Estimating the Values of Wetlands in Riparian Communities: A Tool for Decision-Making in Planning

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ABSTRACT

In spite of the importance of wetlands to the environment and most especially to the host communities, wetlands are constantly under pressure for conversion to other forms of use by policy makers. The reason for undervaluing the significance of wetlands is possibly due to lack of data on its values for it is not easily measured like other environmental goods. This study therefore adopted the use of Contingent Valuation Method (CVM) to measure the direct use values and non-use values of riparian wetlands to the communities in Lokoja, Nigeria. Four hundred and ninety four (494) households were surveyed in seventeen (17) riparian communities involving a series of focus group discussions and questionnaire administration. Our findings show that both direct use values and non-use values of the wetlands exist and majority of the people were willing to pay for these values. Most of them were also against conversion of the wetlands to other forms of use. The mean estimate of non-use values was however more than that of direct use values. Unfortunately, non-use values are not usually considered in decision making concerning wetlands conversion to other forms of use. The estimates of the values of the wetlands to the local communities as found can be used as a basis for argument by planners for its conservation and not conversion.

KEY WORDS: Wetlands, Contingent Valuation Method, Direct use values, Non-use Values

Introduction

Wetlands have been described as both "the kidneys of the landscape" and "biological supermarkets" because of its functions in the hydrological and chemical cycles and as extension for food webs and support for biodiversity respectively (Gren *et al.,* 1994; *Barbier et al.,* 1997; Boyer and Polasky 2004). Barbier *et al.* (1997) also referred to it as the transitional zones between the aquatic and the terrestrial environment or generally, the intermediary between the permanently wet and permanently dry environment. Getting a precise description or definition of wetlands is pretty difficult because of variety of types and diversity in boundaries definitions across the globe.

Wetlands values are generally classify into use values and non-use values (Barbier *et al*., 1997; Kulkarni and Ramanchadra 2006). Oglethorpe and Miliadou (2000) categorize it into three, by simply breaking down the first category, that is the use values into direct use values and indirect use values and the non- use values**.** Typically the use values involve some human interactions with the resources whereas non-use values do not have direct interactions

but are use passively (Kulkarni and Ramanchadra, 2006). The direct use values are the benefits provided by wetlands which are of direct use to the people (Oglethorpe and Miliadou 2000; Kulkarni and Ramanchadra 2006; Barbier et al., 1997; Brouwer et al., 1999). While the indirect use values refers to the functional services which the wetlands provides to the society, whose benefits are direct but it implies (Oglethorpe and Miliadou 2000). Non-use values are the intangible non-marketed values we derived from preservation of environmental assets, being refer to as passive, current or future use values, whose values rest merely on the continual existence of that resource and is unrelated to its use, sometime referred to as diversity or attributes (Oglethorpe & Miliadou, 2000; Anderson, 2010; Kulkarni & Ramanchadra, 2006; Barbier *et al.,* 1997). The non-use values are hard to measure because they are not sold in the market. A subset of the non-use value is referred to as bequest value (Barbier *et al.,* 1997). This a high value placed on the conservation of wetlands by the older generations for the use of their children. Barbier et al. (1997) observed that bequest value is usually rated high because wetlands users will want to pass their ways of life that has evolved in conjunction to the features of the wetlands to their heirs and future generations.

Wetlands ecosystems support and provide goods and services to millions of people worldwide within and outside its boundaries. In spite of these gains however, wetlands are faced with constant threats as a result of human activities at local and regional levels (Gren *et al*. 1994). Generally wetlands are being regarded as wastelands which harbour diseases such as malaria (Barbier *et al.,* 1997) and schistosomiasis (Ajibola *et al.,* 2011). This belief has led to its potentials being disvalued and most times treated as wastelands, drained or otherwise degraded (Barbier *et al.* 1997). While some observed that, it's open access nature and being mostly regarded as public goods, makes decisions regards its usage and conservation usually low (Brander *et al.* 2006).

