

INSIGHTS INTO SMALL SCALE COMMERCIAL WATER SERVICES IN NIGERIAN URBAN AREA

Abdul-Wahab Shuaibu^{a*}, Mohammad Rafee Majid^a, Hussaini Bapetel Aliyu^b

^aDepartment of Urban and Regional Planning, Faculty of Built Environment, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia

^bDepartment of Urban and Regional Planning, School of Environmental Science, Modibbo Adama University of Technology, P.M.B 2076 Yola, Nigeria

Article history

Received

15 April 2015

Received in revised form

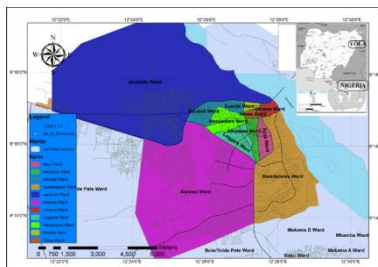
29 September 2015

Accepted

12 November 2015

*Corresponding author
sabdulwahab2@live.utm.my

Graphical abstract



Abstract

This paper reviewed the operation of the Small Scale Commercial Water Providers (SSCWP) in Yola, the capital of Adamawa state, North Central Nigeria. It provide an insight into their contributions, pattern of expenditure on commercial water supply, their operational constraints and possible solutions; and implications of all these issues for sustainable urban development. The methodology employed a household survey and a survey covering the operations of the SSCWP as well as government officials. Results obtained show that 65% of households in Yola presently rely on SSCWP as a coping strategy. The study recommends regulatory oversight to be created through legislation geared towards a water policy that will improve access to portable water base on an all-inclusive approach. This will lead to improvement in public health.

Keywords: Small-scale, commercial water providers, coping alternative, water affordability index, yola-nigeria

© 2015 Penerbit UTM Press. All rights reserved

1.0 INTRODUCTION

Water is one of the necessities of life. The supply of clean water is necessary for human life and health, yet close to one billion people lack access to safe water supply [1]. Causes of water supply problems in urban areas of the developing countries have been highlighted by several authors as an interplay of several interrelated factors, this includes high rate of urban population growth [2, 3]; technical, institutional and social constraints [4, 5]; lack of investment in water supply infrastructure, inadequate resource in terms of personnel and equipment [6, 7]; difficulty in management, operations and maintenance, pricing as well as failure to recover the cost of water by utilities and above all endemic corruption and entrenched inefficiency [8, 9, 10]. Nigeria is a signatory to the United

Nation International Drinking Water Supply and Sanitation Decade whose objectives was to supply water to all citizens of the country between 1980 and 1990 [11]. It was also among the 189 countries worldwide in September 2000 at the UN General Assembly to endorse the United Nations Millennium Declaration. The Millennium Development Goals (goal 7, target 10) aim to halve by 2015 the proportion of people without access to safe drinking water and basic sanitation [12]. In spite of the considerable investment in this essential human requirement, 70 million (42%) of Nigerians still do not have access to water in adequate quantity and quality [1]. The public sector has not been successful in meeting more than a small proportion of the demand for water [13]. Their performance as measured by coverage, number of days of supply and duration of supply to consumers is inadequate and

therefore the demand left unsatisfied is met by Small Scale Commercial Water Providers (SSCWP) [14,1516].

This paper reports a survey undertaken in Yola to look into the operation of the small scale commercial water providers and the cost incurred in the purchase of water by households. The survey was conducted to provide insight into the contributions of small scale commercial water providers, their operational constraints and the implications for urban development.

2.0 THE CASE FOR SMALL-SCALE COMMERCIAL WATER PROVIDERS

The small scale commercial water supply outfit as an emerging potential for domestic water supply is studied to provide insight into their contributions, operational constraints and the likely consequences for urban development

The Federal Government of Nigeria adopted its National Water Supply and Sanitation Policy in January 2000. The policy seeks to supply sufficient potable water and improved sanitation to all Nigerians in an affordable and sustainable way through participatory investment by the three tiers of government, the private sector and the beneficiaries. There is a lot of insincerity on the part of the political leadership which continue to flaunt Free Water Supply in Electioneering Campaigns as well as weakness in policy implementation. [17] observed that the crystallization programs of the adopted Policy (the National Urban Water Supply Sector Rehabilitation Program and the Small and Medium Settlement Water supply Program) came seven years after, and are yet to be entrenched into the system. It is therefore not clear what they would in effect amount to in due course. Similar situations have been reported in other cities of Sub-Saharan African countries [18,19].

