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COMMUNITIES'S WILLINGNESS TO PAY FOR PROTECTION OF ENVIRONMENTAL RESOURCES FROM OIL SPILLAGE IN DELTA STATE: A CONTINGENT VALUATION APPROACH

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ABSTRACT*: Despite the huge benefit crude oil has to the Nigerian economy, its exploration and exploitation activities have resulted in severe incidence of oil spills that has impact on the environment. The paper examined the willingness to pay for protection of environmental resources damage caused by oil spillage in Uzere and Emadadja communities in Delta State. 330 questionnaire were administered on the residents in the communities out of which 250 of the questionnaire were returned for analysis representing 76% response rate. The data collected were analysed using the Frequency Distribution, and Binary Logistic Regression Model based on the Contingent Valuation Method. The Frequency Distribution was used to determine the socio–economic characteristics of the residents while the Binary Logistic Model based on the Contingent Valuation Model was used to calculate the total benefit and explain the socio – economic factors influencing the communities' willingness to pay (WTP) for environmental resources. The results showed that majority of the respondents were willing to pay for environmental protection. The mean WTP was N948,018 per respondents. Also, religion (2.826), household size (3.103) and nature of job (5.715) were the important socio – economic factors that influenced the respondents willingness to pay (WTP) for environmental resources protection. The paper recommended that government should do all within its power to protect environmental resources of its citizens as this will enhance the peoples sense of belonging in the country and the communities in particular.*

KEYWORDS: Community, Willingness to Pay, Environmental Protection, Oil Spillage.

INTRODUCTION

Oil spill is the act/process and the instance of mineral oil escaping or running out of a container (tanker), or pipe and it includes accidental spill and routine spill (Ifediora, 2000). In the past major oil spills has attracted global attention and created awareness due to the associated ecological, human and environmental risk and damage that result from such spillage. The common causes of spillage are oil blowouts from the flow stations, equipment failure, leakages from aged and corroded network of the pipelines, operational mishap, maintenance error, sabotage, bunkering and oil theft operations. In whatever perspective oil spillage is viewed, oil spills have resulted in disastrous effects on land, freshwater swamps, marine environment as well as potential threats to human health in the affected host communities in Nigeria (Ite, Ibok, Ite and Peters, 2013).

Oil spillage in Uzere and Emadadja communities in Delta State has been a regular incident and the resultant degradation of the surrounding environment has caused significant tension between the people living in the region and the multinational oil companies operating in the community. The incredibly well – endowed ecosystem that can sustain a wide variety of crops and lumber experiences loss of its inhabitable terrain as a result of extensive

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exploitation by oil industries. The region contains a relatively large amount of environmental goods such as wildlife, natural scenic views, wetland, natural heritage, sites, recreation sites and others and these has positive impact on the life of the people (Akujuru, 2005).

When oil spillage occurs, the well endowed environmental resources are damaged. Kalu (2002) noted that when this happens, the Petroleum Act and the Oil Pipeline Act demands that affected residents be compensated not only for market – related real estate (land, buildings, plant and machinery, severance, injurious affection, disturbance etc) but for all intangible socio- cultural and health environmental assets lost. Unfortunately, when compensation is paid to victims of oil spillage, agitation or confrontation has always ensued because the compensation paid are often based on marketed goods only (Nuhu 2008; Otegbulu 2009 and Udo and Egbenta 2011). The question therefore, is if the individuals are not satisfied with the compensation paid because they are inadequate, are they willing to pay an amount for the protection of their environmental resources? The objective of this study is to examine the willingness to pay for the protection of environmental resources from oil spillage by Uzere and Emadadja communities using the Contingent Valuation Method. The Contingent Valuation Method (CVM) explores individuals willingness to pay (WTP) for a change in public goods and services to detect the cost and benefits that a society receives. The method involves asking the affected people what they are willing to pay (WTP) for a benefit and what they are willing to accept (WTA) as compensation for tolerating a loss of environmental asset.

