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Estimating the Willingness to Pay for Water Services in Nsukka Area of South-Eastern Nigeria Using Contingent Valuation Method (CVM): Implications for Sustainable Development

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ABSTRACT The importance of water in human environment cannot be over emphasized. Water cleanses the environment and contributes in keeping it clean. This has positive impact on human health and longevity. This establishes relationship between the availability of water and sustainable development. This notwithstanding water as a natural resource is not readily available in most Nigerian communities. This has resulted in degraded environment with its consequent health hazards and economic poverty. Nsukka in Enugu State of Nigeria is one of the communities where potable water is non-existent. Using the Contingent Valuation Method (CVM) as analytical tool, this study sought to identify the determinants of the peoples' Willingness to Pay (WTP) for improved water supply in Nsukka, ascertain what they would pay to support government, and determine the amount of revenue that government could generate. The study made use of primary and secondary data. The estimation of the Tobit (censored) model showed that most of the variables included in the model individually and collectively provided basic information on the nature of household utilization of water. Findings also showed that the willingness to pay for water was sensitive to the level of education and occupation of the household head, prices charged by water vendors, expenditure on water vending and the average monthly income of the households. Given these facts, the study recommended that government policies and programmes should revolve around the core issues of environmental development, such as engaging in public private partnership to ensure regular supply of potable water to rural dwellers.

INTRODUCTION

Extant literature on water supply and sustainable development indicate there exists a nexus between the two variables. This is evident in scholarly works of Hensher et al. (2005), Adenike and Titus (2009), Moffat et al. (2011), Wendimu and Bekele (2011). These studies were informed by the recognition of the importance that proper management of water resources has on global socio-economic development. The problem however is that with particular reference to Nigeria, especially in the rural communities of the South-Eastern region, water supply and provision of sanitary services remain problematic given that water supply in these areas are in critical short supply. Unfortunately, this is not highlighted in the extant literature, excepting in Olajuyigbe and Fasakin (2011) who focused primarily on the south-western region of Nigeria in their study. Thus, this study is carried out to cover the absence of scholarly research on the implications of water supply on sustainable development in the south-eastern Nigeria. Secondly, the study aims at refocusing and redirecting government policies and reform programmes towards environmental sustainability and development.

The subjugation of the earth through the exploitation of both human and natural resources has degraded the harmonious or cordial interaction, which existed between man and his environment. To reduce poverty and improve the standard of living of an average man, economic growth has remained a legitimate objective of the world community. Painfully though, people are now aware that pursuing economic growth devastates the environment (for example, through pollution) – unlikely to be sustainable (Pearce and Warford 1993: 3). The issue then is, how, not whether to grow.

The concept of sustainable development requires balancing environmental, societal and

economic considerations in the pursuit of development and an improved quality of life. Thus, sustainability entails intergenerational equity, just and peaceful societies, social tolerance, environmental preservation and restoration, poverty alleviation and natural resource conservation. However, sustainable growth and development cannot be achieved except developmental activities fall within the ambit of the carrying capacity of the environment. Thus, whether in developed or developing societies, the supply of clean and potable water provision of sanitary services remain one of the basic developmental objectives of national governments. In Nigeria for example, the government took a number of initiatives related to water resources policy in the latter part of the 1990s. These include development of a set of key water resources principles that were circulated initially in 1998 for review by approximately 100 representatives of government agencies, academics and other water specialists; a World Bank sponsored study, concluded in 2001, that included specialist reports on the legal and regulatory framework, institutions and trans-boundary waters, various drafts of a water policy culminating in the 2004 National Water Policy, and the EU funded report on Water Resources Management and Policy, etc. (Ezeji 2010). This is in recognition of the importance of water resources management for the economic development of Nigeria and the well-being of its citizens. Empirically, sustainable livelihoods can be built on access to water that goes beyond current approaches to meeting both domestic needs (drinking, cooking, and washing) and irrigation needs. For instance, productive uses of water at the household level include a range of small-scale activities that enable people to grow food, earn income and save expenditure: fruit and vegetable production, keeping livestock, brick making and building, and a wide range of informal micro-enterprises.This indicates that the water needs of the poor always extend beyond the domestic. However, in most rural communities in the south-eastern Nigeria in particular and Nigeria in general, the supply of water and provision of sanitary services remains problematic. This is because in Nigeria generally, water supply services are in critically short supply. For example, out of the 85 million people living in urban and semi-urban areas, less than half have reasonable access to reliable water supply. Water supply services, where they exist, are unreliable and of low quality and are not sustainable because of difficulties in management, operation and pricing and failure to recover costs. Many water supply systems show extensive deterioration and poor utilization of existing capacities, due to under-maintenance and lack of funds for operation (FRN 2000).