These unfortunate situations had made households in towns and cities of Nigeria and indeed sub-Saharan Africa resort to alternative sources such as rain water harvesting [18, 20] as well as a spontaneous emergence of small-scale water service providers [14, 15, 21, 22]. Small-scale service provider is a broad term that includes intermediate and independent providers. Intermediate service providers describe services provided by those working as an extension of the water board or the independent providers, mediating between them and the end users; these are the water vendors. Independent service providers describe services provided by those working separately and in competition to the water board; these are the wells and borehole owners. [23] reported that the increased attention gained by the small scale service providers is a result of the global search for ways to improve access to potable water geared towards the achievement of the Millennium Development Goals. The main advantage of the small scale service providers is their ability to respond quickly to changes in demand, to offer services needed by low income families, to self-

finance and to recover all cost [15]. [14, 24] made a case for small scale water providers. She stressed their ability in meeting unserved niches of the water supply market. Using instances, she exhibited their viability, efficiency and flexibility.

In Yola presently, 65% of households use small-scale commercial water providers as an alternative source of water when supply from the water board is inadequate (Table 1). The SSCWP supply every day for an average of 15 hours duration except that households pay three times what they will ordinarily pay for the same service from the public outfit even if the tariff is on economic principle. A similar situation is reported in many urban centers of developing and less developed countries [16].

3.0 THE STUDY AREA

Yola is in the northeast region of Nigeria which falls within the Guinea Savanna Ecological Zone and lies between the semi-arid north and the wet southern part of Nigeria [25] (Fig 1). It is located between latitude $9^{\circ} 14'$, and longitude $12^{\circ} 38'$ east of the Green witch Meridian, with altitude of about 185.9 above the sea level, it covers an approximate landmass of 37,000 square kilometers with a population density of 45 people per square kilometer [26]. Yola is the headquarters of Yola Local Government Area; it is equally the administrative seat of the government of Adamawa state Nigeria. This dual status has been responsible for its growth in population. The population of Yola was 120,555 in 1991 and 198,314 in 2006 [27], by 2014 it is expected to be around 247,893 at 2.8% growth rate. The population growth has brought about physical development, as well as increased water demand. This increased demand coupled with the operations and maintenance problems with the Water Board has created water supply inadequacies in the town. This circumstance has lead households resorting to a variety of alternative sources.

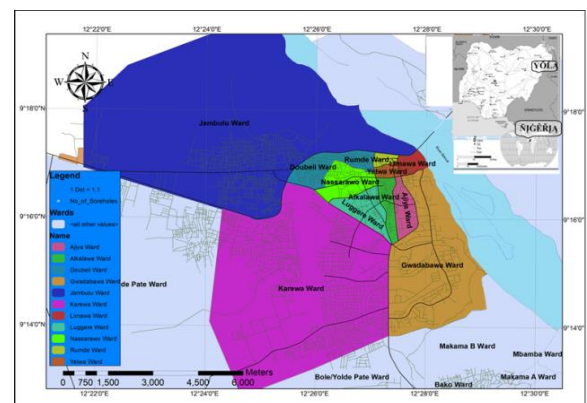


Figure 1 Map of Nigeria showing the Study Area (Generated through ArcGIS 10.0)

Yola has a public water supply system that is based on both surface and ground water. The Yola treatment

plant which is the main source, supported by forty two submersible bore holes scattered all over the wards. The installed capacity of the Yola treatment plant is 28,800 cubic meters per day (28.8 million liters). But due to operational problems, the daily production capacity is now 7,200 cubic meters (7.2 million liters) per day. The combined daily production of the forty two (42) boreholes is 3,024,000 liters per day; put together the total daily production is 10,224,000 liters. At present the actual supply is not known, this is attributed to the unavailability of pressure gauges and production meters; hence the inability of production personnel to keep production logs [28]. When 40% system losses are subtracted and another 10% goes to industrial, institutional and commercial uses the supply is estimated be 5,112,000 liters [29]. Based on an estimated population of 275,939 (projections from the 2006 census figure), the average daily water supply from the system will at best meet only about one fourth ($1/4$) of the demand for domestic consumption, assuming an average of 80 liters per person per day.

4.0 MATERIAL AND METHOD

Data for this study were collected through field survey involving a household survey and a survey covering the operations of the small scale commercial water providers (SSCWP) as well as government officials. A questionnaire addressed to the household heads was employed to solicit the information required. The questionnaire contained questions on the water supply status, alternative sources of water and expenditure on water supply. [30] reported that, there are about 21,370 households in Yola by 1999. Projected for 2011 at 3% annual growth rate the number of households becomes 30,469. That represents the population of households. Three hundred and eighty (380) households were the sample at the 5 percent level of significance [31]. Interestingly, Yola has been stratified into wards; these wards were taken as strata. The sample was drawn in proportion to the number of households in each stratum. The survey which covered the operations of the Small Scale Commercial Water Providers (SSCWP) was based on primary data obtained from the field. The SSCWP comprise of the commercial boreholes operators (CBO) as the source of water on the one hand, and the pushcart vendors (PCV) and water tank vendors (WTV) as distributors of the water. A total of 342 respondents participated in this aspect of the study. There were 300 PCV, 32 CBO and 10 WTV. For the operational constraints of SSCWP respondents rated on a 5 point Likert scale their degree of agreement or otherwise with given statements concerning the operational problems and possible solutions. State Ministry of Water Resources (MWR) being the principal regulator was exposed to the same statements to show their level of agreement or disagreement, both were as well given the opportunity to freely comment or give further suggestions on the issues raised. The ministry is composed of four units, Head-quarters (HQ), Water Board (WB), Rural Water Supply and Sanitation Agency

(RUWATSSAN) and Small Towns Water Supply and Sanitation Program (STWSSP). Four Directors out of six in the HQ, four Assistant General Manager out of six in the WB, three Directors out of five in RUWATSSAN and three principal officers out of five in STWS were involved in the study. These samples formed the basic unit of analysis on the household survey and the operations of the Small Scale Commercial Water Providers.