The remainder of the paper is organized as follows. The next section (section two) deals with the Willingness to Pay for Environmental Resources Protection caused by Oil Spillage. Section three presents a detail description of the methodology adopted for the study, while section four focuses on empirical results. Concluding remarks and policy implication are contained in section five.

WILLINGNESS TO PAY FOR ENVIRONMENTAL RESOURCES PROTECTION CAUSED BY OIL SPILLAGE

Many environmental goods are not traded in the market, nor are they closely related to or tied with any marketed goods; there is therefore, no price for such goods. However, these values are measured in monetary terms through the concept of individuals Willingness to Pay (WTP) or Willingness to Accept (WTA) compensation for alterations in environmental services. Willingness to Pay is measured directly by asking people to state their Willingness to Pay an amount for environmental services, nature protection, or indirectly assuming that the amount can be inferred by looking at economic cost afforded to enjoy environmental services or at the cost incurred to acquire service substitute. Analyzing Willingness to Pay is a function of several socio economic factors such as income, taste and preference. Kolstad (2000) conducted a study on coastal water quality and found out that whatever the environmental goods, the willingness to pay is observed to rise with income of the respondents. To forgo the consumption of a commodity, a consumer will be willing to accept an amount that serves as compensatory variation or that puts him/her in the constant previous utility level (Mundy and Mclean, 1991). However, WTP cannot be expressed through the market, the most common approach used to estimate Willingness to Pay is the Contingent Valuation Method (Hanemann, 1999 and Bateman et al, 2002).

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The method was first used by Davis (1963) in United States of America to estimate the benefits of outdoor recreation in a Marine backwoods area. Since then, the Contingent Valuation Method has been widely used to measure the value of environmental goods and the improvement of their status. Mohammed et al, (2012) estimated Willingness to Pay among communities in Hulu Langat for watershed conservation using a Dichotomous Choice Contingent Valuation Method. Face to face interview was conducted to obtain primary data for Logit model estimation. The model estimation indicated that bid amount, income, occupation and residential area were the significant determinants influencing the communities Willingness to Pay.

Loomis, et al (2000) measured the total economic value of restoring ecosystem services in an impaired river basin using contingent valuation. Five ecosystem services that were described to the respondents include wastewater, natural purification of water, erosion control, habitat for fish and wildlife and recreation. Households were asked whether they are willing to pay higher water bill for increasing ecosystem services. The result shows that households were willing to pay an average of $252 annually for the additional ecosystem services. To the households living along the river, this calculation yields a value of $19 million to $70 million depending on whether those refusing to be interviewed have zero value or not. Even the lower bound benefit estimated exceed the high estimate of water leasing costs $1.13 million necessary to produce the increase in ecosystem services.

Carson, Mitchell, Haneman, Lopp, Presser and Puud, (2003) applied Contingent Valuation Method to determine the damage done to non – use value in Exxon Valdez oil spillage near Prince Williams sound in Alaska in 1989. The spill was the largest oil spill from a tanker in United States of American history. The result shows that household Willingness to Pay (WTP) to prevent another Exxon Valdez type of spill is $30.

Loureiro, Loomis and Vazquez (2009) conducted an economic valuation of environmental damages due to the Prestige oil spill in Spain. The study was limited to the passive use and non – market use losses caused by the spill using the Contingent Valuation Method via a non – parametric approach, the Turnbull distribution and a parametric approach and Logit Model. The study found out that if each of the households pays on average 40.51 Euro of extra taxes, mean social Willingness to Pay will amount to 574,722,216 Euro to avoid a future oil spill similar in size to the Prestige spill. The study followed the approach used by Carson et al, (2003) and summed up the passive use and non – market use losses caused by the Prestige oil spill. The approach was to elicit from the respondents their Willingness to Pay for a programme that will prevent similar spill in the future.

