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Evaluating the Role of Payment Vehicles in the Non-market Valuation of Riparian Habitat Protection in Kenya

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Abstract: Riparian habitats (RH) have been known for provision of essential service (Environmental conservation, scenic beauty and recreation) among others. In Kenya, these habitats are under pressure from human encroachment. Recently, the Kenya National Environmental Management Authority (NEMA) demolished structures along RH to promote their health. The intervention could be rational with economic and environmental implications on RH protection, but empirical evidence is lacking. Therefore, understanding the role played by payment vehicle (PV) in valuation of welfare estimates could explain the observed behavior. Multistage sampling design was used to sample 774 households. Stochastic Payment Card (SPC) and Multiple Bound Discrete Choice Payment Card (MBDC) generated the data. Data were: - collected through interview schedule, analyzed using two stage random valuation model and processed with STATA. Tax exhibited a consistent and higher mean WTP value than Trust. Determinants (Age, Gender, Income, Necessity to protect RH (NPRH), Distance, Household size, Certainty of future incomes (CFI), Elicitation Format (EF) and PV significantly influenced WTP values. Standard deviations of WTP distributions were significantly influenced by (Distance, Education level, Age, EF, Change in PV, CFI, Household size, NPRH and Land ownership). Change in PV influenced welfare estimates at 1% significance level, thus rejection of overall null hypothesis (Changing the PV does not significantly affect individual welfare estimates towards RHP in Kenya). The Kenyan residents were willing to pay positive amounts for RHP and were supportive of the Tax fund given that it exhibited higher and consistent WTP estimates contrary to what is desirable in contingent valuation studies. Moreover, Tax as a PV worked well with SPC data generation format even though it overstated the WTP values, the estimates were consistent.

Keywords: Contingent Valuation, Willingness to Pay, Stochastic Payment Card (SPC), Multiple Bound Discrete Choice Payment Card (MBDC), Payment Vehicle (PV), Tax, Trust

1. Introduction

1.1. Background of the Study

Studies linked to protection of environmental goods and services are many and literature is huge on economic valuation using stated and revealed preference approaches. However, revealed preference method has been criticized due to its failure to effectively measure non-use values which lack market value [50]. Stated preference methods such as contingent valuation (CV) allows for elicitation of non-use values because of its simplicity and flexibility [3, 4, 61, 41, 50], and that is why it was adopted in this study. Moreover, its application on valuation of other environmental goods such as riparian habitat protection (RHP) is limited [45].

The word riparian habitat (RH) owes its origin from the Latin word 'riparius' which means "of or belonging to the bank" implying that any area or land adjacent to the water bank is regarded as a riparian area or reserve [29, 47, 58]. Reference [30] clearly defines riparian zone as "land within a minimum distance of 6 meters and a maximum distance of 30 meters from the water course [58, 37, 36, 47]. Whenever the conditions or environment in the riparian areas are favorable to support biotic systems, then these areas become riparian

habitats (RH) which simply means a home for riparian resources. RH have been known over time for their provision of essential services such as hosting flora and fauna, acting as wildlife corridor and habitats, ecosystem services which contributes to both ecological and environmental conservation among others [36, 49].

Despite the importance attached to the RH, in Kenya, these habitats have been endangered by frequent urban subdivisions, construction of residential and commercial buildings and other structures, human settlements, industrial activity and urban agriculture. Their health, has been degraded by dumping of solid wastes, discharge of harmful chemical effluents and untreated sewages into these areas, hence hindering their proper functioning and provision of essential services [48, 36, 40]. In a quest to protect these habitats, the Kenyan government in partnership with non - governmental organization (NGO's) have been holding educational campaigns on the benefits of RH and ecosystem protection, which is in line with different provisions of the law. Emphasis has been on RH support for flora and fauna, regulation of water bodies, mitigation of floods and adoption of environmental friendly agricultural practices among others as per [11].

