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Factors Determining Households' Willingness To Pay For Improved Water Supply Services In Nzoia River Basin, Kenya

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Abstract: ***Willingness to pay (WTP) for a particular service is often regarded as a means of ensuring sustainability and replication of such services. This paper examines the factors determining households' WTP for improved water supply services in Nzoia River Basin, Kenya. Data was collected from 403 households through multi-stage random sampling from the three counties of Trans Nzoia, Kakamega and Busia. Analysis was done using chi-square test to establish the factors associated with WTP for improved water supply services. The results reveal that 29% of the respondents obtain water from public utilities where monthly payments are expected while the remaining 71% obtain their water from communal water points. Majority of the respondents 78% were willing to pay for improved water supply services. They were willing to pay an average of Ksh.500 (US$ 5) per month for improved water supply services. The study results further indicates that: age, gender, education, income, household history of water related illnesses, sanitation facility, monthly water tariffs, water connection charges, time spent fetching water round trip, walking distances to water source, perceived water quality, adequacy of supply from main source, water source reliability, existing sources for domestic water supply and respondents' attitudes towards water management were significant and acted as determinants to WTP for improved water supply services in Nzoia River Basin. Other factors such as marital status, household size, household composition, households receiving remittance, occupation, household location, livestock keeping, kitchen gardening, land tenure security, respondent's years of stay in the area, customer services from water utility and in-household treatment of water were statistically insignificant. The households' WTP for improved water supply services is not dependent on anyone set of factors but rather on their joint effects and on specific cultural setting. This information is vital to judicious decisions such as the choice of appropriate technology or level of service and the monthly tariffs and connection fees to be charged for private house connections. The findings of this study provide an insight for water service providers, national and county governments in Nzoia River Basin on the factors that they should consider when planning for water supply services. There is need to create an enabling policy environment for public-private partnerships in the improvement of water supply services in the basin.***

Keywords: ***Nzoia River Basin, Existing sources of water, Improved water supply services, Willingness to pay (WTP), Socio- demographic and economic factors, Sense of entitlement to government services.***

I. INTRODUCTION

The importance of clean water to human life has been emphasized through the Sustainable Development Goals 2030 which aims at ensuring availability and sustainable management of water and sanitation for all. In many developing countries of the world, access to adequate portable water remains a big problem. Even in a few regions where water is available, the quality and quantity are far from the internationally acceptable standards. The scholarly works of Hensher *et al.* (2005), Adenike and Titus (2009), Moffat et al. (2011), and Wendimu and Bekele (2011) indicate that there is a nexus between water supply and sustainable development. Water is not only important for livelihood but also for primary

healthcare which is important for poverty alleviation. International water policies and management practices have generally considered water to be a free and renewable resource. Governments in developing countries have often subsidized water supplies, typically in an attempt to achieve social and health benefits for low-income households that comprise a large majority of the rural population (Lammerink, 1998; Whittington et al., 1998).

According to WHO/UNICEF, 2017, about 844 million people globally lack access to clean water supply while 2.5 billion people have no access to adequate sanitation. It was also estimated that 319 million people are without access to improved water supply in sub-Saharan Africa. The consequence of this is that a large proportion of human beings have resorted to the use of potentially harmful sources of water. In this regard, millions of people are locked up in a cycle of poverty and disease. UNDP, 2010 observes that more than 14,000 people die each day, 11,000 of them being children under five years of age. There are more people in the world hospitals today, suffering from water-borne diseases than any other ailment. The Water Project (WP, 2015) notes that poor water and sanitation conditions cause about 80% of all diseases and more than one-third of all deaths in developing countries. UN, 2002 confirms that with adequate supplies of safe drinking water, the incidence of some illnesses and deaths could drop by as much as 75%.

Progress in improving the quality and quantity of water used by people in developing countries has been unsatisfactory in two respects; one, systems that have been built are frequently neither used correctly nor maintained properly, and two, extension of improved service has been slow. A major impediment to improved performance is inadequate information concerning the response of consumers to new service options. The behavioral assumptions that typically underlie most rural water supply planning efforts are simple. It is commonly assumed that as long as the financial requirements do not exceed 3 percent to 5 percent of income, rural consumers will choose to abandon their existing water supply in favor of the improved system. Experience has shown that this simple model of behavioral response has usually proved incorrect. 1f rural water projects are to be both sustainable and replicable, an improved planning methodology is required that includes a procedure for eliciting information regarding the value that households place on different levels of service. A key concept in such an improved planning methodology is that of "willingness to pay." 1f people are willing to pay for a particular service that is a dear indication that the service is valued (and therefore will most likely be used and maintained) and that it is possible to generate the funds required to sustain and replicate the project.

A lot of studies have been carried out on willingness to pay for improved water services. World Bank, (1993), investigated the determinants of house- hold demand for water supply in some countries in Africa, Latin America and South Asia using the revealed and stated preference approaches. Contrary to expectations WTP for water supply did not depend on income since it was statistically insignificant but had the expected sign. Other factors that had positive impact on WTP were education, occupation, household size, perceived quality of water and gender. The researchers concluded that households' WTP for water system is not dependent on anyone set of factors but rather on their joint effects and on specific cultural setting. Ahmad, Haq and Mustafa, (2008), analyzed household's willingness to pay for improved water service in Abbottabad district, Pakistan. Systematic random sampling technique was used in selecting 2,779 respondents through a well structure questionnaire. While the study discovered that household members are willing to pay for improved water services, the study concluded that location, sources of water, tap water, level of education, reliability of water services and quality have significant effect on households' WTP for improved water services in Abbottabad district.