Thus, using the Contingent Valuation Methods (CVM) to value the non-market good – water supply, this paper seeks to estimate the willingness to pay for water services in South-Eastern Nigeria and its implications for sustainable development. The questions posed in this study include; what should constitute the appropriate pricing for water in rural communities in the South-East? Will the willingness to pay (WTP) for the community water is enough to support the government in the face of deregulation? What are the effects of deregulation of water supply in rural communities? If water supply is deregulated and the pricing of water is made to reflect economic values, of what price will rural community members pay? Will the willingness to pay (WTP) reflect economic values of water; and what are the implications of these estimates on sustainable development?

Objectives of the Study

Generally, the study using the Contingent Valuation Methods (CVM) to value the non-market good – water supply, seeks to estimate the willingness to pay for water services in Nsukka area of south-eastern Nigeria. Specifically, the study aims at;

1. Examining the implications of adequate and regular water supply on sustainable development;
2. Projecting into the possible success or otherwise of governments proposed water commercialization programme; and
3. Refocusing and redirecting government policies and reform programmes towards environmental sustainability and development.

Review of Relevant Literature

The science of Economics has always had something to say about the relation between economic welfare and the stock of natural assets and resources. To ensure that the welfare

of the people is maintained, there should be an improvement in environmental conditions. This can only be done when the environmental goods and/or assets/resources are made more sustainable. Thus, the sustainability of these assets is to ensure intra – and inter-generational equities (Pearce and Warford 1993).

Most environmental goods such as water, among others, are public goods and are communally owned; and as such, are provided by the State. Most states have taken the responsibility of providing these public goods, either because they cannot be provided efficiently by the private sector or because of the inherent importance and necessity attached to them. In the changing context of contemporary world development, water resources continue to play a key role of sustained but inestimable significance. This has made natural resources in general and water resources in particular, attain recognition as a fundamental component of national development. This was revealed in the evolving international outlook toward environmental standards and ecological balance at the Stockholm Conference in June 1972 – Committee for the United Nations Conference on the Human Environment (United Nations 1974: 3). A follow – up conference was held at Mandel Plata, Argentina, in March 1977, with the statement that people have the right to have access to drinking water in quantities and quality equal to their needs. The 1981–1990 decade declaration for drinking water and sanitation for the whole world was done with the intention to ensure that adequate attention is paid to water supply and sanitation by all nations and hence reduce the adverse effects associated with inadequate safe water supply and sanitary conditions. This decade placed every national government in a strategic position to take the responsibility of providing potable water, thus confirming that it should be provided by the State (The International Drinking Water Supply and Sanitation Decade Directory 1981).

Nsukka in the Northern part of Enugu State and Uzuakoli in Abia State of the South-Eastern Nigeria are cases in point (Ezeji 2009). It can be found in what is known as Nsukka plateau, which lies 350M above sea level, with isolated peaks, reaching over 545M. The people of Nsukka are predominantly farmers. They cultivate food crops like yam, cassava, cocoyam, etc., though at subsistence level. Access to potable water in Nsukka is serious and problematic. Out of the 16 communities in the area, only 7 have functional boreholes, even in those who have the boreholes, the taps are not extended to remote villages, to the detriment of the residents there. The sitting of the University of Nigeria in Nsukka seems to compound this problem. Although the University community has its own sources of water, these sources cannot cater for the large population in the University. The result is that the search for water is extended to the neighbouring communities, thus compounding their problems. The people travel about 2 or 3 miles to their neighbours to get water, at times without success. The price of water charged by vendors is too high to be afforded by the poor rural dwellers. Many households, often the poorest, end up purchasing water from private vendors much more expensively than from the public supply where they exist (FRN 2000).

To alleviate this problem, there is need to know how the consumers of water in these areas value the good by posing such questions as how much they would pay to have the source of water (taps) brought closer to their houses. This method is known as Contingent Valuation Method (CVM).There exists a plethora of research works on the use of the Contingent Valuation Method. After its advocacy by Ciriacy – Wantrup (1952) as quoted in Blore (1996) and Cummings et al. (1986), early applications of this technique to environmental goods commenced vigorously in the 1970s and 1980s. Samuelson (1954) published in a seminal work, which made people believe that information about consumer preferences could not be obtained by direct means due to strategic behaviour bias on part of the respondents. Consequent upon this publication, investigation were rife with the existence of biases in CVM methodology. Smith (1977) published a report of empirical evidence, which belied the proposition of strategic bias. Brookshire et al. (1976), Bishop and Herbelein (1979), Bishop et al. (1983), Thayer (1981: 32), Mitchel and Carson (1981), Shulze et al. (1981: 158), Shulze et al. (1983), etc., all conclude that the results of CVM Surveys do not lead to strategic bias. Several tests were done for starting point and vehicle biases. Brookshire et al. (1981), Rowe and Chestnut (1983), Brookshire et al. (1980), all showed no starting point bias with the application of CVM. However, the tests carried by Randall et al. (1978a; 1978b), Brookshire et al. (1980), Doubert and Young (1981) and Cronin and Herzeg (1982), showed evidence of bias with CVM.

