological results show zero faecal coliform (Kortatsi & Quansah, 2004).

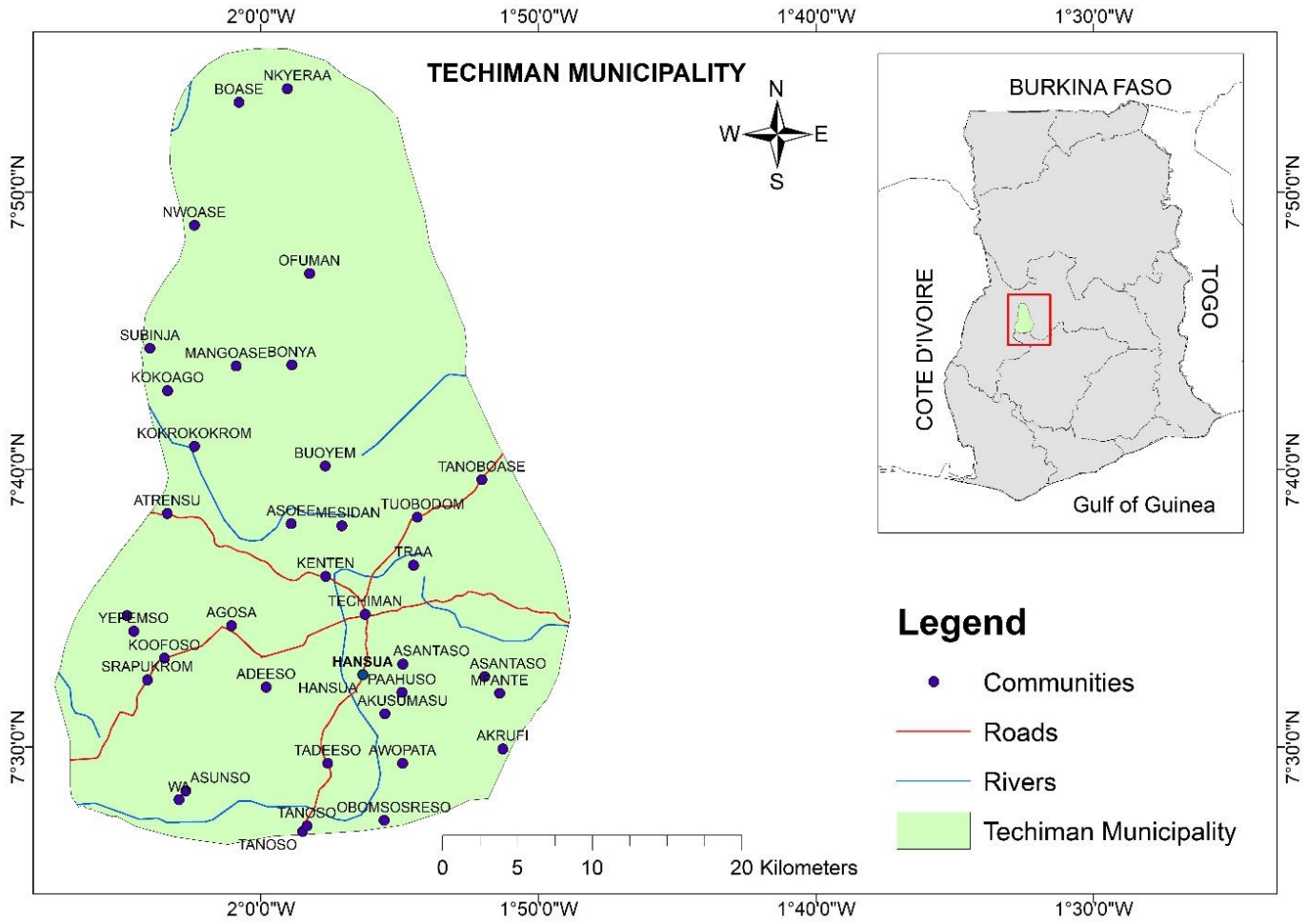

Figure 1: Map of the Techiman Municipality

Results and Discussion

Evolution of Informal Groundwater Suppliers in The Techiman Municipality

There is evidence of rapid development in the Techiman Municipality in the form of modern houses owned by high/middle income earners spreading out even beyond the urban fringes and in some instances encapsulating traditional or 'Atakpame' houses of low-income earners located along the Techiman-Kumasi highway. This resonates with Willis (2007) description of a peri-urban area. Nonetheless, in the Techiman Municipality challenges such as population increase and financial constraints are affecting the coverage of municipal water supply. As a result, there is the emergence of informal groundwater suppliers in these peri-urban areas of the Municipality.