Noor and Siddiqi (2009) adopted the contingent valuation method and the tobit econometric model to estimate the WTP for drinking water quality in Wasa, Lahore and established that household's WTP is influenced by coping costs that households pay for ensuring quality of water and the education level of household heads. Jordan and Elnagheeb (1993) using the weighted OLS and the Maximum Likelihood approaches, employed the Contingent Valuation Method to investigate WTP for drinking water quality in Georgia, USA. Their results indicate that income elasticity of WTP was approximately 0.1. Also, WTP was found to increase with the level of education while female and younger respondents were found to be WTP more than their male and older counterparts.

Olajuyigbe and Fasakin (2010) using the logistic linear regression model investigated factors that influence people's WTP for improved sustainable water supply in Southern Nigeria. The empirical results indicated that the most important determinants of water services in this area are: distance from main source to house, adequacy of supply from main source, quantity of water used per person per day, quantity of water purchased per day from vendor, average amount spent on water during dry season, main source of domestic water used by households, access to improved source of water, infestation through water-borne diseases and performance of supply from the State Water Corporation. Raje, Dhobe and Deshpande, (2002), determined the consumers' WTP for improvements in water supply system and identified factors affecting WTP. The study hypothesized that the satisfaction of consumers about water services, their belief about water management system and the affordability might influence WTP more for water. Logistic regression was used to describe the impact of various factors on WTP.

Wang et al., (2008) surveyed households in five sub-urban districts in Chongqing Municipality, China and found that water tariffs significantly affect WTP for improved water services. He also found that significant increases in water prices were feasible as long as the poorest households were properly subsidized and certain public awareness and accountability campaigns conducted to make the price increase more acceptable to public. Mezgebo and Ewnetu, 2015, examined households' willingness to pay for improved water services in urban areas in Nebelet town, Ethiopia. The study sampled 181 households through random sampling. The study used probit model to identify socio-economic factors that affect the willingness to pay (WTP) of households. The study discovered that inhabitants of Nebelet town are willing to pay for improved water supply service if it is provided at an

affordable price. The study revealed that income, distance, water expense, bid, education, level of existing water satisfaction, marital status and sex were associated with households' willingness to pay for the provision of improved water services.

Bah, (1997) employed the contingent valuation method to estimate the WTP for potable water services in Freetown, Sierra Leone. His results showed that gender, educational level, income, number of years in residence, expenditure on water and respondents' attitudes towards water management have significant influence on WTP. Aguilar and Sterner (1995) investigated WTP for potable water services in three different areas - Guanacaste and Limon in Costa Rica and MuangXiathani in Laos. Their result indicated that WTP is positively influenced by income and age and negatively by household size. In Limon, women were willing to pay more than men but the reverse was the case in MuagXiathani. On average, inhabitants are willing to pay 80%, 40% and 71% over the current fees in order to receive potable water services in Guanacaste, Limon and MuagXiathani respectively.

Adjei, (1999) used contingent valuation method to determine factors influencing the demand for water in the Greater Accra Region of Ghana. Willingness to pay was positively related to income, education, time spent in collecting water and distance from home to existing water source and negatively related to the perception of water quality. Also, people were willing to pay for potable water supply but what they were willing to pay was lower than the cost of production. Boadu, (1992) examined the relationship between WTP for water and selected socioeconomic characteristics using data from selected villages in Ghana and obtained a positive relationship between household history of water related illness and the WTP for water services. The other socioeconomic factors' effect did not follow any consistent pattern and therefore broad generalisations were not possible.

Fissha, (2006) employed the contingent valuation method to estimate the determinants of households demand for potable water in Addis Ababa, Ethiopia, using the tobit and probit models and established that income, education level, age, sanitation facility, perceived water quality and water related diseases have a significantly positive impact on WTP. Pour and Kalashami (2012) carried out a study in Iran and found that WTP for improved service was higher in urban than rural areas. Income had a positive relationship with WTP. Reduced water pressure and quantity were the major reasons for dissatisfaction and use of alternative sources.

Calkins and Vezina, (2002) estimated the WTP for potable drinking water in semi-urban area of Douentza, Mali using the linear regression and logit econometric models. Their results revealed that wealth, relative distance to proposed new sources compared with the best existing sources, land tenure security and family size are major determinants of WTP for potable water. Coster and Otufale, 2004, assessed households' water-use demand and willingness to pay for improved water services in Ogun State, Nigeria. The study discovered that marital status, education, connection charges, household size and income are the correlates of willingness to pay for improved water services in the study area.

Appau-Danso, (2004) used the logit model to estimate the WTP for potable water supply in the Asante Akim South District in Ghana and established that income, age, household size, level of education, distance from the respondent's homesteads to the existing source, time spent in fetching water and occupation have positive relationship with WTP but income and level of education were not statistically significant at 10% level. Mugabi et al. (2010) investigated the determinants of customers' decision to pay utility water bills promptly in Uganda. The findings from this study revealed that customer attitude towards prompt payment, perceived ease or difficulty of paying on time (perceived control), as well as social pressure, strongly influence intentions to pay, which in turn directly affects actual prompt bill payment behavior. The study further showed that attitudes towards prompt payment are informed by perceptions of benefits and sacrifices associated with the behavior.

In Nzoia River Basin, very few studies have been carried out to measure willingness to pay (WTP) for improved water supply services and especially, the assessment of factors determining willingness to pay. It is important that we understand the drivers of household payment for improved water supply services to ensure continuous flow of income to sustain the services; and it's against this background that the present study seeks to examine the factors determining willingness to pay (WTP) for improved water supply services in Nzoia River Basin, Kenya.