However in recent years there is increasing awareness on the importance of wetlands functions, products, attributes and archaeology (Barbier *et al.,* 1997). This is exemplified by several countries enacting policies that prohibit further loss or degradation and encouraging sustainable use of wetlands and demanding more research undertakings to quantify its values. Several international bodies are therefore in the forefront of promoting research, analysis and information dissemination on economic valuation of natural systems, wetlands inclusive (Barbier *et al.,* 1997). As component part of the environment, its conservation or conversion has to be valued, so that its present or future use will be based on the principle of sustainability. This becomes the basis for choosing its goods and services against other competing alternative uses.

The non-capturing of wetlands values in decision making is due to lack of data on the economic estimate of wetlands. Like other natural world, wetlands are often rated as having zero values in the political arena because of lack of tool in expressing its gains or losses in monetary terms (Boyer & Polasky 2004). The problem emanate from the fact that wetlands values are not usually sold in the market. Knowing its values in economic terms is therefore a difficult task. Lindsey (1994) concurred and asserts that lack of suitable methods for quantifying the worth of public goods has been the basic problem planners' face in valuing natural resources. However thirty years of research he said has led to the adoption of the CVM as a technique for coping with the above problem. Wattage *et al.* (2000) also reported that CVM has been accepted as one of the renowned techniques available in placing values in immeasurable environmental goods in monetary form. The whole essence of CVM is to place economic values through monetary estimates on measurable and immeasurable environmental goods that are not sold in the market.

This is done by asking how much an individual will be willing to pay or willing to accept for specific environmental goods. Pearce *et al.* (2002) noted that a number of scientists are completely or partially not bothered on what people care about. Garrod & Willis (1999)

are of the opinion that the society should be given the chance to choose the quality of environmental goods it wishes to keep or produce amidst other goods and services since choices logically represent some form of valuation. Hanley *et al.* (1997) posit that, "Economists have a distinct definition of value based on the ideals of rationality and consumer sovereignty- an individual consistently knows what he or she wants and needs (rationality) and is best able to make choices that affect his or her own welfare (consumer sovereignty)".

Unfortunately, exploring the use of CVM to solving planning problems in practice or research has being scanty especially in the developing world. Unlike other disciplines, health sector in particular have sizeable evidence for using the method to improve its practice (Klose, 1999, Hanley et al., 2003, Smith, 2008, Martín-Fernández et al., 2010)

When the economic value of the wetlands or other types of environmental resource for that matter is handy, planners can use that to compare cost and benefits with any intended future alternative plan by government. This becomes the basis for the planners to mediate between the wetlands local users and government and arrive at acceptable sustainable decision on wetlands. Especially in the light of the fact that, recurring issues on resource management disputes generally are not necessary technical in nature but are rather the questions of values

Hooper & Mcdonald, (2010) have also observed that, in many occasions, planners and managers often deals more with resource conflict resolution than the management of a resource or the environment itself. Consequently, when decision makers don't have sufficient information on wetlands, it would result to taking inferior decision that will not benefits the society (Boyer & Polasky, 2004). In Africa for example, where decision-makers don't usually have clear understanding of the economic values of wetlands, protecting the wetlands are consequently not taken as serious alternative (Schuyt, 2005). The planners therefore have the task of supplying policy makers with vital information that will aid in decision making concerning the wetlands. Moreover, most planning and development decisions these days are based on economic grounds and more frequently on the basis of the forces at play in the free market system (Barbier *et al.* 1997). Politicians desire a straight forward answers to hard questions on issues bordering on the ecological and environmental priorities and wish to have measurable economic techniques that will enhanced their decision concerning investment in environmental improvement (Coker & Richards, 1992).