The interviews revealed that in the past, it was common to find manually constructed groundwater wells located in houses providing water for households and their neighbours; usually a small population. These wells were privately owned and neighbours could access this water free of charge. In recent times, groundwater supply for domestic purposes in the Techiman Municipality has evolved through personal initiatives in the urban fringes that have been poorly covered by the conventional network. Peri-urban dwellers here who could bear the cost of a mechanised borehole contacted a registered driller to drill boreholes in their dwelling units. The primary reason was basically to provide

water for the household. However, this motive changed over time.

The characteristics of the informal groundwater suppliers here typified the typology captured of small scale water providers in Maputo, Mozambique, as 'social' and 'resident' water providers (Cave & Blanc, 2012). As social providers, they only shared their water with other users as an act of benevolence. Their primary reason for drilling their boreholes was not to sell the water. These providers were ready to stop their operations at any time. The operators within this category had their main income generating activities other than the sales of water. Hence, they were not enthused in getting many customers. The second category of providers were the resident ones who were once social providers. In the Techiman Municipality, the interview responses showed that these suppliers realised that additional and more income could be generated from the sales of water. Thus, these operators made water supply a major business activity and their services covered several metered customers and they were always searching for new customers.

As either pioneers or gap fillers, it was realised from the interviews that informal groundwater suppliers in areas such as Hansua, Brigade and James Town were pioneer suppliers as there was no municipal water supply network in these places at all. In Fante New Town and Abosso, they served those customers who were yet to be connected to the municipal water network system. They also provided water to customers who were connected to the municipal water network system but did not frequently get water supply from their primary supplier.

Elements of Informal Groundwater Supply Enterprises

Guided by Kariuki and Schwartz (2005) analysis of key business elements of small-scale services providers (SPSPs), the following indicate the nature of the informal groundwater supply enterprises in the Techiman Municipality.

System

A detailed description of the system is provided in Figure 2 where water is pumped using electricity (A) and the water is stored in a storage tank (B). Water in the tank is then filtered (C) and chlorinated before being supplied. A platform (D & E) is constructed to encourage point-of-source services. A metre (F & G) is installed to record monthly water use.