Percentage of households using a commercial outfit as an alternative, average supply days in a month, and duration of supply in a day were used as indicators. This is because the SSCWP in the study area does not have a pipe network distribution system and the fact that households in developing countries must not necessarily have a connection to access domestic water [32, 33, 34]. This is to indicate the contribution of SSCWP to domestic water supply. The SSCWP were asked their source of finance for the business, average number of tanks/push cart sold a day, the cost of a tank/push cart, whether they belong to an association or not, whether they are into savings club or not, as well as their operational problems and possible solutions. Several studies [35, 36, 37, 38] have revealed that these issues need to be understood.

5.0 RESULTS AND DISCUSSION

5.1 Operations of the Small-Scale Commercial Water Providers

The commercial water supply outfit is essentially the digging of submersible bore holes by entrepreneurs for the sale of water either through vendors or direct sale to the consumer. There are ninety seven such outfits in Yola by 2011 that are registered with the National Agency for Food and Drug Administration and Control (NAFDAC). The registered outfits are better organized as a requirement for registration and therefore the portability of water produce is assured. The same cannot be said for the unregistered and there are many. Apart from domestic and commercial water supply, the SSCWP are also engaging in the production of table water. With an average of 2 liters per second production capacity for ten hour operation, the total combined mean daily production of these outfits is 4,608,000 liters per day. The push cart and water tank vendors distribute an estimated 1,985,520 liters, while the remaining 2,614,480 liters is shared between direct purchase by households and the production of table water.

5.1.1 Business Ownership and Finance

In terms of the ownership of business, 100% of the Water Tank Vendors and 90.3% of Pushcart Vendors do not own their business but operate on hire basis, while 9.7% of the PCV own their carts. As for Commercial Borehole operators, 100% own their businesses. With regards to the source of business finance 93.7% of CBO set up the business through personal savings and only 6.3% loans.

5.1.2 Membership of Business Associations

In relation to membership of business association, 100% of the CBO and WTV as well as 95.7% PCV do not belong to any business association, only 4.3% of the pushcart vendors belong to an association. Asked whether or not they belong to any savings club, 60% of the WTV said YES, while 40% said NO. For the PCV 88.3% do not belong to any saving club while 11.7% do. A hundred percent of the CBO do not belong any savings club.

5.2 SSCWP as a Coping Alternative

Households were asked to indicate alternative sources of water they use to cope with the insufficient water supply from the Water Board. Seasonal variations between wet and dry seasons have not been captured because the data collected was during the dry season. Therefore, contributions of sources like stream and rain harvesting which are associated with weather conditions have not been captured. Households utilize a variety of sources; the percentage usage of each source across wards is as summarized in Table 1.

Table 1 Alternative Water Supply Sources

	Water Sources								
	Private Well	Public Well	Private Borehole	Public Borehole	River	Public Standpipe	Commercial Borehole	Push Cart Vendor	Water Tank Vendor
Wards	Percentage								
Ajiya	5.6	11.1	20.0	8.1	0.00	20.0	5.7	3.9	44.4
Alkalawa	16.7	44.4	0.0	0.0	0.00	0.0	3.4	9.9	11.1
Demsawo	9.3	0.0	0.0	0.0	0.00	0.0	6.8	13.2	0.0
Doubeli	7.4	13.0	6.7	10.8	0.00	20.0	9.0	7.9	0.0
Gwadabawa	1.9	11.1	6.7	0.0	0.00	0.0	5.7	11.2	0.0
Karewa	29.6	33.3	4.0	29.7	0.00	0.0	7.95	11.8	33.3
Limawa	7.4	0.0	0.0	2.7	0.00	0.0	5.7	3.3	0.0
Luggere	3.7	33.3	6.7	10.8	0.00	0.0	4.5	19.1	11.1
Nasarawo	11.1	11.1	13.3	21.6	0.00	0.0	20.5	6.6	0.0
Rumde	7.4	22.2	6.7	16.2	0.00	20.0	14.8	3.9	0.0
Yelwa	0.0	11.1	0.0	0.0	0.00	40.0	15.9	9.2	0.0
Total	14.3	4.8	3.9	9.8	0.00	1.3	23.3	40.2	2.4
Percentage of Household using SSCWP as an alternative							(23.3+40.2+2.4)=65.9		