These tests stimulated the advocacy of the usefulness of the CVM to determine compensation and equivalent variation measures of costs and benefits. This was the theme of the state of Arts Assessment of the contingent valuation method in 1984 Palo Alto Conference (Comings et al. 1986). Consequent upon this conference, several studies have been carried out to accentuate its applicability and reliability in public policy-making. These include; Whlitington et al. (1988a, 1988b, 1990, 1992); McConnel and Ducci (1989), Randall (1991), Shulze et al. (1996), Shultz et al. (1998), Echevarria et al. (1995), Brown et al. (1996), Onwujekwe et al. (2001), Kohlin (1997), Mekonnen (2000), amongst others. A number of theoretical and methodological issues and criticisms have been raised about the application of the CVM in general and in evaluation in developing countries in particular. Criticisms at the theoretical level are rife, especially those related with economic theory which are linked with the problems of how questionnaire is prepared and data collected and analysed (Mekonnen 2000) and the doubt about the usefulness of CVM in developing country context (Dixon and Sherman 1990). It has been shown that CVN can be applied to developing countries (Whittington 1996; Georgiou et al. 1997). Another criticism is the choice of response format to adopt during the exercise. As the choice of response format – to employ depends on the problem under consideration and the context of applicability (Hanemann et al. 1991), there is consensus among researchers that willingness to pay (WTP) format performs better than willingness to accept (WTA) format (Cummings et al. 1986; Mitchel and Carson 1989). Similarly, it is generally accepted that a binary question with open-ended follow up questions provides more information on WTP than alternatives, such as dichotomous choice format and double-bounded referendum methods (Mitchel and Carson 1989; Shulze et al. 1996; Brown et al. 1996).

Another issue in the CVM literature is related to test of validity of the contingent valuation estimator. An issue which has received limited attention is the treatment of invalid responses – missing bids, protest zeros, and outliers – from the empirical analysis. Mekonnen (2000: 294) concludes that discarding the invalid responses may result in sample selection bias. However, criticisms and controversies on the use of CVM as being too hypothetical and imaginative should be taken with caution. Using hypothetical scenarios and imagination, far from being a distraction from reality is probably both closer to the way many people think about environment and a necessary step to problem solving. A policy that engages in a dialogue to achieve such an objective changing people's preference – may, however, have a better chance of success than one that is imposed by government (Blore 1996: 231).

METHODOLOGICAL FRAMEWORK

Water supply in Nsukka area of Enugu State is a serious concern. The same applies to other communities in the South-Eastern part of Nigeria. This is because out of 16 communities in Nsukka, only 7 have functional boreholes. The rest do not have. Even in those communities where boreholes exist, the taps are few and are concentrated in few places. With the establishment of University of Nigeria in Nsukka, the problem seems to have worsened because even though the University community has its own sources, they are not enough to cater for the large population. The residents in the communities without boreholes travel about 2 or 3 miles to their neighbours to get water at times without success. To solve this problem, they resort to buying water from public vendors – tanker drivers and retail vendors. Most people cannot afford to purchase all the water needed by the household throughout the year. They therefore, resort to the purchase of local pots, which they fill with muddy water collected from holes dug around their houses during the rainy season. Though this serves their water needs during the dry season, it poses a threat to their health: they are exposed to the attack of mosquitoes and other water-borne diseases like dysentery, cholera and diarrhoea, etc. This scenario observed at Nsukka area similarly applies to other parts of south-eastern Nigeria such as Uzuakoli and Urualla (Ezeji 2009). Four out of the seven communities that have functional boreholes were selected for study. They are Nsukka, Opi, Ede-Oballa and Obukpa. A sample of about 2.1 per cent of the sample population was selected and assuming an average household size of 6 people, we have about 23287 households in the sample area. That is, a sample to population ratio was set at 1: 49, which implies that about 480 households involving about 2880 people were sampled. A two-stage sample design was adopted. The first stage involved the selection of the clusters to

be sampled – the villages become the first stage (primary unit).