In Nigeria, several studies have been conducted on oil exploration and spillage (Akpofure, Efere and Ayawei 2000; Nwilo and Badejo, 2004; Kadafa, 2012) as well as assessment of oil spillage for compensation purposes (Udo and Egbenta, 2006; Ijagbemi, 2010). Nwilo and Badejo, (2004) carried out a study on the impact and management of oil spill pollution along the Nigerian coastal areas using a hypothetical simulation model. The result of the study showed that the simulated oil spill for the wet season reached the shore after 104 hours while during the dry season, the results from the model indicate that the oil spill reached the shore after 162 hours. Also, Kadafa (2012) carried out a study on oil exploration and spillage in the Niger Delta of Nigeria using statistical analysis. The result showed decrease in oil spillage quantity and increase in oil spillage incidence.

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For the assessment of oil spillage for compensation purposes Udo and Egbenta (2011) used the Contingent Valuation Method to determine the damage to non-use goods caused by oil pollution for compensation in Nigeria. The study concluded that the inclusion of non-use good in compensation claim potentially increased the stake in natural resources damage assessment and provide a ground work in favour of sustained exploitation ratio than over exploitation that would deprive future generation the enjoyment of the goods.

Also, Ijabgemi (2010) carried out a study on the assessment of methods used for oil spillage compensation in Delta, Edo and Ondo states in Nigeria using the Contingent Valuation Method and found out that the Contingent Valuation Method is best suited for compensation for oil spillage. However, the few studies conducted in Nigeria on oil spillage and compensation did not focus on the willingness to pay (WTP) to protect the environment from future oil spillage damages. This study tend to fill this gap that exist.

METHODOLOGY

The data for the study was collected through a survey conducted among the residents of Uzere and Emadadja communities in Delta State. Uzere Kingdom comprises of three (3) communities namely Uheri, Ezede and Uweye. Emadadja community has a population of 500 affected people while Uheri, Ezede and Uweye has 1,453, 164 and 973 affected respectively (Umuandi and Partners, 2011). The sample size for the study was taken from Israel (2003) published tables with sample size for ± 10% precision level where confidence level is 95%. The formula for sample size given by Israel (2003) is given as:

$$n = \frac{N}{1 + N(e)^2} \quad \text{.......(1)}$$

N= Population size

n= Sample size

e= Sample size precision

Using the formula, the sample size for the study was 330. The Simple Random Sampling Technique was used to select the 330 residents out of the total sample population. Three hundred and thirty (330) questionnaire were designed and administered on the selected residents in the communities out of which 250 were returned for analysis representing 76%. response rate. The questions asked includes; the socio economic background of the residents, what the residents will be willing to pay in preventing future oil spillage destroying environmental resources. Also included in the questions are the factors that affects the willingness to pay of the residents. The data collected were analysed using Frequency Distribution, Contingent Valuation Model and Binary Logistic Regression Model.

The Frequency Distribution was used to determine the socio–economic characteristics of the residents who are affected by oil spillage while the Binary Logistic Model based on the Contingent Valuation Method was used to analyse their willingness to pay (WTP) for a benefit and explain the socio – economic factors influencing the residents' willingness to pay (WTP) for environmental resource protection. Binary Logistic Regression model is

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characterized by binary dependent variables with mutually exclusive and exhaustive outcomes. The equation is stated below

$$\text{Probability (yes)} = 1 - \{1+\exp(-a+\beta A\})^{-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Correspondingly, the mathematical expectation of WTP is

$$E(WTP) = \frac{1}{1+e^{-(b_0+b_1X_i)}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Where a and β are coefficients to be estimated with logit statistical techniques and A is the amount of money the household was asked to pay.

EWTP is Expected Willingness to Pay.

Bo, b_1 is regression coefficient for variables.

Table 1: Operationalisation of Variables

Variable code	Definition of variable	Measurement scale
X_1	Willingness To Pay	1 = Willing, 0 = Not willing
X_2	Age of individual	Actual years
X_3	Occupation	1 (farmers), 0 (others)
X_4	Religion of individuals	1 (traditional), 0 (others)
X_5	Income level of individuals	Actual amount
X_6	Household size	Actual number
X_7	Level of education	1 (lower level), 0 (higher level)

Table 1 above shows the definition of variables used in the model and their measuring scale.