II. MATERIALS AND METHODS

The research methodology comprised of both field work and data analysis. Preliminary work conducted involved the review of literature and development of data collection techniques and instruments before the commencement of field work. Reconnaissance survey preceded field data collection which involved discussions with the respective stakeholders in the study area.

A. DESCRIPTION OF STUDY AREA

Nzoia River Basin is located in Kenya along the border with Uganda. It lies between latitudes $1^0\,30'$ N and $0^0\,05'$ S and longitudes 34^0 E and $35^0\,45'$ E and has an area of 12,959 km^2 with a river length of 334 km up to its outfall into Lake Victoria. The area has a population of approximately 3.5 million people that is rising rapidly with increased water demand. Majority of the people live in rural areas. The basin covers the nine counties of Elgeyo/Marakwet, West Pokot, Trans Nzoia, Uasin Gishu and Nandi (in former Rift Valley province); Kakamega, Bungoma and Busia (in former Western province) and Siaya (in former Nyanza province). The basin is characterised by three physiographic regions namely; the highlands (characterised by Mt. Elgon and Cherangani hills); the upper plateau (which includes Eldoret and Kitale); and the lowlands (which includes Busia that experiences the majority of flooding in the basin).The dominant topography consists of rolling hills and lowlands in the Eldoret and Kitale plains. Nzoia river is one of the largest rivers in Western Kenya which drains into Lake Victoria contributing to the waters that

form the source of River Nile. The Climate of Nzoia river basin is predominantly tropical humid and is characterized by day temperatures that vary from 16 °C in Cheranganyi and Mt. Elgon areas to 28 °C in the lower semi- arid plains of Bunyala. Night temperatures vary from 4 °C in the highlands to 16 °C in semi-arid lowlands. The highest rainfall ranges from 1100 – 2700 mm annually. Lowest rainfall ranges from 600 – 1100 mm annually.

Agriculture is the dominant land use in the region with the main food crops grown as maize, sorghum, millet, bananas, groundnuts, beans, potatoes, and cassava while the cash crops include coffee, sugar cane, tea, wheat, rice, sunflower and horticultural crops. The inhabitants of the basin also practice dairy farming together with traditional livestock keeping. Few people have regular wage employment and remittances from family members working in other towns. Nzoia river and its many tributaries provide water for domestic use, agriculture, industrial and commercial sectors (WRMA, 2012) in the region. The upper Nzoia River Basin has soils that are described as light clay with good drainage and good moisture capacity and are characterized with high fertility. Nzoia River Basin has the soil type textures forming: clay (77%), loamy (9%) and sandy (14%). In the basin, the Ferralsol form well drained soils found mostly on level to undulating land. The Acrisols in the basin form clay-rich soils associated with humid tropical climates and supports forestry; whereas Nitisols compose deep well drained red tropical soils found mostly in the highlands occupying more than 75% of the catchment.

Groundwater is the main domestic water resource, supplying 78.8% of the residents leaving 21.2% for surface water resources. Many of the large piped schemes supplying the towns and rural areas have their intakes built on Nzoia river and its tributaries. On the existing sources of domestic water supply, 62 % of the residents of Nzoia River Basin use improved water sources. Out of these, 3 % use piped water into dwellings, 7 % water piped into compound, yard or plot, 3 % public tap/standpipe, 6% tube well or borehole, 11% protected dug well, 31% protected spring and 1% rainwater collection. Those using non-improved sources are 38%. Out of these, 10 % use unprotected dug well, 19 % unprotected spring, 1% tanker truck/cart with small tank, 8 % surface water (river, dam, lake, pond, stream, canal, irrigation channel) and 0 % bottled water.

The point water sources provide only modest amounts of water, and individuals often have to wait for some time to draw water, especially in the dry season. The population of Nzoia River Basin expresses strong preferences for safe clean drinking water and sometimes will walk considerable distances past alternative sources to collect drinking water from sources that are considered safe. Water for drinking and cooking is usually collected by women and children and carried home in relatively standard-size 20 liters jerricans for adults and 5-10 liters jerricans for children. Although children under 5 years old are usually bathed at home in basins, adults and older children in some villages still have a strong preference for bathing in rivers.

Nzoia River Basin was chosen for this study because it has been experiencing problems with domestic water supply. It has areas that are relatively well-off in terms of water supply (water-abundant areas), and those that are dry and poorly endowed with water supply. Most of the count governments in Nzoia River Basin have improvement of domestic water supply as a top agenda on their development priority lists. This study will provide an insight for policy makers, water service providers, national and county governments in Nzoia River Basin on the factors that they should consider when planning for improved water supply services.

B. DATA COLLECTION AND SAMPLING TECHNIQUE

Rift valley and western Kenya regions generally experience drinking water supply problems, hence, Nzoia River Basin was purposively selected for this study as it cover parts of both Rift valley and Western Kenya. Elgeyo/Marakwet, West Pokot, Trans Nzoia, Uasin Gishu and Nandi (in former Rift Valley province); Kakamega, Bungoma and Busia (in former Western province) and Siaya (in former Nyanza province) are some of the many counties that experience problems with access to adequate and reliable safe drinking water supplies. Assessing the factors determining willingness to pay for improved water supply services in the basin will provide valuable insights for policy makers, water service providers and national and county governments on the factors that they should consider when planning for improved water supply services.