The table shows that households utilize different sources, that is; private wells, public well, neighbours well, private boreholes, public boreholes, commercial boreholes, public standpipe, push cart and water tank vendors. A combination of commercial boreholes, push cart and water tank vendors reveals that 65% of the households in Yola use the commercial outfit as an alternative to the public water supply system. The result in the table, while showing variations in proportion of households purchasing water from the commercial outfit; show high usage rate of these alternative sources. This is indicative of the uniformity of water supply situation across the town. Purchase of water from vendors was the most frequently cited sources, although there are differences between the wards, it cuts across all the wards. This is attributed to the door step delivery system they operate as well as regularity of service. Despite the weather (dry season) domestic use of water from the River was at zero. The aggregate usage of wells is 19.1% not very large a percentage, but this alternative just like the push cart vendors cut across all the wards as can be seen from the table 1. However, while well water provides a source of relief from the inadequacies of the public water supply system, at shallow depths it constitutes a potential health hazard [39].

5.3 Expenditure on Small-Scale Commercial Water Providers

The ratio of the water bill of a household to its disposable income describes the size of the part of the household budget used for water; it is called the "affordability index" of the household. If the index is high, water is said to be too expensive, too costly or even an affordable [40]. In Africa, the affordability indexes of between 9-20% have been observed in neighborhoods with water supplied by SSCWP [41, 42].

The commercial outfit in Yola does not have a network system of water distribution; as such households are not billed directly. They have lined up taps where individuals and push cart vendor fetch water from; billing is therefore based on service offered. There is a predetermined amount of money per volume of water supplied. Purchase of water directly from the source and purchase from vendors cost differently. A push cart of 200 liters of water cost USD 0.38 from the source and \$ 0.76 from vendors. While a water tanker of 10,000 liters cost an average of USD 18.75 but will vary depending on distance.

To have an idea of household income spent on coping for domestic water supply, households were asked to indicate the amount of money spent on the

purchase of water from commercial outfit. The responses are as presented in Table 2.

Table 2 Pattern of Expenditure on Water Purchase

Wards	Categories of Daily Expenditure					Mean Daily Expenditure
	USD 0.38	USD 0.76	USD 1.14	USD 1.53	USD 1.91	
	200 liters	400 liters	600 liters	800 liters	1000 liters	
	Number of Households Involve					
Ajiya	0	16	9	0	0	\$0.90
Alkalawa	1	15	11	3	1	\$1.00
Demsawo	0	8	13	8	1	\$1.17
Doubeli	0	18	11	0	0	\$0.91
Gwdabawa	0	5	14	3	0	\$1.11
Karewa	0	24	20	3	1	\$1.00
Limawa	3	6	5	0	0	\$0.82
Luggere	0	20	16	5	2	\$1.05
Nasarawo	1	17	23	1	0	\$1.00
Rumde	0	15	13	1	0	\$1.00
Yelwa	0	18	13	0	0	\$0.92
Total	5	182	148	24	5	
Percentage	1.37	50	40.67	6.59	1.37	
Mean						USD 1.00

It can be seen that there is no wide variation in the mean values for the purchase. This again, is indicative of the homogeneity of the water supply situation across all the wards, as shown earlier by the uniform proportionality of households purchasing water from the SSCWP across the wards in Table 1. These results are consistent with the findings of [14, 43] that the patronage for SSCWP cuts across income and class as well as location in the city Table 2.

It can be seen from Table 2 that greater than 90% of households in Yola spends between USD 0.76 and USD 1.14 daily on water purchase. This translates to spending USD 22.88 to USD 34.20 monthly, on water alone. This means that an average of 18.9 percentages (Table 3) of household's monthly income is spent on the purchase of water; this scenario is equally captured in other studies [41, 16]. This is better appreciated when mean monthly expenditure on domestic water across income groups is looked at, Table 3.

Table 3 Percentage Income Spent on Water Purchase across Income Groups

Income Range (USD)	Percentage In Sample Population	Mean Daily Expenditure (USD)	Mean Monthly Expenditure (USD)	Percentage Income Spent
< 113	27.6	0.90	27	20.3
113-137	39.4	1.00	30	24.0
144-169	15.8	1.03	30.9	19.7
175-200	5.6	1.41	34.2	18.2
206-231	4.2	1.33	39.9	18.3
>231	7.4	1.00	30	12.9
Average			USD 32	18.9

Table 3 shows the income ranges of household Heads in neighbourhoods of Yola. Bearing in mind the obvious limitation of assessing people's income from survey of this nature, in view of the lack of reliability of information given; it has shown that while there is variation across the neighbourhoods in the percentage income spent on domestic water purchase, the affordability index of those earning lower wages is higher. 27.6%, of the respondents earn less than USD 113 which is the minimum wage of civil servants as ordained by the government of Nigeria. This shows that these respondents are retired civil servants, menials, petty traders, or subsistence farmers. The second category which is the largest with 39.4%, earns between 113 and 137 and has the highest affordability index, 24% of its disposable income is spent on domestic water purchase. This group comprises of the lower level civil servants and businessmen. 25.6% earn between USD144 and USD 231. These are the middle level civil servants and businessmen staying in middle income residential areas. Their affordability index is lower than the first two categories. While the last category of 7.4% represents the higher level civil servants or businessmen occupying low density residential accommodation. The affordability index is the lowest at 12.9% of disposable income. The affordability index seems to be declining as the income grows. This is because the water supply regime of the Water Board is unfortunately based on social stratification. The water supply situation improves as you move from high density to low density residential accommodation. So, those with less supply patronize SSCWP the more.