RESULTS AND DISCUSSION OF FINDINGS

Background Information of Respondents in the Communities

This section presents the background information of the victims of oil spillage according to their age, religion, level of education, occupation, income and number of households.

Table 2: Background information of the Respondents in the Communities

Characteristics	Frequency (f)	Percentage (%)
AGE		
20-30 years	78	31.2
31-40 years	91	36.4
41-50 years	54	21.6
Above 50 years	27	10.8
Total	250	100
RELIGION	88	35.2
Christian	0	0
Muslim	64	25.6

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Traditionalist	98	39.2
Christian plus Tradition	250	100
Total		
LEVEL OF EDUCATION	20	8.0
No formal education	40	16.0
Primary School	120	48.0
Secondary School	70	28.0
Tertiary Education	250	100
Total		
OCCUPATION	31	12.4
Civil Service	25	10.0
Artisans/Business	66	26.4
Farming and Fishing	34	13.6
Farming only	16	6.4
Fishing only	78	31.2
Farming/Fishing plus others	250	100
Total		
INCOME DISTRIBUTION		
(Range ₦)	100	40.0
10,000-50,000	81	32.4
51,000-100,000	35	14.0
101,000–150,000	10	4.0
151,000-200,000	24	9.6
200,000 and above	250	100
Total		
HOUSEHOLD SIZE	33	13.2
Single	57	22.8
2-5	125	50.0
6-10	35	14.0
Above 10	250	100
Total		

Table 2 showed that 89.2% of the respondents are between the ages of 20-50 years while 10.8% are above 50 years. This is an indication that majority of the respondents are in their prime age and active. Thus their ability to go about their daily activities in order to earn income with which to cater for their family basic need may be interrupted by the negative effect of oil spillage. Also the proportional distribution of respondents level of education showed that 16% of the respondent have primary education, 48% have secondary education, while 28% have tertiary education. Only 8% of the respondents have no formal education. The findings showed that an average respondents is aware of his environment and what to pay to protect the environment from damage. Also since a considerable number of the respondents are literate, they are able to supply information that is required for this research work. The Table also revealed that 35.2% of the respondents are Christian, 25.6% are traditionalist while 39.2% are both Christians and traditionalist. The implication of the finding is that a considerable number of the people though Christians also place so much

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value on their sacred places such as shrines, forest/trees, and some river species which are most times destroyed whenever there is spillage. From the Table, majority of the respondents (77.6%) are into farming and fishing. This implies that majority of the respondent depend on their natural environment. For many, the environmental resource base, which they use for agriculture, fishing and collection of forest product, is their principal or sole source of food. Pollution and environmental damage, therefore, pose significant risks to their existence. Also majority of the respondents fall within the household size of 6 -10 persons (50%) and above 10 persons (14.0%). The implication of the findings is that the household size will affect per capita expenditure. The result of the distribution of respondents according to the average monthly income (in naira) from the Table indicate that 40% of the respondents earn between ₦10,000 - ₦50,000, while 32.4% earns between ₦50,000 - ₦100,000, The income of a respondent is a function of the type of job/business and sometimes the level of education. The overall implication is that for the community people, environmental quality and sustainability are fundamental to their overall well being and development.

Estimation of Willingness to Pay (WTP) to Protect Environment resources

The respondents were asked if they would vote 'for' or 'against' if government sets up a programme/policy requiring them to pay certain amount as tax from their income, so as to prevent oil spill from destroying the environment/natural resources. The result is detailed in Table 3.