The survey was carried out from May, 2017 to September, 2017 and the study adopted survey research design. Multi-stage random sampling techniques were employed for the study. The first stage involved stratification of Nzoia River Basin area into nine counties delineated by the national Independent Electoral Boundaries Commission (IEBC). The second stage followed with random selection of representative counties from the existing counties forming Nzoia River Basin. Pilot survey revealed that there were 9 and 3 were selected randomly. The counties randomly selected were Trans Nzoia (upper basin catchment), Kakamega (middle basin catchment) and Busia (lower basin catchment). The pilot survey (or pre-test) was used to identify errors and omissions, and to familiarize the research assistants with the process and tools. The pre-test survey was conducted in the neighbouring Siaya county. The third stage involved the identification of sub-counties in the selected counties to be sampled. The fourth stage was the selection of wards to be sampled under each sub-county. The households interviewed under each ward were selected through multi-stage random sampling. This sampling technique was deemed ideal as it gave the targeted population equal chances of being represented. 403 household questionnaires were proportionately divided amongst Trans Nzoia, Kakamega and Busia based on the number of households under each county. The unit of analysis in the study was the household. The household head was the targeted respondent and where he was absent any other adult member of the household was interviewed personally.

Key informant interview method was used for more in-depth data collection from community members, and in particular, institutional representatives, who had diverse experiences on factors determining willingness to pay for improved water supply services. The aim was to get information that would not easily be obtained from the other

data collection methods. The key informant interviews were conducted with selected community members based on their experience in the subject matter and experts from selected organizations. The national government, county government, parastatals, private sector and NGO officials were identified based on the work of their respective institutions in relation to willingness to pay for improved water services in the study area. A total of 51 key informant interviews were conducted with the Researcher capturing data on flip charts, note books and voice recording tapes.

Informed by the fact that some respondents get the motivation to share their views while in a group, focus group discussion (FGD) was used to get in depth knowledge about factors determining willingness to pay for improved water services in the study area. The FGD was chosen to provide more detailed interactive information as it created an environment in which the respondents freely discussed the issues at hand and were allowed to give their personal opinion regarding the issues. A total of nine FGDs were conducted with each FGD meeting having between 8-12 participants. The researcher also used observation checklists to collect additional data while in the field.

C. DATA ANALYSIS

Descriptive as well as inferential statistics were used for data analysis. Descriptive statistics were used to find the frequency, percentage whereas Chi-square test was used to find the factors determining/associated with willingness to pay for improved water supply services. Quantitative data was analyzed using the embedded methods in Statistical package for social scientists (SPSS).

D. ETHICAL CONSIDERATION

The ethical approval for this study was obtained from the National commission for science, technology and innovation (NACOSTI) with issuance of research permit requiring adherence to all conditions spelt therein .At all levels of data collection, the relevant administrative officials were contacted and permission secured. All the necessary explanations about the purpose of the study and its procedures were explained with the assurance of confidentiality for the respondents.

III. RESULTS AND DISCUSSION

The study established that 29% of the respondents obtain water from public utilities where monthly payments are expected while the remaining 71% obtain their water from communal water points. Majority of the respondents 78% were willing to pay for improved water supply services. They were willing to pay an average of Ksh.500 (US$ 5) per month for improved water supply services.

It was established further that the significant factors determining respondents' WTP for improved water supply services in Nzoia River Basin are; age, gender, education, income, household history of water related illnesses, sanitation facility, monthly water tariffs, water connection charges, time spent fetching water round trip, walking distances to water source, perceived water quality, adequacy of supply from main source, water source reliability, existing sources for domestic water supply and respondents' attitudes towards water management.

Other factors such as marital status, household size, household composition, households receiving remittance, occupation, household location, livestock keeping, kitchen gardening, land tenure security, respondent's years of stay in the area, customer services from water utility and in-household treatment of water were statistically insignificant in determining WTP.

Classification of determinants for WTP	Determinant variables for WTP for improved water supply services	p- value based on chi-square (+ Significant) (-Insignificant)	
Socio-economic and demographic characteristics of the households	**Age** (Less or equal 40 or Above 40 years)	0.450	+
	Gender (Male or Female)	0.005	+
	Marital status (Married or Others-separated, divorced, single, widow/widower)	0.169	–
	Education (Years of schooling- Less or equal 5 years or Above 5 years.)	0.003	+
	Household income (Less or equal Ksh.30,000 pm or Above Ksh.30,000 pm)	0.007	+
	Household size (Less or equal 5 persons or Above 5 persons)	0.399	–
	Household composition (Females : males – Adults : youths : babies)	0.654	–
	Households receiving remittance (Yes or No)	0.220	–
	Occupation (Civil servants- Others-private sector, students, self-employed, casual laborers)	0.638	–
	Household location (Urban or Others-Peri urban, Rural)	0.745	–
	Livestock keeping(Yes or No)	0.700	–
	Kitchen gardening (Yes or No)	0.540	–
	Household history of water related illnesses (Yes or No)	0.002	+
	Land tenure security (Owned or Others-rented, communal, government land)	0.721	–
	Sanitation facility (Yes	0.163	+

	or No)		
	Respondent's years of stay in the area (Less or equal 1 year or Above 1 year)	0.443	_
	In-household treatment of water (Yes or No)	0.338	_
Characteristics of the existing or traditional source of water versus those of the improved water supply	**Monthly water tariffs** (Less or equal Ksh.500 pm or Above Ksh.500 pm)	0.007	+
	Water connection charges (Less or equal Ksh.2,500 or Above Ksh.2,500)	0.003	+
	Time spent fetching water round trip (Equal or less than 15 minutes or More than 15 minutes)	0.001	+
	Walking distance from home to existing water source (Less or equal 500 metres or Above 500 metres)	0.008	+
	Perceived quality of water (Bad or Good)	0.006	+
	Adequacy of supply from main source (Adequate or inadequate)	0.003	+
	Water source reliability (Equal or less than 6/24 hrs or More than 6/24 hrs)	0.005	+
	Existing sources for domestic water supply (Single source or Multiple sources)	0.009	+
	Customer services from water utilities (Yes or No)	0.611	–
Households' attitudes toward government policy in the water supply sector and their sense of entitlement to government services.	**Respondents' attitudes towards water management**	0.002	+