The planning profession therefore has a crucial role to play in sustaining the natural environment. In order to achieve environmental sustainability, appropriate planning, conservation and management of natural resources becomes the necessary tools (Alwi *et al.,* 2011). Taylor (2010) is also of the opinion that, planning should be all inclusive, not just the physical built up environment, but should incorporate the planning and management of the environment in its entirety with emphasis on the natural environment taking cognisance of its peculiar ecology and unique habitats. He further assert that, spatial planning should go beyond traditional land use planning to bringing together or integrating policies for the development and use of land with other policies and programmes which influence the nature of places and how they function. The wetland is a unique component of the environment, there is need to understand its unique nature and how its function as this will enhance planning decisions concerning its utilisation.

Environmental valuation is believed to be one of the tools that can provide answer to the question of how to measure sustainability. Coker & Richards (1992) opined that though it is important that government has accepted sustainability as the key environmental concept of the day, as it serves as a trade–off between economic growth and maintenance of, or improvement in environmental values, the question of what these values are and how the trade-off can be effected, is yet to be answer clearly and definitely. These are the values that environmental valuation of our natural resources and the wetland in particular tends to

provide. This is to be done so that, government, politicians, planners and environmental managers can make informed sustainable decisions on the basis of empirical estimates in place of vague assumption. Wetlands are component part of the environment, its conservation or conversion has to be valued, so that its present or future use will be based on the principle of sustainability. The goods and services in wetlands must be quantify or given value if their conservation is to be chosen against other competing alternative uses of the land itself or the water which feeds it (Barbier *et al.*, 1997)

The study explores the use of CVM through willingness to pay (WTP) approach to value the wetlands in the riparian communities of Lokoja. CVM is being used in the context of this study as a tool to measure the economic values of the wetlands based on the local users' perception. This will serve as background in aiding future planning decision on the wetlands by both planners and politicians. It is hope that the economic estimates of the values of the wetlands will provide scientific ground for comparing cost and benefit of either conserving the wetlands or converting it to other uses. The study therefore aim at using CVM to establish the economic values of the wetlands in the riparian communities of Lokoja, Kogi state Nigeria. The study objectives is to identify the various ways in which the local people benefits from the wetlands and how much individual households will be willing to pay for the identified uses.

Lokoja is the state capital of Kogi state and situated in the north-central geopolitical zone of Nigeria. The Lokoja master plan takes its focal point form the general post office at 16 kilometre radius and covers an area of 106, 203 hectares of land. The town is located at the confluence of river Niger and Benue the two major rivers in the country, as shown in Figure 1. Hence sizeable wetlands are found along the banks of these rivers stretching from Lokoja town to other riparian communities in three other neighbouring local government areas.

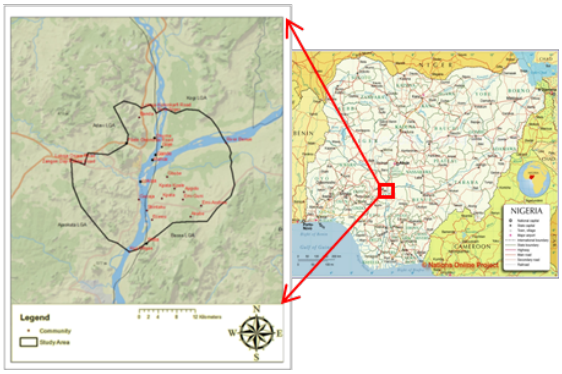

Figure1: Map of the Study Area

Even though the local people derived several economic benefits from the wetlands, the true economic value of these benefits has not been established empirically. The Kogi State government has not delineated the wetlands as area of economic value to the local people. More disturbing however is that the Federal Government of Nigeria is considering building a river port in some portions of the wetlands without first assessing the economic values of the wetlands to the local people who will be affected by such decision. If the plan is allowed to be implemented, the local communities are going to be denied access to the wetlands for farming, fishing and other related activities. In spite of the fact that the impact of such decision on the local communities is glaring as both their source of food and income will be affected, regrettably they may not be consulted. Previous antecedences have shown that the interests of local communities are rarely considered when decisions are made on natural resource like wetlands.