The second stage was the selection of the families (households) to be interview (secondary unit). Based on this, the households sampled for Opi, Ede-Oballa, Obukpa and Nsukka were 89, 53, 70 and 268respectively.The use of Ordinary Least Square (OLS) in this type of study could lead to sample selection bias. This is because consumers of water already pay a rate charged by the Water Corporation and hence the amount which they pay should form the basis upon which they are asked about how much they would be willing to pay (Nwabuokei 1986). Edwards and Anderson (1987) suggested that Heckman (1979)'s analysis of censored samples was germane to sample selection bias in contingent valuation research. For the purpose of this work, the researchers used Tobit (censored) model as propounded by James Tobin (1958).

The data for this work were from primary source. The household questionnaire was the main instrument used for data collection. The questionnaire was structured to elicit information needed from the sample households, and the questions were made as simple as possible. The elicitation format used was double-bounded referendum methods with follow-up questions because of the benefits, which include: it is easy to administer and responses are simply (Yes or No); it is consistent with what the rural dwellers are familiar; and it is suitable for the analysis of Tobit (censored) methodology.

On the whole, 480 households with an average population of 2880 were interviewed. During the data cleaning, about 60 households involving 360 individuals were eliminated. The remaining 420 households involving about 2520 individuals were valid. These eliminated include missing variables (75 per cent), cut-offs (8.33 per cent), outliers (10 per cent) and non-response and other reasons (6.67 per cent).The econometric software used for the analysis (estimation) of the Tobit (censored) model was done with E-Views Version 3.

RESULTS AND DISCUSSION

In this section, the researchers present the results of the regression of the Tobit (censored) model and the policy recommendations. The data were censored both sides (left and right): The left truncation was the starting bid, in which any respondent who indicated a WTP below this bid was represented by zero. The right censoring indicates that zero also represented any respondent willing to pay above 10 per cent of the stated monthly households income. With censoring on both sides, we had 69-censored observations and 351 uncensored observations, giving a total of 420 valid responses. The regression results are shown in Table 1.

Table 1: Regression results of the Tobit model

Dependent Variable: WTP

Variable	*Coefficient*	*Std. Error*	*Z. statistic*	*Prob.*
DIST	0.084889	0.092527	0.917443	0.3589
EDU	0.159582	0.062407	2.557103	0.0106
OCC	0.225451	0.059161	3.810774	0.0001
POP	-0.005777	0.001586	-0.199045	0.8422
PRICE	0.005777	0.001586	3.642536	0.0003
SEX	-0.017370	0.036242	-0.479285	0.6317
DITURE	0.000147	5.65E-05	2.606371	0.0092
INCOME	1.16E-05	5. 77E.06	2.003282	0.0451

Source: Authors' Computations
Where:
DIST = Distance in km (During variable) of the household from the nearest public tap.
EDU = Level of formal education (a dummy) of the household head
OCC = Dummy variable for occupation of the household head
POP = Dummy variable for the size of the household
PRICE = Price of the alternative source of water (vending)
SEX = Dummy for the sex of the household head.
DITURE = Average monthly expenditure on alternative source of water.
INCOME = Average monthly income of the household.
(The computer printout of the results is as shown in Appendix A).

The variable distance shows the distance the households have to travel before getting water from the public tap. The further the household from the nearest public taps, the higher the disutility to the household involved. The variable has the a priori positive sign, indicating that households far away from the source of water would be willing to pay more. Bad roads and cost of transport could compound the problem of distance. However, the variable is not significant at 90 per cent, 95 per cent and 99 per cent confidence levels, respectively.

The level of education attained by the household heads has the expected positive sign, which indicates that households whose heads have higher education indicated a higher willingness to pay than the less educated ones. Higher education shifts the demand for water services to the right, implying a higher level of welfare. A household with higher level of literacy has better chances of maximizing the utility and welfare from consuming and having access to clean and potable water. The result is not unusual; the enlightened population has great impact on the demand for welfare facilities like water, health, education, sanitary conditions, etc. Education is significant at 90 per cent and 95 per cent levels but insignificant at 99 per cent confidence level. Similarly, the occupation of the household head is a key determinant of the willingness to pay. This stems from the fact that better and more permanent jobs give more income for the households, which would influence their willingness to pay. This factor is derived from the level of education a family has attained; a household with better education has better jobs and higher income.