Source: Author's survey data, 2017

Table 1: Association between WTP for improved water supply services and the selected determinant variables in Nzoia River Basin, Kenya

The households' WTP for improved water supply services is not dependent on anyone set of factors but rather on their joint effects and on specific cultural setting. This information is vital to judicious decisions such as the choice of appropriate technology or level of service and the monthly tariffs and connection fees to be charged for private house connections and other types of connections in Nzoia River Basin. As shown in Table.1, the factors jointly determining WTP for improved water supply services in Nzoia River Basin can be divided into three major categories: i). socio-economic and demographic characteristics of the households; ii). the characteristics of the existing or traditional source of water versus those of the improved water supply; and iii). the households' attitudes towards government policy in the water supply sector and their sense of entitlement to government services.

A. SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF THE HOUSEHOLDS

The socio-economic and demographic characteristics of the households in the study area that determine WTP for improved water supply services include; age, gender, marital status, education level, income, household size, household composition, households receiving remittance, occupation, household location, livestock keeping, kitchen gardening, household history of water related illnesses, land tenure security, sanitation facility, respondents' years of stay in the area and in-household treatment of water.

Age has a significant role in determining WTP for improved water supply services in the study area. The research findings here agree with the study by Mezgebo and Ewnetu (2015) showing that the respondents of age above 50 years were less WTP more for improved water services in the short term. The respondents of ages between 35 and 40 had more dependents, the family size was big, and they also earned more money, hence they had a higher WTP than the other age groups. The agreement with the study findings is further re-enforced by Jordan and Elnagheeb (1993); Appau-Danso, (2004) and Fissha, (2006) and Aguilar and Sterner (1995). Young respondents are likely to pay more for water compared to the elderly ones. *Gender* is statistically significant in determining WTP for improved water supply services in the basin. The research findings here are similar to the case study of Whittington et al. (1987) carried out in Douentza, Mali in 1987 which found that the difference in WTP for improved water supply services between male-headed household and female-headed household was statistically significant, as the female-headed households had higher WTP to that of the male-headed households. The high WTP in female-headed households could be explained by the report from the case study conducted by (Perez-Pineda 1999) in El Salvador, Central America, which stated that, "Willingness to pay for quality water service increased when the decision-makers were women, and was more likely to be sustainable if there was greater dissatisfaction with traditional water sources that involved a greater opportunity cost (the opportunity cost of the time involved in carrying water)". This is further supported by the findings of World Bank, 1993; Jordan and Elnagheeb (1993); Bah, (1997) and Briscoe and de-Ferranti (1988). To test how the gender of the respondent influenced the household's WTP for improved water services, both male and female respondents were interviewed. Because women almost universally bear the burden of collecting water, sociologists

who study household water use hypothesize that women would attach more importance to improved supplies than would men and that women would therefore be willing to pay more for such improvements. But in many cultures women do not have equal control over or access to the household's cash resources. When asked how much the household would be willing to pay for an improved water supply, a woman might be reluctant or unable to commit the household to a substantial financial obligation, even though in her opinion the improved water supply would be worth the expense. In other words, the gender of the respondent appears to be an important determinant in households' expressed WTP for improved services, but the direction of that influence depends on the specific cultural context.

Marital status was statistically insignificant in determining WTP for improved water supply services in Nzoia River Basin. This research finding is in agreement with Coster and Otufale, (2004) and Mezgebo and Ewnetu, (2015). Mezgebo and Ewnetu, (2015), found that marital status was one of the factors associated with households' willingness to pay for the provision of improved water services in urban areas in Nebelet town, Ethiopia. One would expect that married people would be WTP for improved water services as a security measure to protect families against water related illnesses but unfortunately this was not the case in the study area. *Livestock keeping, Kitchen gardening and Households receiving remittance* all showed a statistically insignificant trend in determining WTP for improved water supply services in the basin. Livestock keeping and Kitchen gardening are activities that bring income to the households and one would expect that households would be WTP for improved water services to support such activities; however this was not the case in the study area. Likewise, households receiving remittances would be expected to use such resources to pay for improved water services which would in turn improve the quality of livelihoods, but this was not the case with the study area. *Existing sources for domestic water supply* plays a significant role in determining WTP for improved water supply services in the study area. This agrees with the findings of Olajuyigbe and Fasakin (2010) and Ahmad, Haq and Mustafa, (2008). Olajuyigbe and Fasakin (2010) established main source of domestic water used by households as one of the factors influencing people's WTP for improved sustainable water supply in Southern Nigeria. If the existing sources for domestic water supply are unable to satisfy the households water needs, then, the households will be forced to pay for improved water services which satisfy their needs.

Education plays a significant role in determining WTP for improved water supply services in the study area. These findings are similar to those from other studies where the level of education had an influence on the amount of money the respondents were willing to pay (Whittington et al. (1990); Kanyoka et al. (2008); Sale et al. (2009); Kanayo et al. (2013); Mezgebo and Ewnetu (2015); Noor and Siddiqi, (2009), Ahmad, Haq and Mustafa, (2008). This was because respondents with more education and better paying jobs could not afford time to collect drinking water from sources outside their homesteads. Such respondents were willing to pay for a reliable water services instead of struggling to get water. This is further confirmed by the findings of World Bank, (1993); Jordan and Elnagheeb (1993); Bah, (1997); Adjei, (1999) and Fissha, (2006). One would expect that, as levels of education increase among household members, those households would be more aware of the health benefits of improved water supplies and would thus be more likely to use improved services if they were available. If improved water services were not available, one would expect that such households would be willing to pay more to obtain than would households with lower educational levels. And because better educated households might, for a variety of reasons, have higher opportunity costs for time spent collecting water from a source outside the house, they might well be willing to pay more for improved water services than would other households; but, Appau-Danso, (2004) using contingent valuation method and the logit model to estimate the WTP for potable water supply in the Asante Akim South District of Ghana established that income and level of education were not statistically significant at 10% level.