Although the proposal is still a speculation, there is no doubt that it might be implemented in no distance time. The government may on false assumption think that the local communities are not seriously benefitting from the wetlands. Another possibility is that even though the government may be aware of the dependency of the local people on the wetlands, but assumes that the river port could be of greater economic value to the local people. Worse still is the lack of convincing economic statistics on the values of the wetlands that will convince the government that the local people are deriving measurable economic values from the wetlands. It becomes needful therefore to measure the economic values of the wetlands to the riparian communities. Only on this basis can the government be convinced that the local people are deriving measurable economic values from the wetlands and take cognisance of these values on decision making. It is hope that planners can use the economic estimates as a tool for negotiations between the local people and the government as potential future resource conflicts over the wetlands is envisaged.

Methodology

Seventeen riparian communities were sampled from the identified 54 riparian communities. Selections of the sampled communities were purposeful and based on two criteria. The first criterion was close proximity to the river fronts and the second is those communities with highest population of wetlands owners or users who are actually depending on the wetlands for subsistence living. The reason for this was to focus on target community and to cover a wide range of population in the study area. Systematic sampling was adopted since the population of the riparian communities is homogeneous in nature. Households were the unit of measurement, and every second household in the sample communities were selected. Household heads or representatives were the target respondents. Personal interview was adopted and 494 questionnaires were administered with the help of enumerators.

Focus group discussions and pilot test preceded full study implementation as recommended in contingent valuation literature ((Mitchell & Carson 1989; Shyamsundar & Kramer 1996; Brouwer 2000; Whittington 2002; McNally & Mohd. Shahwahid, 2003). The focus group discussions and pilot test improve and change some aspects of the designed plans to fit the cultural setting of the study communities. The heads of household were first asked to identify the various economic values of the wetlands and to indicate their WTP for the identified values.

Data analysis was done with the use of Statistical Program for Social Sciences (SPSS). Outliers were identify through the use of boxplots (Pallant 2007), and the decision rule was to adjust outliers to the next values systematically until a perfect boxplot was obtained. The mean value for the direct use values and non-use values were obtained through descriptive statistics. Student t-test was however used to establish if difference exist between the mean of the two values. In other to identify the factors that predict WTP, bids were regressed against the socio-economic variables of the heads of households through multivariate regression analysis. Contingent valuation literature recommend this as a way of determining the socio-economic variables of the respondents that influence their WTP statistically (Mitchell & Carson, 1989; McNally & Mohd. Shahwahid 2003). The annual incomes of the respondents were arrived at based on the annual financial gains from the wetlands in terms of annual of harvest. All the elicitation formats were pre-tested so as to arrive at an acceptable and plausible format. Open ended elicitation format from the focus group discussion and pilot test was the most acceptable technique.

Results and Discussions

Table 1 shows the identified values of the wetlands as perceived by the local wetlands users. Two forms of values were identified, that is direct use values and non-use values. Farming was identified as the core direct use value of the wetlands while bequest value was identified as the core non-use value. Apart from the direct use and non-use values of the

wetlands, other forms of secondary uses also exist which are also directly or indirectly linked to the wetlands as well, as shown in the table.

Table 1: Economic Values of the wetlands

Uses	Frequency	Percentage (%)
Primary:		
A. Direct Use		
Farming	492	99.6
Fishing	2	0.4
Total	494	100
B. Non-use		
Ancestral	4	0.8
Cultural	4	0.8
Bequest	459	92.9
Existence	25	5.1
Missing Values	2	0.4
Total	494	100
Secondary:		
A. Direct Use		
Fishing	304	61.5
Boat Operators	53	10.7
Boat Making	45	9.1
B. Other Activities		
Trading	83	16.8
Teaching	3	0.6
Mechanic	2	1.4
Carpentry	4	0.8
Total	494	100

Table 2 presents results of bids estimates for the wetlands direct use and non-use values in accordance with the frequency of responses. Most of the respondents represented by 70% were willing to pay for the direct use values as indicated in the table. Their WTP mean estimate is N200.572.67 ($1,266.24). The remaining 30% of the respondents however were not willing to pay, and the core reason for not willing to pay is basically linked to lack of affordability. This is an indication their votes does not translate to zero bids, since the respondents had expressed reasons for not willing to pay.