Occupation is statistically significant at 90 per cent, 95 per cent and 99 per cent levels, respectively. Price of alternative source of water (water vending) is another key determinant of WTP. It shows that when vendors charge higher prices for water, the welfare levels of the households deteriorate, as they divert resources from the consumption of other goods to water. The welfare of the people could be increased if there is improvement in the supply of water so as to make consumers of water maintain the existing level of utility they are used to. This variable is not significant at 99 per cent level only. Closely connected with this is the average expenditure of the households on water vending. Since expenditure on water from vendors takes a large part of the household's income, the implication is that higher expenditure on water from this source reduces the utility and increases the disutility of the rural dwellers. This poses a big problem for the low-income earners who cannot afford the hike in the price of water from vendors. This variable is statistically significant at the three levels of significance. The average monthly income of the household is another strong factor of WTP. Higher income implies that better and higher quality goods would be preferred, ceteris paribus. The significance of this variable suggests that improving the income of the people in the study area would shift their demand for water services to the right, and also reduces the excessive impediment posed by the distance to the source of water, price charged by vendors, and the expenditure on water.

However, the negative influence of the sex of the household head and the size of the household on the WTP bid is rather surprising. A larger household depicts the level of education the household has attained. Enlightened households have fever children; the larger the size of the household the less equitable the distribution of the family's resources is and, thus, the less the welfare levels. The result shows that smaller households have a more equitable distribution of resources and are in a better position to cater for the welfare of the members. The negative sign of sex of the household head shows that women feel the impact of scarcity of water more than men. Since they bear more pains than men, they expressed a higher willingness to pay for the improvement of water facilities. This arises from the fact that women use more water for household chores and can hardly bear the risk of running out of water for this purpose. The two variables are not statistically significant at all the confidence levels. Using all the variables that are statistically significant we can derive the demand (WTP) function. This function is derived using the coefficients of those variables and their mean values. The variables theatre significant includes education, occupation, price, expenditure and income.

The bid function=

$$WTP = 0.159582\ (9.8) + 0.225451\ (1) + 0.005777(35.4) + 0.000147\ (1499.8) + 0.0000116\ (7585.4)$$

$$WTP = 2.300239$$

This implies that the mean WTP for improved water services is N230.02. For various communities in the survey area, the population of each

community and the average number of households (assuming 6 persons per household) is shown in Table 2.

Table 2: Household distributions in the four communities and the expected revenue to the government

Study area	*Population size**	*Number of households*	*Mean WTP (₦)*	*Total R*
Obukpa	20,056	3,343	230.00	768,890
Ede-Oballa	14,368	2,393	230.00	550,850
Opi	25,384	4,231	230.00	973,130
Nsukka	79,913	13,319	230.00	3,065,600

Source: Authors' Computation
*The population size of each community was based on the 1996 population data collectedfrom National Population Commission, Nsukka Area Office.

Table 2 shows the possible revenue that could be generated for the government every month from each community if the consumers of water (each household) contribute about ₦230.00 for the extension and maintenance of the public taps. One major finding from this study is that communities in Nsukka Area suffer terribly because of insufficient potable water. A way to ensure that the problem could be reduced is to make water supply more sustainable. Sustainability can be achieved by using the amount, which the households are willing to pay (mean WTP, that is, N230) to extend the taps to remote villages. Thus, the researchers suggest that since the initial capital for sinking the borehole is too large, and cannot be undertaken by each community, the government can undertake to drill it. The host community can perform the function of extending the taps to the remote villages and carry out other mini repairs from this contribution (mean WTP) which every household would pay each month. The revenue generated from this WTP should be divided into two parts: a smaller portion should be kept in the account of the host community in the event of minor repairs; the larger percentage should be paid into government account, so that any major damage could be undertaken jointly by the host community and the government. By charging a price of N230.00 per month, the impact of this amount from the household's monthly income would not be felt. This would serve as the appropriate price, which each household should pay so that they maximize the utility derivable from the consumption of water. Even though this does not depict the economic value of water, it is the price, which every household feels satisfied about or is indifferent to both parties are at welfare equilibrium at this price; the host households are happy that they pay this amount and still have regular supply of water. In the someway, the government feels satisfied because the running cost is reduced and while large revenue is generated.

One of the contemporary public policy issues in the world today is that deregulation of the public goods or public private partnership in the provision of public goods and services. The approach suggested in this study for the improvement of water supply is in conformity with the notion of deregulation. The government can undertake the initial capital, while the host community would undertake the running costs and other expenses. This approach saves the government the problems of budgetary and extra-budgetary allocations, which do not yield returns. This approach introduces competition among the communities since each community would try to ensure that its own supply is regular so as to draw people from the neighbouring communities, and thus, it spurse. This approach to deregulation is called "quasi-deregulation".