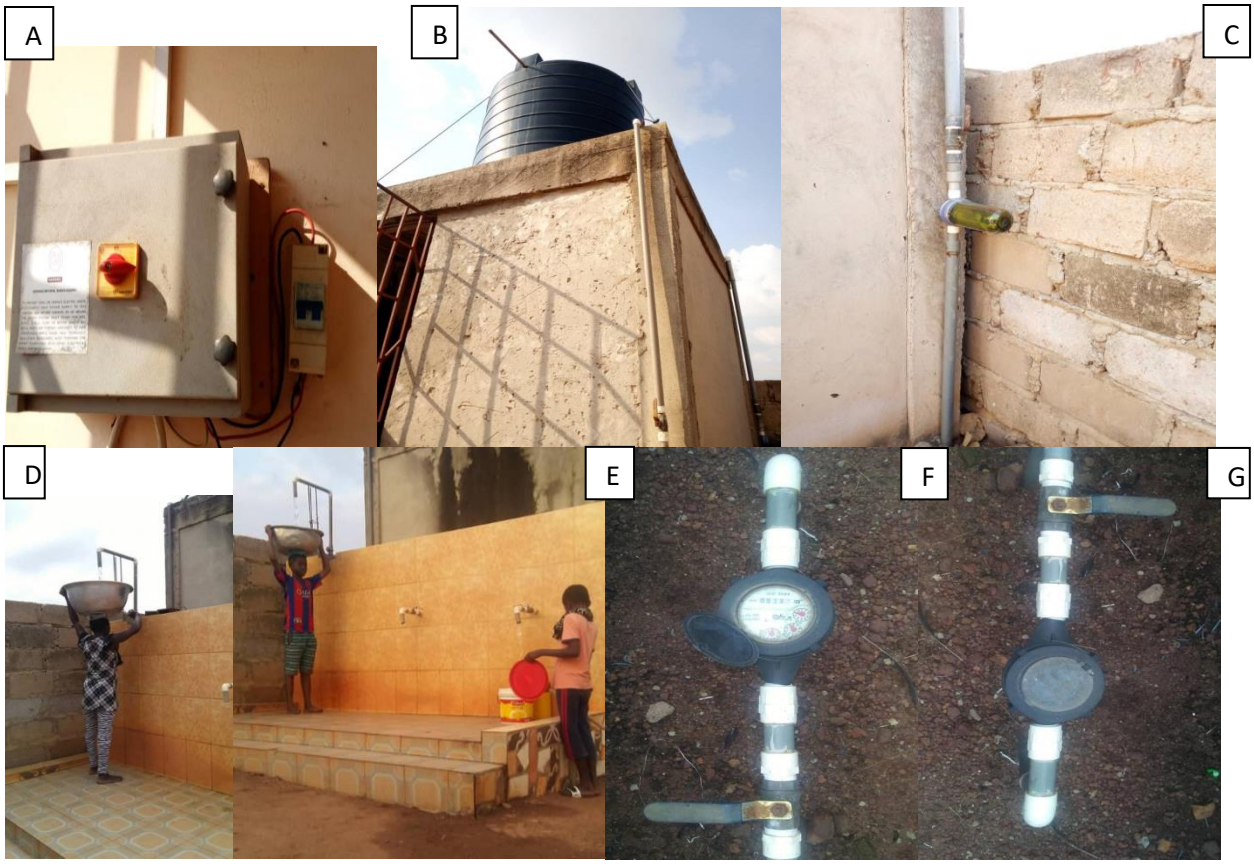

Figure 2: Groundwater supply system in the Techiman municipality

Source: Kwoyiga (2021)

Organisation

Informal water suppliers were mostly sole proprietorship small water enterprises. The interviews further revealed that family members usually assisted in organising the activity through the provision of labour and income/initial capital. The boreholes were located on the land purchased by the individual operators. As noted elsewhere (Solo, 1999), the operators in the Techiman municipality also recovered their cost fully as they had no unaccounted-for water.

Regulatory Issues

From the interviews, after the borehole was drilled and the drilling contractor provided details of the borehole to the District Municipal for registration. The Water and Sanitation Unit of the Municipal Assembly then monitored the quality of the water and the sanitary conditions of the borehole surroundings. The unit also advised operators to filter or chlorinate the water before distribution.

Technology

From the responses, the technology adopted by the water suppliers involved the abstraction and pumping of groundwater. Electricity powered machine or motor drew the water from the ground and then pumped it into an elevated storage tank(s).

Staffing

The interviews showed that staffing was a flat structure with less than two layers between management and the water users. The owner of the house was usually the owner of the borehole. However, the water activities might be directly handled by the owner that is if the person had no formal job or any major business activity. Where the owner had a primary income generating activity, the wife (that is if the owner of the house is a man) or other family members operated the borehole. The composition of workers included meter readers, record keepers and daily salesperson. A few of the staff were paid, most of the family members were not paid as the income generated was used to meet the family's living expenses.

Customer Services

The interviews showed that the services offered by these operators were satisfactory. Communication was mostly through personal contacts. Payment for water services was flexible and not necessarily on a fixed date. In certain instances, customers fetched water on credit. Transactions were largely influenced by social trust, culture and religion. Informal means of resolving conflicts like dialogue were often applied. The results thus refute the arguments of Schaub-Jones (2008) that customers of informal water suppliers are usually exploited and offered poor but costly services.

Financing

The responses of the interviews showed that operators depended on income from savings from formal jobs, pension benefits, income from small enterprises and family members. Operators did not access loans for such a purpose. Earnings and savings, therefore, constituted the principal source of income of these activities. Their activities did not require government subsidies a confirmation of Solo (1999) assertion that, such do not require public subsidies or borrowing.

Pricing, Sales and Earnings

Operators fixed the prices themselves depending on the size of the water vessel. However, regarding connected customers, each point recorded on the meter was charged uniformly for all customers. Interviews of customers corroborated Solo (1999) argument that even though their activities are without subsidies, their prices embody a simpler and appropriate charging mechanism making them more efficient and cost effective.

Sales depended on the number of customers and the use of the water at a given time. Conditions like weather/season determined daily sales. It was realised from the interviews that in the rainy season, some customers harvested rainwater which they conjunctively used with the water from the borehole. This reduced the level of demand for borehole water. Another factor influencing the demand for water is festivities. Operators admitted that during Christmas or Islamic celebrations, customers demanded a lot of water and this increased the sales margin. The sales realised were usually saved at home, used to meet household expenses or saved with mobile credit operators or '*susu'* operators.

Contrary to the observation made by Cave and Blanc, (2012), the results indicated that the operators in this study provided water to both high and low income earners. The results also corroborated Kariuki and Schwartz (2005) assertion that such operators significantly influence water supply. Like Solo (2003) noted, they are significantly contributing to water coverage targets faster in the Techiman municipality.

Informal groundwater supply and the formal sector

It is argued that informal water suppliers have some linkages with the formal sector. The interview results showed that:

- Informal water suppliers depended on the Northern Electricity Department for electricity to pump water.
- Activities of informal water suppliers took place on a legally registered land/dwelling unit.
- The Techiman Municipal Assembly through the Water and Sanitation Unit routinely monitored informal water services delivery.
- Suppliers' startup income sometimes came from savings from formal jobs.
- Suppliers depended on registered and licensed well drillers to drill mechanised boreholes.