Income was statistically significant in determining WTP for improved water supply services in the study area. These findings are similar to those from other studies where higher incomes were found to have a positive correlation with WTP such as Arouna and Dabbert (2012); Kanayo et al. (2013); Mezgebo and Ewnetu (2015); Aguilar and Sterner (1995); Bah, (1997); Adjei, (1999); Fissha, (2006); Twerefou DK, et.al, (2015); and Fujita Y et.al, (2005). The results also confirm economic theory, which states that an individual or household demand for a particular commodity depends on his/her income. Therefore an increase in respondents' income will increase the likelihood of paying for improved water supply services. Some studies report on the probability of approving increase in water tariff when household's income is increased, eg. Bogale and Urgessa, (2012); Jiang et al., (2010); Wendimu and Bekele, (2011). Household income has a significant impact on WTP. Contrary to the findings of this study, World Bank (1993) while investigating the determinants of household demand for water supply in some countries in Africa, Latin America and South Asia found that WTP for water supply services did not depend on income since it was statistically insignificant. The study concluded that WTP for improved water services does not depend solely on income, but equally on the characteristics of both the existing and the improved supplies. Often, income is not even the principal determinant; the percentage of income that a household is willing to pay may vary widely. Household income, although often important, is not the overriding determinant of demand for improved services. This is also supported by Appau-Danso, (2004) who used contingent valuation method and the logit model to estimate the WTP for potable water supply in the Asante Akim South District of Ghana and established that income and level of education were not statistically significant at 10% level.

Household size was statistically insignificant in determining WTP for improved water supply services in the study area. The research findings here are similar to World Bank, (1993) and Aguilar and Sterner (1995). World Bank (1993) observes that household size and composition has an insignificant effect on households' WTP for or to use improved services. This is true for variables such as proportion of adult women in the family, proportion of

children in the family, age of respondent, religion, and work experience outside the community (for instance, whether a member of the household was working abroad). One would expect that when a family size is large, they would use more water and also having young children placed more demand on the use of more water and this would trigger WTP. The research findings here do not agree with Whittington et al. (1987) study in Douentza, Mali, which recognized that, the coefficient for household size was positive and significant, thus, indicating that the feeling of urgency of meeting water needs as embodied in WTP increased with the number of people in the household. This is further supported by Calkins and Vezina, (2002) and Appau-Danso, (2004) who insist that family size is a major positive determinant of WTP for potable water supply services. *Household composition* has an insignificant role in determining WTP for improved water supply services in the study area. The research findings here are similar to World Bank, (1993) which observes that household size and composition does not determine WTP. *Occupation* too is statistically insignificant in determining WTP for improved water supply services in the study area. The research findings on occupation disagrees with World Bank, (1993) and Appau-Danso, (2004). World Bank (1993), found that the effect of occupation on households' WTP for improved services was mixed. Farming families in Haiti were willing to pay less than nonfarm families for access to a public tap. In Brazil respondents employed in the formal sector were willing to pay about 15 percent more than those employed in the informal sector. In India civil servants were more likely to be connected to the water distribution system than households where no one worked for the government. In Pakistan and Nigeria the World Bank survey found no difference between farm and nonfarm households in demand for improved water services.

Household location is statistically insignificant in determining WTP for improved water supply services in the study area. The research findings here agree with Pour and Kalashami (2012) and Ahmad, Haq and Mustafa, 2008. Pour and Kalashami, (2012) carried out a study in Iran and found that WTP for improved service was higher in urban than rural areas. People living in the urban areas have better incomes than those living in the rural areas. Also, the urban areas have more educated people than the rural areas. This is what raises the WTP for improved water services in the urban areas than the rural areas. *Household history of water related diseases* plays a significant role in determining WTP for improved water supply services in the study area. The research findings here are similar to Fissha, (2006); Olajuyigbe and Fasakin (2010). Malik, A. et.al, (2012) carried out a study on WTP for water borne diseases interventions in the rural communities of Lahore, Pakistan and established that only 26% of the population were WTP for piped water supply at US3.6 per month. The same study also found that only 36% of the respondents surveyed were aware that diarrhea and malaria were water-borne diseases. Boadu, (1992) used data from selected villages in Ghana and obtained a positive relationship between household history of water related illnesses and WTP for improved water supply services. Where water borne diseases are common as a result of poor water and sanitation, people will be forced to pay for improved water supply services as a means of eradicating water borne diseases.

Land tenure security was statistically insignificant in determining WTP for improved water supply services in the study area. The research findings here do not agree with Calkins and Vezina, (2002) who estimated the WTP for potable drinking water in the semi-urban area of Douentza, Mali and found that land tenure security was one of the major determinants of WTP for potable water. One would expect that where there is land tenure security, households will struggle to install improved water supply services and ensure payment of monthly bills. *Sanitation facility* had a significant role in determining WTP for improved water supply services in the study area. This is in line with the findings of Fissha, (2006) who established that sanitation facility had a significant positive impact on WTP for improved water services in Addis Ababa, Ethiopia. Where there is water borne sanitation facilities, households will be forced to pay for improved water supply services because without water flushing toilets will not be possible. *Respondents' years of stay in the area* was statistically insignificant in determining WTP for improved water supply services in the study area. These research findings disagree with Bah, (1997) who found that number of years in residence had a significant influence on WTP for potable water services in Freetown, Sierra Leone. One would expect that when a person has stayed in an area for a long time, he will struggle to install improved water supply services and ensure payment of monthly bills. *In-household treatment of water* is statistically insignificant in determining WTP for improved water supply services in the study area. This research finding disagrees with Kamshat T., (2017) who established in rural Kazakhstan that in-household treatment of water was significant but differently correlated with the WTP among different water users. One would expect that since people with in-household water treatment facilities are receiving good quality drinking water, they may not bother connecting to the improved water supply systems.