Table 2**:** Mean Score of Identified Values

	Willing	Not willing	Mean
Direct Use Values	344 (70%)	150 (30%)	N200,572.67 ($1,266.24)
Non-use Values	360 (73%)	134 (27%)	N238,411.11 ($1,505.12)

For the non-use values, 73% of the respondents shown WTP, a figure little above that of the direct use values. Their mean stands at N238,411.11 ($1,863.16). Since bequest value was identified as the core non-use values, this suggests that majority of the respondents were willing to ensure that the wetlands are conserved for their children and future generations. However those who were

not willing to pay for the non-use values did so mainly on the basis of the fact that the wetlands are their property and they are not expected to pay for what is theirs before passing it to their children

Even though the means of non-use values are higher than direct use values, a paired sample t – test was performed to show if the difference was significant. The results show significance difference. The mean of the direct use values of (M = 200572.67 SD = 167321.27) is significantly less the mean of the non-use values of (M =246415.70, SD = 144195.34); t (-17.352) = .343 P < .05 (two-tailed). The eta square statistics is 0.10 which according to Cohen (1988) indicates large effect size. This result shows that the perceived non-use of the wetlands are rated above the direct use values. Unfortunately when policy decisions are made on natural resources like wetlands, the hidden non-use values are rarely measured. Oglethorpe & Miliadu (2000) had mentioned that even though non-use values of the wetlands exist for local people but must times when it comes to decision making, such values are never taken into consideration.

In order to show where lays the difference in mean of the two values, the range of bids estimates is presented graphically in Figure1.This shows the characteristics of the bids of the two and why the mean of non-use values was more than direct use values.