CONCLUSION

The major objectives of this study were to identify the determinants of WTP for improved rural water supply in Nsukka Area Igbo-land, ascertain what consumers of water would pay to support the government and determine the amount of revenue that could be generated to the government. Over and above these set objectives, the study set to establish the implications of the provision of water and sanitary services on sustainable development. The estimation of the Tobit (censored) model showed that most of the variables included in the model individually and collectively provided basic information on the nature of household utilization of this public good- water. The issues raised by this study revolve around societal and infrastructural development and environmental sustainability. As has been observed, sustainable growth and development cannot be achieved except developmental activities fall within the ambit of the carrying capacity of the environment.

To this end, the proposed 'quasi-deregulation' or public private partnership in the provision of water and sanitary services in the affected areas which entails government undertaking of the initial investment and the host communities handling of the running costs/minor expenses, has positive implications for sustainable development. First, it will ensure a clean, decent and healthy environment as the households will have constant and regular supply very close to them. Constant and regular water supply leads to a clean and healthy environment. The second implication is that clean and healthy environment will positively impact on the health and longevity of the residents of the affected areas. Third, it will result in economic empowerment of the people through income savings and boosting of commercial activities. Above all, it will ensure a boost in the internally generated revenue of the state which could be reinvested in the provision of more social and economic infrastructure for the people by the government since government stands to recoup its expenditure on the initial investment through the monthly payment of the amount the households stated they are willing to pay, while the households.

Thus, the policy lesson to be drawn from this is that government policies and reform programmes should revolve around and explore the many core issues of sustainable development, especially environmental development. To this end, the proposed 'quasi-deregulation' or public private partnership in the provision of water and sanitary services in the affected areas which entails government undertaking of the initial investment and the host communities handling of the running costs/minor expenses, has positive implications for sustainable development. First, it will ensure a clean, decent and healthy environment as the households will have constant and regular supply very close to them. Constant and regular water supply leads to a clean and healthy environment. The second implication is that clean and healthy environment will positively impact on the health and longevity of the residents of the affected areas. Third, it will result in economic empowerment of the people through income savings and boosting of commercial activities. Above all, it will ensure a boost in the internally generated revenue of the state which could be reinvested in the provision of more social and economic infrastructure for the people by the government since government stands to recoup its expenditure on the initial investment through the monthly payment of the amount the households stated they are willing to pay, while the households.

RECOMMENDATIONS

From the findings, the study made the following recommendations;

1. That government policies and reform programmes should revolve around and explore the many core issues of sustainable development, especially environmental sustainability and development;
2. That, the proposed 'quasi-deregulation' or public private partnership in the provision of water and sanitary services in the affected areas which entails government undertaking of the initial investment and the host communities handling of the running costs/minor expenses.

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APPENDIX A – MODEL REGRESSION

Dependent Variable: WTP
Method: ML - Censored Normal (TOBIT)
Date: 06/17/02 Time: 21: 19
Sample (adjusted): 1 420
Included observations: 420 after adjusting endpoints
Left censoring (value) at zero
Convergence achieved after 7 iterations
Covariance matrix computed using second derivatives

	Coefficient	*Std. Error*	*Z-Statistic*	*Prob.*
DIS	0.084889	0.092527	0.917443	0.3589
EDU	0.159582	0.062407	2.557103	0.0106
OCC	0.225451	0.059161	3.810774	0.0001
POP	-0.018275	0.091811	-0.199045	0.8422
PRICE	0.005777	0.001586	3.642536	0.0003
SEX	-0.017370	0.036242	-0.479285	0.6317
DITURE	0.000147	5.65E-05	2.606371	0.0092
INCOME	1.16E-05	5.77E-06	2.003282	0.0451
	Error Distribution			
SCALE: C(9)	0.344953	0.013724	25.13439	0.0000
Mean dependent var	0.835714	S. D. dependent var	0.370977	
S.E. of regression	0.301064	Akaike info criterion	1.001414	
Sum squared resid	37.25282	Schwarz criterion	1.087991	
Long likelihood	-201.2970	Hannan-Quinn criterion	1.035634	
Avg. log likelihood	-0.479279			
Left censored obs	69	Right censored obs	0	
Uncensored obs	351	Total obs	420	

APPENDIX B – SAMPLE QUESTIONNAIRE

SECTION A: SOURCES OF WATER SUPPLY

INSTRUCTION: We would like to know the various sources of water supply to the rural household.