5.4 Operational Constraints of Small-Scale Commercial Water Providers

Figures 2 and 3 have been collated from responses to a questionnaire in which problem areas identified with the operations of the small scale water providers in a number of studies have been compiled. Possible solutions were listed for respondents to indicate their level of agreement or otherwise with issues raised on a 5 point Likert scale. These problems have to do with issues of official recognition of the SSCWP and their contribution, access to finance from both the public and private sources and the issue of regulation from multiple and sometimes conflicting outfits [15, 44, 21, 45-46, 23, 16]. The Ministry of Water Resources does not agree that SSCWP are not recognized since the CBO are required to register with the National Food and Drug Administration and control (NAFDAC) an agency responsible for ensuring the wholesomeness of especially those engage with the production of bottles and sachet water. But the CBO, PCV and WTV do not feel that is enough recognition as it does go beyond tax collection. In respect of the issues of access to finance and the regulatory environment, there is a consensus of opinion that a lot needs to be done to improve the situation. The Ministry of Water Resources is of the opinion that the SSCWP may not be credit worthy from the commercial banks' point of

view because of the small scale nature of its operations. This position is opposed by the SSCWP who feel the MWR is antagonistic to its growth and expansion to avoid competition.

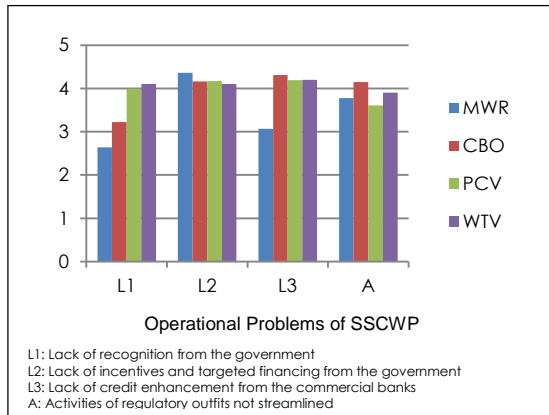


Figure 2 Findings Regarding the Operational Constraints of Small Scale Commercial Water Providers

On the other hand, there is a unanimous agreement by all the respondents that the first step towards solving the operational constraints of SSCWP is by officially recognizing their role and contribution towards access to domestic water supply. The respondents agree with the need for the federal government in line with its National Water Supply and Sanitation Policy (2000) which endorses private sector participation and commercialization of water supply [47], to create the enabling environment for accessing funds as is obtainable with other fundamental requirements for living such as housing. Respondents are equally of the opinion that, Multinational organizations such as the European Union engage in co-funding water supply projects at the local government/community level can extend such gesture to SSCWP. With respect to the need for a regulatory framework for SSCWPs' oversight, all the respondents agree with that except CBO which feels it is going to be a way of exercising excessive control over them.

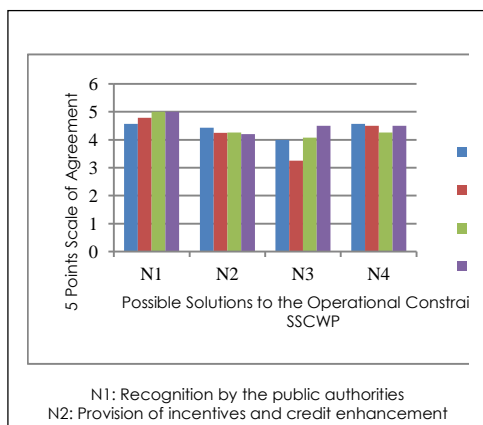


Figure 3 Findings Regarding Possible Solutions to the Operational Constraints of Small Scale Commercial Water Providers

But CBO fails to realize that is the way to streamline the multiplicity of regulatory outfits as is obtainable now. What has been revealed in this study strongly alludes to the typical situation portrayed in cities in developing countries, more than half the population gets basic water services from suppliers other than the incumbent official utility [48, 14-15, 49-50]. Private entrepreneurs owned or manage water points, "kiosk," pipelines, storage tanks and fillers. These suppliers make up the fastest growing category of water providers in Dhaka, Bangladesh; cover more than half of Nairobi, Kenya; and supplies a third of families in Addis Ababa, Ethiopia [51]. In Nigeria, like in other African countries; the use of small-scale services has resulted from necessity rather than deliberate policy. These experiences include intermediate and independent providers and domestic resellers. Private investors have provided boreholes and pumps, vending kiosk, and even some individual connections. Water vendors are present in virtually every Nigerian town [9]. The small-scale outfit which cannot be compared with the public outfit in terms of infrastructure, efficient service delivery has made greater than 68% of households in Yola to rely on it. The amount paid for the services of Small Scale Water Providers is high because they provide 'public service' without any subsidy. They deserve the recognition and support of National, State and local authorities.