The informal Nature of Groundwater Supply Services in Techiman

Guided by Chen (2012) discussion about informality, the interviews revealed the following: (i) the enterprises were family unincorporated enterprises and were not registered or taxed. Formal water quality standards were not applied, with the enterprises not being members of any formal organisation or association and there were no Water Users Associations (WUA); (ii) the employer/employee's characteristics showed that the supplier was mostly an employer who was supported by family members. There existed casual workers like plumbers, repairers, electricians. There was no social security protection for workers and formal job contracts. Employment relationships were not legally regulated and employees had no membership in formal trade unions or associations. There was also no formal occupational health and safety measures; (iii) Informal rules, norms, customs, procedures governed water service delivery. For instance, customers who wanted to connect via the metred system must first pay the connection fees. Customers could fetch water from the taps of the operators from 6 am to 6 pm. (iv) social relationships were important as operations took place within a social field. Thus, social trust, kinship ties and religion played a role. Activities were further governed by series of extra-legal contractual relations.

It can be said that the informality of groundwater suppliers depicts the description given by (Assaad, 1996). One sees that the activities/operations are well organised but only lie outside formal bureaucratic rules and procedures, with the absence of legal interpretations. As noted by Ahlers et al. (2013), informality does not mean lack of structures, or predictability but involves the application of a different set of rules other than formal rules as seen by informal rules, norms and procedures which are followed, though unwritten. The existing informal rules appear effective in addressing conflicts while enhancing customer satisfaction. Therefore, describing informality as urban logic is seen here. The results of the paper hence support Ahlers et al. (2013) assertion that informality should not be addressed derogatorily while formality is celebrated.

Implications of Formalising Informal Groundwater Supplies in The Techiman Municipality

At the moment, the only form of formalisation of informal water supply is the registration of the boreholes. This notwithstanding some of the arguments for formalisation proved otherwise by the study results. For instance, as argued by De Soto (2000) that formalisation may increase efficiency as the full cost will be achieved, one sees that the water supply systems have been able to achieve this already. Also, suppliers are able to thrive on their own without any external financial support hence no need to formalise as a way of increasing the value of groundwater operators' assets. Also, the argument by Njiru (2003) that formalisation will address the challenges of social discrimination of suppliers

is refuted as the state and water users recognise informal water supply activities. Nonetheless, the assertion that many activities in the informal economy do not generate enough output, employment or income in order to fall into the existing tax bracket (Chen, 2005) resonates the situation in the Techiman municipality, as the outputs of these operators are barely enough to be taxed let alone recruit permanent workers.

Regarding efforts to further formalise groundwater services in the Municipality, like Assaad (1996) noted in Egypt where formalisation displaced vulnerable residents, such may be experienced here when not carefully implemented. Some dwellers particularly the poor will not be able to afford informal water services. The social providers will simply refuse to share their water with their neighbours since profit making is not their goal. That is the social providers will erase their 'benevolent' water provision mandate. Secondly, the resident providers who would choose to remain in business might still want to operate at a full cost hence they would shift the additional cost of formalisation to customers and this may affect the poor. Besides, as Chen (2012) cautioned that formalisation may not be desired by all, in the municipality, both suppliers and users have long applied informal rules which may not easily be replaced or penetrated by formal rules.

Notwithstanding these reservations, formalisation, when necessary, should be about increasing informal groundwater suppliers' capacity to improve water quality. This is because, from the results, the only water treatment methods are filtration and chlorination. These methods may not be enough to enhance groundwater quality with time. Also, apart from the boreholes being registered, no formal measures are in place to monitor the groundwater abstraction rate. This has implications for groundwater overexploitation in the future. Thus, other formalisation efforts should aim at improving the monitoring of groundwater abstraction for sustainability.

Conclusion

The study set out to discuss the evolution and nature of informal groundwater supply and the feasibility of formalisation in some peri-urban areas of the Techiman municipality of Ghana using mainly qualitative research methods. The study highlighted that through individual efforts, informal water suppliers whose source of water is groundwater have evolved in some peri-urban areas of the Techiman municipality. Their activities are largely independent of the municipal water supply system. Water is provided in the form of in-situ services and reticulation to other users. In places such as Hansua, Brigade and James Town, they are pioneer water providers while in areas such as Abosso and Fante New Town, they are gap fillers. However, though their transactions and organisation are largely informal, the boreholes have been registered, a form of formalisation. Thus, attempts at further formalisation should focus on improving water quality for consumption and regulating groundwater abstraction to avoid over exploitation.

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