B. THE CHARACTERISTICS OF THE EXISTING OR TRADITIONAL SOURCE OF WATER VERSUS THOSE OF THE IMPROVED WATER SUPPLY

It is the difference between what people have now and what they expect to receive that affects their demand. Households' WTP for an improved water supply services depends as much on the characteristics of existing alternatives as on the characteristics of the improved water supply; hence the need to assess the effects of; monthly water tariffs, water connection charges, time spent fetching water round trip, walking distance from home to existing water source, perceived water quality, adequacy of supply from main source, water source reliability, existing sources for domestic water supply and customer services from water utility.

Monthly water tariffs was statistically significant in determining WTP for improved water supply services in the study area. The research findings are in line with Wang et al., (2008) who surveyed five suburban districts in Chongqing municipality, China and found that water tariffs significantly affect WTP for improved water services. He also found that significant increases in water prices were feasible as long as

the poorest households were properly subsidized and certain public awareness and accountability campaigns conducted to make the price increase more acceptable to public. *Water connection charges* was also statistically significant in determining WTP for improved water supply services in the study area. The research findings are in line with Gunatilake and Tachiiri (2012) and Coster and Otufale, (2004). Gunatilake and Tachiiri (2012) carried out studies in Khulna, Bangladesh which showed that both monthly charges and connection charges significantly affect WTP for improved water services. Where monthly water tariffs and connection charges are too high, poor households will be kept off from connecting to the supply.

Time spent fetching water round trip play a significant role in determining WTP for improved water supply services in the study area. The research findings agrees with Adjei, (1999) and Appau-Danso, (2004). Palaniappan M, et.al (2010) observes that economic losses occasioned by lack of water in Africa have been placed at US$ 28 billion. RSC, (2010) adds that much of this economic loss is incurred through time lost in travelling to fetch water. In the study area, majority of the respondents have to travel some distance to obtain water and also some time is wasted queuing for the supply. This therefore constitutes constraints to accessibility in the study area. Where the time spent fetching water round trip is high, households will be forced to pay for improved water supply services in an effort to save time and invest it on other income generating activities that will improve livelihoods. *Walking distance from home to existing water source* is significant in determining WTP for improved water supply services in the study area. The research findings here are similar to Calkins and Vezina, (2002); Olajuyigbe and Fasakin (2010); Appau-Danso, (2004) and Mezgebo and Ewnetu (2015). Mezgebo and Ewnetu (2015) found that there was a positive correlation on WTP for improved water services with distance to the water source. The amount of money the respondents were WTP increased when the walking distance decreased but when the distance increased, even the amount of money they were WTP decreased. The research findings are further in agreement with other studies which observed that the opportunity cost of having a tap closer to the home or at a shorter distance was considered by the customers when paying for the water services (Whittington et al. (1990); Kanyoka et al. (2008) and Rietveld et al. (2009).

Perceived water quality plays a significant role in determining WTP for improved water supply services in the study area. The study findings here are similar to World Bank, (1993); Fissha, (2006); Noor and Siddiqi (2009) and Ahmad, Haq and Mustafa, (2008). Normal expectations are that a household would be more WTP for an improved source when the perceived quality of the existing or an alternative water source is poor. Beaumais, et.al, (2010) in a cross-country valuation study on household's WTP found that respondents who faced problems with taste in water or health concerns related to drinking water were WTP higher for better water quality. A similar finding was found for people of a district in Southern Ethiopia who were WTP 1.5 times higher than the current water charges they were facing (Behailu, Kume, and Desalegn, (2012). Contrary to the findings of this study, Adjei, (1999) in a study carried out in the Greater Accra region of Ghana found that WTP was negatively related to the perception of water quality. *Water source reliability* too was statistically significant in determining WTP for improved water supply services in the study area. The study findings agree with Ahmad, Haq and Mustafa, (2008). Reliability is crucial and households are typically WTP much more if the water from an improved source is reliable. Unreliability causes considerable dissatisfaction. Increased reliability also means that people can be less preoccupied with obtaining water and attend to other concerns. Some studies suggest that improvement of water services through uninterrupted water supply is crucial in developing countries: Baisa, et.al, (2010); Whittington, et.al, (2002). Urban household residents in wealthier countries such as Australia are found to be WTP to reduce the frequency and duration of water service interruptions; however, WTP is lower when households face more interruptions per year (Hensher, et al., 2005). In addition, WTP is bound to diminish when a culture of unreliable water supply services takes place as argued by Dutta and Verma (2009) mainly because households have to invest a significant amount of money to buy large water storage in an attempt to avoid unreliable water supply. Many studies are found to report a lower WTP in the cases where households have uninterrupted water supply, clean and safe water, and reliable water supply (Akram and Olmstead, 2011; Olanrewaju, Cecilia, Omonona, and Titus, 2012; Wang, Xie, and Li, 2010). The length of the water shortages have an influence on the amount of money the respondents are WTP for the water service. As the length of the water shortages increase, the amount the respondents are WTP also decrease. The respondents, who experience water shortages for a short period of time, such as for a day, have the highest WTP. This is due to the reason that they hardly feel the impact of water shortages as they are probably ably having reserve water for use during that short space of time. However, the respondents who spent from a week to months without water, have a lower WTP as they probably get acquainted with the situation and then look for some alternatives to survive without the service from the utility.