5.5 Urban Development Implications of the Findings

As a vital service required universally for direct human consumption and as an input in the various production process in the urban economy, water supply is central to urban development [9-10]. [52] envisaged that encouraging Small Scale Water Service provision will improve access to save domestic water. This, it says will imply less burden on people in terms of water collection, reduce burden on water related diseases, create new investment opportunities, enhance productivity and reduce poverty by creating job opportunities as well as reducing the amount spent on procuring water. On these premises, the scenario as represented by the situation in Yola has important implications in these respects.

5.5.1 Increase Access to Portable Water Leading to Improvement in Public Health

The regularity of supply as well as the door step delivery system operated by the Small-Scaled Commercial Water Service Providers is a measure of the reduce burden on households in terms of time spent on water collection. It is revealed that 65% of households in Yola use the commercial outfit as an alternative to public water supply. This implies that without the commercial outfit, the usage of wells and other unsecured sources would have been very high; this could have had grave consequences of Yola urban development in terms of public health as it

could have contributed to the prevalence of water borne diseases. It needs to be stated here that in Yola, the Water Board as a policy does not engage the SSCWP in its operations; as such they rely on commercial boreholes for their source of water. Boreholes are protected source of water.

5.5.2 Investment and Employment Opportunities

The operational infrastructure of the small-scale water providers provides an investment opportunity which has a multiplier effect on the urban economy. The number of commercial submersible boreholes rose from 5 boreholes in 2000 to 64 in 2005 [54]. Field survey has shown that there are 96 commercial boreholes now. There are also twenty commercial water tanks and about 2000 push carts. At an estimated USD 2000 per borehole and USD 13,000 per tanker, the total worth of the small-scale water providers is estimated to be close to half a million US dollars. In terms of employment, it generates employment to at least 2000 daily especially during the dry season, as compared to the total number of 198 Yola Water Board staff. This job opportunity created will lead to poverty reduction.

6.0 CONCLUSION

In this paper, a case has been made for the need to recognize small scale commercial water providers given the increasing reliance of households on that outfit for their domestic water supply. The inefficiency of the public water supply through the water utilities in Nigeria has made households in towns and cities resort to alternative sources. This has led to the spontaneous emergence of small scale commercial water service providers. The main advantage of the SSCWP is; they are demand driven as against the public water supply which is supply driven; they can respond to changes in demand; they offer services needed by low income families; they are self-financed and recover their cost. However, the SSCWP are challenged by lack of official recognition of their contribution, access to finance and over bearing taxation. As a result households pay three times what they will ordinarily pay to public outfits even if government water subsidies were eliminated. Moreover, the low income earners are the worst hit as they have the highest water affordability index.

There is a need for legislation by the state legislature in consonance with the right to water as well as the NWSSP 2000 that will recognize and regularize small scale commercial water service provision. This will serve as a basis on which a regulatory framework for SSCWP oversight will be created. As has been reported earlier on, more than 90% of commercial borehole owners financed their business through personal savings and greater than 90% of the Pushcart and Water tank Vendors do not own their businesses but operate on hire basis.

Creating the enabling environment in which the SSCWP will enjoy incentives and access some form of credit facility will go a long way in reducing the cost of doing business thereby reducing the cost of water especially to lower income earners. This will set the stage for an improved water supply system which has concomitant urban development benefit.