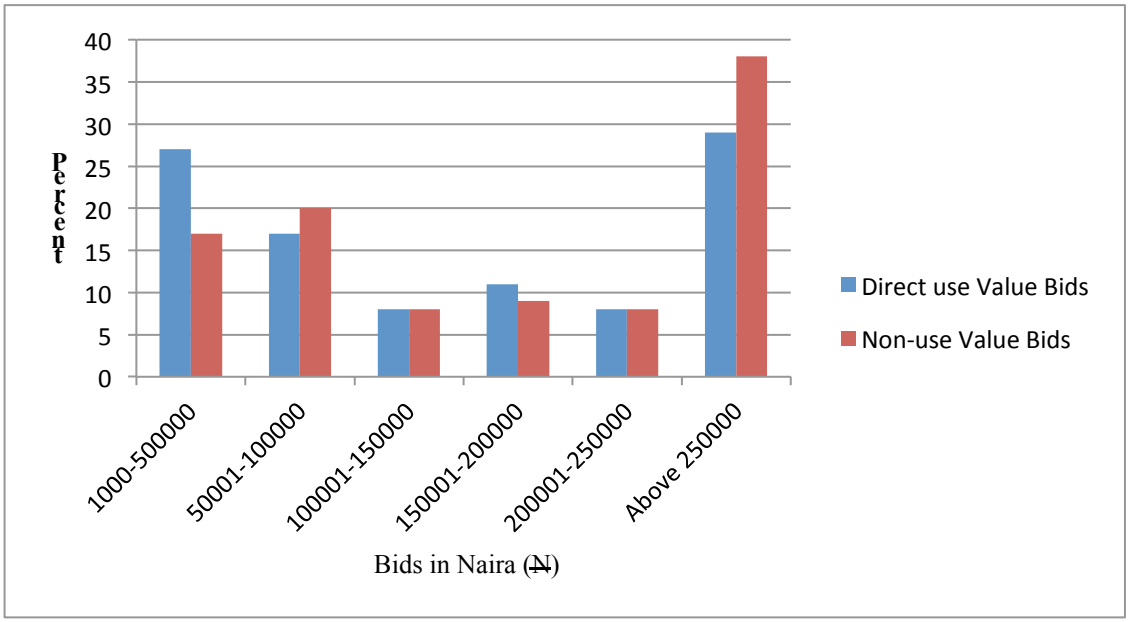

Figure 1: Bids Estimates of the Wetlands

The distribution of bids for both direct use and non-use values are higher at the lower and higher range as shown in the Figure. However while the peak bids estimates for the direct use values is at the range of N1,000.00 – N50,000.00 ($6.15 – $307.78) and above N250,000.00 ($1,538.94) represented by 27% and 29% respectively, the peak of non-use values is at the range of above N250,000.00 ($1,538.94) represented by 38%. This is an indication that the respondents were willing to pay higher bids for non-use values compare to the direct use

values. This explains why the mean of non-use values is significantly higher than direct use values.

The result of the regression analysis test show that the tolerance values for all the independent socio-economic variables are not less than .10, the diagnostic test suggests that multicollinearity assumption was therefore not violated, and this is supported by the VIF values which are well below the cut-off of 10. The result shows a significant relationship between WTP and the socio-economic variables of the respondents where $F= 19.7$, $p < .001$. Positive relationship was however found with only Length of use of the wetlands (beta = 0.22, $t = 3.78$, $p < 001$), and annual income of heads of households (beta 0.42, $t = 8.59$, $p < 001$). However annual income was found to be a better predictor among the two. This is an indication that the longer the period of use of the wetlands determine how much households were willing to pay. In terms of income, it shows that households who harvest more goods from the wetlands were willing to pay more compare to those who have less harvest. Even though significant relationship was also found with household size but in this case a decrease in relationship, where (beta = 0-.14 $t = -2.31$, $p < .001$). Unlike length of use and annual income, in this case households with larger sizes were willing to pay less compare to those with smaller household. This suggests that the larger households were cautious in bidding probably because of the enormous domestic responsibilities. So they were careful in bidding since they have other areas where they are expected to spend money. Age and educational backgrounds of the respondents were not significant in determining WTP for the wetlands.

The adjusted R^2 value is 0.23. In spite of the fact that the R^2 value appear to be low, it is well above the recommended minimum of 0.15 R^2 value for a reliable contingent valuation study (Mitchell and Carson 1989). Moreover Wattage et al. (2000) have also reported that typical R^2 for cross- sectional data are not usually high. However the R^2 value reported here is within the range of findings of other studies, where Kotchen & Reiling (2000) got 0.21 and 0.26 while Wattage *et al*. (2000) got 0.23.

Conclusion

The study has identified the various ways in which the local people in the riparian communities of Lokoja derived economic values from the wetlands. The economic estimate of the values of the wetlands has also been established. Planners can use these estimates as benchmark for initiating discussion with all parties concerned on how best the wetlands in the riparian communities can be put to use. The estimates values obtained from the local users of the wetlands may serve as a tool for cost- benefit analysis in relation to any alternative use proposals. If the values of the wetlands as perceived by the local communities are considered in decision making, technically the local people would have participation in decision making on what affect them directly or indirectly. We share the same view with Oglethorpe and Miliadou (2000) in advocating that, the sustainable management of the wetlands demands that, it should be used in such a way that local wealth of the local people are not jeopardised. Planners as custodian of the natural environment and the wetlands have vital role to play in this regard. Further study may consider attempting the use of the CVM in valuing wetlands or other related environmental resources in similar local communities so that the findings of this study may be confirm, modify, enhanced or challenged.

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