1a. Is the respondent a male? Yes ( ) No ( )
b. Where were you born? _____
c. When was that? _____
d. How old are you now? _____ Years
e. Number of people in this household: Adult_____ Children_____
2a. Does this house have its own tap? Yes ( ) No ( ) (If "No" go to 3)
b. Is there any tap for groups of families? Yes ( ) No ( )
c. How many 50-litre containers does this household get from the tap per week? ( )
d. How much does this family pay per month for water from its tap? ₦ _____
e. How is the payment made? (Choose one) Directly to the water corporation ( )
To the manager/caretaker ( ) communally ( )
f. Is the reliability of their service good? Good ( ) Bad ( ) I don't know ( )
g. Is the water quality good ( ) bad ( ) I don't know ( )
h. Do you pay for the water? Yes ( ) No ( ).
i. What is the water used for? (Tick as appropriate)
Drinking ( ) Cooking ( ) Bathing ( ) Washing ( ) Cleaning ( ), etc.
3a. Do you have any public taps in this area? Yes ( ) No ( ) (If "No" go to 4)
b. How many taps are there? _____
c. How far apart are they? _____
d. How long does it take to go there and return? _____ hr
e. Is the water quality good ( ) bad ( ) I don't know ( )?
f. How much is charged per 50-litre container ₦ _____
g. How many 50-litre containers does this household obtain per day from the public tap? _____
h. How many days per week do they supply water through the public taps? ____days.
i. Is the reliability of their service good ( ) bad ( ) I don't know?
j. Do you pay for the water? Yes ( ) No ( ).
k. What is the water used for? (Tick as appropriate)
Drinking ( ) Cooking ( ) Bathing ( ) Washing ( ) Cleaning ( ), etc.
4a. Do Tankers trucks sell water in this neighbourhood? Yes ( ) No ( )
b. Do you ever buy water from tanker trucks? Yes ( ) No ( ) (If "No" go to 5)
c. How many times do they come in a week? _____
d. How many 50-litre containers do you buy per day?_____
e. How much is charged per 50-litre container? ₦ _____
f. Is the water quality from tanker trucks good ( ) bad ( ) I don't know ( )?
g. Do you pay for the water? Yes ( ) No ( ).
h. What is the water used for? (Tick as appropriate) Drinking ( ) Cooking ( ) Bathing ( )
Washing ( ) Cleaning ( ), etc.
5a. Do you buy water from other retail vendors (Household retailers)? Yes ( ) No ( )
(If "No" go to 6)
b. How many times do you buy from them in a day? _____ Times
c. How many 50-litres containers do you buy in a day? _____
d. How much is charged per 50-litre container? ₦ _____
e. Is the water quality from this source good ( ) bad ( ) I don't know ( )?
f. Is the reliability of their service good ( ) bad ( ) I don't know ( )?
g. Do you pay for the water? Yes ( ) No ( ).
h. What is the water used for? (Tick as appropriate). Drinking ( ) Cooking ( ) Bathing ( ) Washing ( ) Cleaning ( ), etc.
6a. Does your household collect rain water at your house? Yes ( ) No ( ). If "No" go to 7).
b. Is the water quality good ( ) bad ( ) I don't know ( )?
c. How many 50-litre containers do you collect in a week? _____
d. What is the water used for? (Tick as appropriate). Drinking ( ) Cooking ( )
Bathing ( ) Washing ( ) Cleaning ( ), etc.
7a. Does your household collect (fetch) water from springs, streams or other natural sources? Yes ( ) No ( ). (If "No" go to section B)
b. How far are they from your house? _____ Km
c. How long does it take to go there and return? ( ) hr
d. Do you pay for the water? Yes ( ) No ( ).

e. If yes, how much is charged per 50-litre container? ₦_____
f. How many times do you fetch water from there in a day? _____
g. How many 50-litre containers do you fetch in a day _____
h. Is the water quality good ( ) bad ( ) I don't know ( )
i. What is the water used for? (Tick as appropriate) Drinking ( ) Cooking ( ) Bathing ( ) Washing ( ) Cleaning ( ) etc.

SECTION B: HOUSEHOLD CHARACTERISTICS

1. The number of rooms in this dwelling is _____
2. The number of bedrooms in this dwelling is _____
3. Does this household have its own:
   Toilet Yes ( ) No ( ); Bathroom Yes ( ) No ( ); Kitchen Yes ( ) No ( ).
4. Does this household own or rent this building/dwelling?
   Own ( ) Rent ( ) Rent free ( ) (choose one).
5. If rent, how much is paid as rent per month? ₦ _____
6. Is the household connected to electricity? Yes ( ) No ( )
7. How much is the monthly electric bill? ₦ ( )
8. Is the reliability of electric supply good ( ) bad ( ) I don't know ( )?
9. Does the household own: (Tick as appropriate).