References

- [1] WHO and UNICEF 2012. *Progress on Drinking Water and Sanitation*, WHO Press, Geneva, Switzerland.
- [2] Niemezynowicz, J. 1999. Urban hydrology and water management – present and future challenges. *Urban Water*. 1: 1–14.
- [3] Ramakrishna, N. 2009. Private Sector Participation in the Provision of Urban Water Supply: Examining the Options and Scope in Mumbai. *The IUP Journal of Infrastructure*. 7(2).
- [4] Dawoud, M. A., and Raouf, A. R. A. 2008. Groundwater Exploration and Assessment in Rural Communities of Yobe State, Northern Nigeria. *Water Resources Management*, 23(3), 581–601. <http://doi.org/10.1007/s11269-008-9289-x>.
- [5] Van Rooijen, D. J., Turrall, H., & Biggs, T. W. (2009). Urban and industrial water use in the Krishna Basin, India. *Irrigation and Drainage*. 58(4), 406–428.
- [6] Emoabino, I.U. and Alayande, A.W. 2007. Water demand management, problems and prospects of implementation in Nigeria. *Paper presented at the International Congress River Basin Development*, 22 – 24 March, Antalya, Republic of Turkey. II: 154 – 159.
- [7] Aladenola, O.O. and Adeboye, O.B. 2010. Assessing the Potential for Rainwater Harvesting. *Water Resour Manage*. 24: 2129–2137.
- [8] Montgomery, M.A. and Elimelech, M. 2007. Water and sanitation in developing countries: Including health in the equation, *Environmental Science & Technology*. 1: 12–24.
- [9] WSSISN 2000. *Federal Republic of Nigeria: Water Supply and Sanitation Interim Strategy Note*. Iii: 3, 4, 6&14.
- [10] Ma'aruf, S. 2005. Prospects and Urban Development Implications of Commercialization in Water Supply: Case Study of Zaria; *Doctoral Research Seminar, ABU Zaria*. June 2003. 1–40. Federal Republic of Nigeria 2004.
- [11] Federal Ministry of Water Resources. 2004. Draft Final National Water Sanitation Policy November.
- [12] Federal Republic of Nigeria 2000. Nigeria: Millennium Development Goals (MDGs), Count Down Strategy 2010–2015. 1–13.
- [13] WHO and UNICEF. 2008. *Progress on Drinking Water and Sanitation: 2010*, WHO Press, Geneva, Switzerland.
- [14] Solo, T. M. 1999. Small-Scale Entrepreneurs in Urban Water and Sanitation Market, *Environment and Urbanization*. 11(1): 117–132.
- [15] Collington, B. and Vezina, M. 2000. Independent Water and Sanitation Providers in African cities. *Full Report of a Ten-Country Study*. Water and Sanitation Program. The World Bank.
- [16] Ayalew, M. M., Malcom, R., Okotto, L., Pedley, S., Chenoweth, J. and Mulugette, Y. 2010. The Regulatory Implications of the Right to Water: Small-Scale and Independent Water Providers in Ethiopia and Kenya. *International Journal of Sustainable Development*. 01(08): 43–63.
- [17] Ma'aruf, S. 2011. Service Sustainability under the National Policy for Water Supply and Sanitation: A prognostic Appraisal; *Second National Water Supply and Sanitation Conference*, Kaduna, Nigeria. 178–188.
- [18] Mohammed, B. I. 2009. Rain Water Harvesting for Urban Areas: A Success Story from Gadarif City in Central Sudan; *Journal of Water Resource Management*. 23: 2727–2736.