Table 3: Descriptive statistics of WTP distribution

Bid Amount(₦)	**100,000**	**500,000**	**1,000,000**	**1,500,000**	**2,000,000**	**2,500,000**	**SUM**
Sample size	17	34	74	58	45	22	250
WTP > 0	14	28	60	53	42	20	217
WTP = 0	3	6	14	5	3	2	33
Y(WTP>0)%	82.4	82.4	81.1	91.4	93.3	90.9	
N(WTP=0)%	17.6	17.6	18.9	8.6	6.7	9.1	
Population (%)							
Y(WTP>0)	5.6	11.2	24.0	21.2	16.8	8.0	86.8
N(WTP=0)	1.2	2.4	5.6	5.6	1.2	0.8	13.2

Mean WTP = $\frac{1}{n}\sum_{i=1}^{n} y_i$

Mean WTP = ₦948,018.43

Table 3 above showed that majority (86.8%) of the respondents voted 'for' while 13.2% of the respondents voted 'against' government policy requiring them to pay certain amount as tax from their income so as to prevent oil spillage from destroying the environment/natural resources. Those that voted in support of payment of tax if need be, were asked in a closed-ended question what they would be willing to pay to keep their natural resource intact, free from pollution.

Result from the Table revealed that 5.6% of the respondents are willing to pay the lowest bid of ₦100,000.00 and 8.0% of the respondents are willing to pay the highest bid of ₦2.5m.

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Factors influence Willingness to Pay to Protect Environmental Resources

To determine the factors that influence willingness to pay, the Binary Logistic Model was used and the result is detailed in Table 4.

Table 4 : Factors affecting Willingness to Pay (WTP > 0, N = 250)

Characteristics	B	S.E	Wald	Df	Sig	EXB (B)
Religion	0.845	0.511	2.727	1	0.990	2.826
Age	-0.010	0.022	0.215	1	0.643	0.311
Income	0.000	0.000	0.872	1	0.350	0.334
Household size	0.049	0.135	0.132	1	0.716	3.103
Nature of job	-0.395	0.414	0.909	1	0.340	5.715
Occurrence	0.673	0.535	1.583	1	0.208	0.942
Education	0.009	0.440	0.000	1	0.983	0.951
Constant	0.305	0.352	0.752	1	0.385	1.357

Table 5: Expected Willingness to Pay Per Unit in Odds

X	B_0	B_1	E (WTP)	Odds	Change in Odds
0	0.305	1.440	0.424	0.734	
1	0.305	1.440	0.851	5.711	7.750

Table 4 showed the factors that determine the respondents willingness to pay for environmental resources protection in the study areas. The Exp B values presents the extent to which one unit influences the odds ratio when the corresponding measures is been raised or increased. From the Table, religion (2.826), household size (3.103) and nature of job (5.715) were the important socio – economic factors that influenced the respondents willingness to pay (WTP) for environmental resources protection. For instance when the nature of job (farming and fishing of the respondents) increases by one unit, the odd ratio has 5.715 likelihood to determine willingness to pay for the protection of environmental resources in the study area. Also, a unit increase in religion has 2.826 likelihood to determine willingness to pay while a unit increase in household size is 3.103 likely to determine willingness to pay for environmental protection.

From Table 5 the expected willingness to pay is 0.851. This means that the highest amount expected from the respondents that chose the lowest bid of ₦100,000 would be ₦85,100 (N100,000 X 0.851) while the respondents that chose the highest bid of ₦2,500,000 is expected to pay ₦2,127,500 (2,500,000 X 0.851). From the above analyses, it is clear that the ratio in terms of change in odds is greater than one which indicates that as the predictor increases, the odds of WTP increases.

CONCLUSION AND RECOMMENDATION

The communities of Uzere Kingdom and Emadadja are willing to pay an amount for the protection of environmental resources damage caused by oil spillage. Out of the two hundred and fifty (250) respondents, 86.8% were willing to pay (WTP) while the rest declined.

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Meanwhile, the anticipated results in the study showed that WTP is influenced by bid amount, religion, household size and nature of job.

In view of this, the government should do all it takes to protect environmental resources of its citizen especially in the oil producing areas. Laws enacted should be strictly enforced so that offenders should be brought to book.

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