Adequacy of supply from main source was statistically significant in determining WTP for improved water supply services in the study area. The research findings here are similar to Olajuyigbe and Fasakin (2010) who found adequacy of supply from main source as one of the most important determinants of people's WTP for improved sustainable water supply in Southern Nigeria. Inadequate supply from the main source will force the consumers to look for alternative sources to supplement the supply and this will in turn affect WTP. *Customer services from water utility* was statistically insignificant in determining WTP for improved water supply services in the study area. The importance of customer service center is acknowledged in the literature as the center that helps to handle feedback, complaint and request from consumers. Hensher et al. (2005) reports on urban country respondents' preference to have a person answer the phone when they call the service center rather than having a voice system provide a message; and that they are willing to pay for this service feature. In addition, willingness of acceptance among consumers can be achieved through provision of information about production process of water treatment (Dolnicar,

Hurlimann, and Nghiem, 2010) and accessibility to information like a public visit to water treatment plant to foster confidence towards service providers (Doria, 2010).

C. THE HOUSEHOLDS' ATTITUDES TOWARDS GOVERNMENT POLICY IN THE WATER SUPPLY SECTOR AND THEIR SENSE OF ENTITLEMENT TO GOVERNMENT SERVICES

In Nzoia River Basin, respondents' attitudes towards water management was statistically significant in determining WTP for improved water supply services. The research findings here are similar to World Bank, (1993); Bah, (1997); Mugabi, et. al. (2010) and Raje, et.al (2002). Many respondents felt that they were entitled to free or subsidized water and that it was the government's responsibility to provide their villages with improved water supply. Respondents who preferred to "wait for the government to help" were less WTP than similar individuals who had a less sanguine view of the government's abilities. This issue of the effect of households' sense of entitlement to improved services on their indicated WTP remains a big problem in the study area as well as Kenya and other parts of the African continent.

When Kenya gained independence in 1963, the government made promises to people and as a result, the vast majority of rural households still consider provision of clean water to be a fundamental government responsibility. In Africa, many countries have had long histories of independence and more experience with broken promises, and people are often deeply cynical about the government's ability to deliver free to highly subsidized water services of reasonable quality. In the field we came across many stalled water projects which were intended to serve thousands of villagers, and when we told them that water was now a devolved function of the county governments and that there is renewed commitment from the governors in the basin to rehabilitate and operationalize the supplies, the villagers appeared too skeptical and told us that elections are not far away and they know that many empty promises are on the way. The findings here show that the households' attitudes towards government policy in the water supply sector and their sense of entitlement to government services may be a significant obstacle to charging realistic prices for water in the basin.

IV. CONCLUSION AND RECOMMENDATIONS

Results from this study indicate that majority of the households in Nzoia River Basin are WTP for improved water supply services. They are WTP on average, Ksh.500 (US$ 5) per month. An analysis of the factors determining households' WTP for improved water supply services indicate that age, gender, education, income, household history of water related illnesses, sanitation facility, monthly water tariffs, water connection charges, time spent fetching water round trip, walking distances to water source, perceived water quality, adequacy of supply from main source, water source reliability, existing sources for domestic water supply and respondents' attitudes towards water management were statistically significant and acted as determinants to WTP for improved water supply services in Nzoia River Basin. Other factors such as marital status, household size, household composition, households receiving remittance, occupation, household location, livestock keeping, kitchen gardening, land tenure security, respondent's years of stay in the area, customer services from water utility and in-household treatment of water were statistically insignificant. The households' WTP for improved water supply services is not dependent on anyone set of factors but rather on their joint effects and on specific cultural setting.

Based on the findings of this study, we recommend that since water is a devolved function of the county governments, county governments within Nzoia River Basin should invest in infrastructure to supply the residents with improved water supply services since there is WTP. This water services up-scaling program can start off from areas where incomes are high, households history of water related illnesses are abundant, sanitation facilities are available, time spent fetching water round trip is high, walking distances to water sources are long, perceived water quality is poorest and water source reliability is low since they all have a positive relationship with WTP. County governments in Nzoia River Basin should improve water supply services if they are interested in improving sanitation. This is because there is a positive relationship between availability of sanitation facilities and WTP for improved water supply services in the basin. National and county government policies and programs aimed at increasing residents' incomes are important since increased incomes have a positive relationship with WTP. Similar policies and programs aimed at improving education in the basin are recommended since the more educated a person is, the more he is prepared to pay for improved water supply services. During data collection in the field, the Researcher came across many stalled water supply projects which were intended to serve the area residents. The county governments should rehabilitate and operationalize these water supplies to ensure availability of safe water in those areas and reduce the walking distances covered and time taken to reach alternative water sources.

Households' attitudes towards government policy on water supply and their sense of entitlement to government services was found to have a positively relationship with WTP. There should be proper sensitization programs on this to correctly align the household attitudes. The county governments should ensure proper public participation in water supply projects identification and prioritization, planning and design, implementation, operation and maintenance, monitoring and evaluation for improved water supply sustainability. Since respondents are WTP, a policy framework that considers middle and low-income groups should be designed in relation to improved water supply services in the basin and proper sensitization done on the need for improved water supply to prevent water related illnesses and create wealth for the households. The county governments within Nzoia River Basin should create enabling policy environment for public-private partnership in the water sector to secure the much needed funds for the improvement of water supply services since there is WTP if it is provided at an affordable price.

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