- [19] Bruggen, B.V., Borghgraef, K. and Vinckier, C. 2009. Causes of Water Supply Problems in Urbanised Regions in Developing Countries. *Water Resour Manage.* 24:1885–1902.
- [20] Ishaku, H. T., Rafee, M. M. and Foziah, J. 2012. Rain Water Harvesting: An Alternative to Safe Water Supply in Nigerian Rural Communities; *Journal of Water Resource Management.* 26: 295-305.
- [21] Kariuki, M. and Schwartz, J. 2005. Small-Scale Private Service Providers of Water Supply and Electricity: A Review of Incidence, Structure, Pricing and Operating Characteristics. *World Bank Policy Research Working Paper.* 3727: 1-38.
- [22] Olajuyigbe, A. E., Rotowa, O. O. and Adewumi, I. J. 2012. Water Vending in Nigeria- A Case Study of Festac Town, Lagos, Nigeria; *Mediterranean Journal of Social Science.* 3(1): 229-239.
- [23] Melissa, C. O., Haiou, H., Kurt, S. and Kellog, J. S. 2009. Data Gaps in Evidence-Based Research on Small Water Enterprises in Developing Countries; *Journal of Water and Health.* 07(4): 609-622.
- [24] McIntosh, A. C. 2003. *Reaching the Urban Poor in Manila: Asian Water Supplies*, Asian Development Bank. 60-65.
- [25] Uyanga, J. 1999. Nigeria, in Mamman A. B. Oyebanji, J.O. and Peters, S.W. (eds) *Nigeria, Survey of States*, Gabumo Publishing Co. Ltd Calabar. 17-28.
- [26] Tukur, A. L. 1999. *Land Forms in Adebayo, A. A. and Tukur, A.L. (eds) Adamawa State in Maps*, Paraclete Publishers Yola. 14-16.
- [27] Federal Republic of Nigeria 2010. National Population Commission, 2006 Population and Housing Census. Population Distribution by Sex, State, Local government and Senatorial District: (Priority Table Vol.III). 28. Bureau for National Statistics Abuja Nigeria. <http://www.nigerianstat.gov.ng>. Accessed 27 April 2012.
- [28] Sadiq Y.I 2004. Planning Strategies for an adequate Water Distribution Network in Jimeta-Yola. B.Tech. URP Thesis. Federal University of Technology, Yola. 13, 24 and 30.
- [29] Adamawa State Water Board (2004): December Monthly Report, Jimeta District Office, Yola. 4, 7, 10, 17.
- [30] Naphtali, G. 2000. *Problems of Water Supply in Yola Metropolis*. B.Tech. URP Thesis, Federal University of Technology, Yola.
- [31] Odekunle, M. R. 2005. *Academic Research; Developing Skills in Project Writing*, RECH Publishing House Yola. 68-91.
- [32] Altaf, M., Jamal, H., Liu, J.T., Smith, V. and Whittinton, D. 1989. *Who Connects to Public Water Systems in Developing Countries? Report, Policy Planning and Research, Infrastructure and Urban Development*. World Bank, Washington DC.
- [33] Adekalu, K. O., Osunbitan, J. A. and Ojo, O. E. 2002. Water Sources and Demand in South Western Nigeria: Implications for Water Development Planners and Scientists. *Technovation.* 22(12): 799-805.
- [34] Emmanuella, C. O. and Sabina, C. O. 2012. Water Service Provision in Owerri City, Nigeria. *Journal of Water Resource and Protection.* 4: 497-506.
- [35] Njiru, C. 2003. Improving water services: utility-small water enterprise partnerships. *Towards The Millennium Development Goals. 29th WEDC International Conference.* Abuja, Nigeria.
- [36] Solo, T. M. 2003. *Independent Water Entrepreneurs in Latin America: The Other Private Sector In Water Services*. The World Bank.
- [37] Baker, J. L. 2009. *Opportunities and Challenges for Small Scale Private Service Providers in Electricity and Water Supply: Evidence from Bangladesh, Cambodia, Kenya, and the Philippines*. The World Bank.
- [38] Ishaku, H. T., Peters, A. A., Ali, H. and Dama, F. M. 2010. The Role of Private Water Vending in Nigerian Peri-Urban Informal Settlements: Implication for Policy Makers; *J. Water Resource and Protection.* 2: 1082-1087.
- [39] WHO and UNICEF 2010. *Rapid Assessment of Drinking Water Quality in the Federal Republic of Nigeria: Country report of the pilot project implementation in 2004-2005*, WHO Press, Geneva, Switzerland.
- [40] Smets H. 2009. Access to drinking water at an affordable price in developing countries. In: El Moujabber M. (ed.), Mandi L. (ed.), Trisorio-Liuzzi G. (ed.), Martín I. (ed.), Rabi A. (ed.), Rodríguez R. (ed.). *Technological Perspectives For Rational Use Of Water Resources In The Mediterranean Region*. Bari: CIHEAM. 57-68 (Options Méditerranéennes: Série A. Séminaires Méditerranéens; n. 88).
- [41] Whittington, D., Laura, T. and Wu, X. 1991. A Study of Vending and Willingness to pay for Water in Onitsha, Nigeria; *World Development.* 19(213): 179-198.
- [42] Mcgranahan, G. and Kjellén, M. 2006. International Institute for Environment and Development (IIED) 3 Endsleigh Street, London WC1H 0DD, United Kingdom.
- [43] McGranahan, C., Njiru, M., Albu, M. S. and Mitlin, D. 2006. *How Small Water Enterprises Can Contribute to the Millennium Development Goals: Evidence from Dares Salam, Nairobi, Khartoum and Accra*. WEDC: Loughborough University. 1-47.
- [44] Mehta, M. and Virjee, K. 2003. *Financing Small Water Supply and Sanitation Service Providers. Exploring the Microfinance Option in Sub-Saharan Africa*. Nairobi, Kenya: *Water and Sanitation Program*.
- [45] Gerlach, E. 2008. Regulating water services for Nairobi's informal settlements. *Water Policy.* 10(5): 531-548.
- [46] Matsinhe, N. P., Juízo, D., Macheve, B. and dos Santos, C. 2008. Regulation of formal and informal water service providers in peri-urban areas of Maputo, Mozambique. *Physics and Chemistry of the Earth, Parts A/B/C.* 33(8): 841-849.
- [47] NWSSP 2000. *Federal Republic of Nigeria: National Water Supply and Sanitation Policy*, Federal Ministry of Water Resources. 1-23.
- [48] Solo, T.M. 1998. *Competition in Water and Sanitation, The role of Small-Scale Entrepreneurs*. The World Bank, Public for the Private Sector. 165: 1-4.
- [49] Conan, H. 2003 Scope and scale of Small Scale Independent Private Water Providers in 8 Asian Cities: Preliminary Findings, Asian Development Bank (<http://www.adb.org/Documents/Events/2003/3WWF/conan.pdf>, accessed 3 March 2009)
- [50] Ginneken, M. 2006 Small Private Sector Providers in Water Supply and Sanitation – an overview and some experiences from the World Bank and WSP.
- [51] Wegelin, M. 1999. Water Demand and the Poor: A Paper Presented at, *International Symposium on "Efficient Water Use in Urban Areas- Innovative Ways of Finding Water for Cities,"* Kobe, Japan, 2.
- [52] UNCHS 1999. *Community Development Library; Urban Indicators Tool Kit. A guide to Istanbul.* 14.
- [53] Abdul-Wahab, S. 2006. Private Sector Participation in Urban Domestic Water Provision in Yola: Contributions and Pitfalls. *A Seminar paper Presented at the Department of Urban and Regional Planning, Federal University of Technology, Yola.* 14th February.