Car	( )	Motor cycle	( )
Refrigerator	( )	Air conditioner	( )
Colour –TV	( )	Black and White TV	( )
Fan	( )	Gas Cooker	( )
Sewing machine	( )	Radio	( )
Tables and chairs	( )	Lamps	( )

   Economic trees (Specify)_____ Animals (specify)_____ Housing Condition (Roof and Wall).
10. What characteristics does your house show? (choose one)
    Thatch/mud house ( )
    Zinc/mud house ( )
    Zinc/mud-plaster ( )
    Zinc/cement-plaster ( )
    Zinc/cement-plaster paint ( )
    Asbestos/cement-plaster paint ( )
11. How many members of the household have their education: below secondary school ( ) above secondary school ( )?
12. What is the highest level of education attained by the head of this household? (Tick as appropriate)
    Primary school ( ) secondary school ( )
    High school ( ) teachers' training ( )
    Professional school ( ) University ( )
    Others (specify) _____
13. How many years of schooling? ( ) years
14. How many members of this family have cash income? ( ).
15. What work do you do most of the time (occupation)? (Tick as appropriate)
    Fishing ( ) fishing/farming ( ) Nursing ( )
    Hired labour ( ) mechanic ( ) tailoring ( )
    Hair dressing ( ) trading ( ) teaching ( )
    Civil servant ( ) others (specify) _____
16. Which of the following do the average monthly income of the household fall in? (Tick as appropriate)
    Less than 1000
    1000 – 2000
    2000 – 4000
    4000 – 6000
    6000 – 8000
    8000 – 10000
    Above – 10000

SECTION C: WILLINGNESS TO PAY FOR WATER

We would like to ask questions relating to the health hazards of using impure water and household's willingness to pay (WTP)

1. Has any member of this household suffered water-borne disease in the last six months?
   Yes ( ) No ( ) (if "No" go to 7).
2. If yes, which type? Dysentery ( ) Diarrhoea ( ) Cholera ( ) others (specify)
3. How long did it last during the last attack? No of days ( )
4. During this period, did the patient visit a doctor?
   Visited a doctor ( ) Treated locally ( )
   If treated locally, how much did it cost you? _____
5. How often does any member of your household suffer from this sickness?
   No of times in a week ( ) No of times in a month ( )
6. Has this sickness killed any member of this household? Yes ( ) No ( )
   If yes did the person visit a doctor before his or her death? Yes ( ) No ( )
7. Have you done any of the following to purify your water? (Tick as appropriate).
   Boiling water (Before drinking) ( ) Adding alum ( ) Filtrations ( ) others specify _____
8. Now suppose you had the option of initiating a scheme to prevent these water-borne diseases in your community and waiting for the government to this. Which option do you choose? Initiate the scheme ( ) wait for the government ( )
9. If you have to make contribution into a community fund to help sustain this project (scheme), would you be willing to contribute to it? Yes ( ) No ( ).
10. If No, what is the reason for not contributing to help improve your community? (Choose one). Lack of money ( ) Lack of trust in community fund project ( ) wait for the government ( ) I don't know the scheme ( ).
11. Have you participated in any community fund project? Yes ( ) No ( )
12. If yes, what type of project? (Specify) _____
13. What kind of contribution did you make? (Tick as appropriate)
    Make money contribution ( ) supply labour ( ) cook for workers ( ) served on the community project committee ( )
    The new scheme (project) involves extending water taps closer to every house or near every house. This scheme has several advantages: it will save you the labour to travelling far distance to collect water, at times, without success. It will save you the cost of buying water at higher prices from tanker trucks or other retail vendors. It will also save you the danger of contracting water-borne diseases, etc.
14. Now assume that this project is to be established and managed through community fund, would you be willing to contribute to such project by using the amount spent on treating the diseases from water and the amount spent on buying water from vendors? Yes ( ) No ( ).
15. Considering the benefits of having water tap close to your house and assuming that the minimum cost of water from vendors and also treating water-borne diseases per month is ₦ 80.00, would you be willing to pay this amount to have water in the house? Yes
    ( ) No ( )
16 If No, what is the reason for not paying? (Choose).
    The amount is too high ( ) I can't afford to pay for the scheme ( ) the scheme is not important for me ( ) I can't trust the fund raising committee
    ( ) I don't think I should for what the government should provide ( )
17. Assume that households in other communities are paying a monthly contribution of ₦ 200.00 to this scheme, would your household be willing to pay this amount? Yes ( ) No ( ).
18. If No, what is the reason for not paying? (Choose)
    The amount is too high ( ) I can't afford to pay for the scheme ( ) the scheme is not important to me ( ) I can't trust the fund- raising committee
    ( ) I don't think I should pay for the government should provide ( ).
19. What is the maximum amount per month you would be willing to pay to establish and sustain the scheme? ₦