With the existence of different Acts and laws in regard to environmental conservation, it is expected that the construction of buildings and structures on these areas, coupled with environmental unfriendly agricultural practices, should be prohibited. However, in Kenya, urban agriculture, human settlement, erection of commercial buildings, and dumping of solid wastes is on the rise on these areas. This raises questions to any researcher on why the observed behavior, could it be happening that most people view these habitats as public good? Is it that individual interests and benefits surpasses societal benefits? Could it be that there are no proper policies on protection of these habitats? The observed scenario called for measures to combat people encroachment into these habitats in order resuscitate the lost glory of the Kenyan RH.

In Kenya, the government has been slow in protecting RH simply because there is no single sectoral Act or law or provisions governing the use and protection of these habitats. Mostly, there is tendency to rely on general principles of environmental law and other general provisions from the Constitution and enabling Statutes to manage the riparian zones [36].

1.2. Empirical Reviews on Contingent Valuation and Payment Vehicle

Approximation of welfare values using contingent valuation is not new [3, 8, 61] opines that a good contingent welfare valuation study should comprise of payment vehicle (PV) which provides the context for payment [15, 16].

PV is the mode of payment for the environmental good or service in question. Some of the commonly used PV's are monetary and others non –monetary for example labour hours and payments in kind [18]. Monetary PV's include: - cash as used by [31], taxes, entrance fees, amenity bills, trip expenditures, donations among others [45, 8, 16]. Literature has shown that care should be exercised when choosing the PV's to be used as some vehicles can raise objections and protest responses among survey participants and hence bias the survey results [23, 45].

Some studies prefer payments to the special fund kitty which can be one-time lump sum or recurrent payment depending on the nature of the good in question [12]. As a general rule, something which looks like a capital investment, such as setting aside a wilderness area, should use a fixed lump sum payment mechanism while other goods and services which could become extinct if there were not continued payments, should consider using a recurring payment [12, 61] Given the fear that RH's in Kenya could easily be extinct, this study considered a regular payment to the special fund.

The use of PV has been shown to influence welfare estimates [51, 39]. Reference [51] observed that the use of taxes in valuation of public moral good led to higher WTP than voluntary mechanisms. In addition, they noted that other PV's which forms part of people's utility function but not directly related to the good and are not subject to any budget constraint will inflate WTP values. Reference [39] observed that use of implicit PV's underestimated welfare estimates, an observation which was empirically proven to be true by this study. Reference [40] argues that as much as the use of taxes is common in valuation of environmental goods and services, taxes are centralized and hence their distribution towards regional needs could be challenging compared to voluntary donations and contributions. This study opted for comparison of the use of trust fund and tax fund, given that the study was conducted in Nairobi county which is the capital city of Kenya with a very high population, and majority are employed. Moreover, following the devolution and delocalization of services to county levels, it was presumed that the tax to be collected was meant specifically for protection of RH within the city of Nairobi.

References [38, 51] used tax as the vehicle and it was realized that for a coercive tax setting, individuals were willing to incur costs in the form of higher taxes that provide benefits or transfer income to others when the good is public, an observation very close to the findings of this study where tax elicited higher WTP for protection of RH.

Reference [26] compared the use of money and labour payments, and it was realized that payment in money was less acceptable. Payment in working days was flexible and acceptable, however these findings are limited in application where samples are split and where data is elicited using different uncertainty preference elicitation formats, hence the use of stochastic and multiple bound dichotomous cards. Similarly, [25] realized that the intensity of preferences measured in monetary terms (or in total WTP) differed according to the PV used, a hypothesis which proved true in this study.

References [60] noted that the manner in which collections towards and spending from a trust fund for the purpose of environmental projects, can easily influence WTP values.

Some of the payment vehicles tend to be inseparable from their collection points and the manner in which they are administered. For example, taxes are set and can only be collected by the government unlike by local project implementers. However, with devolution it could be easier to set policies which favor exclusive collection of environmental taxes at county levels.

Computation of willingness to pay (WTP) as a proxy for welfare estimates in contingent valuation is common and measurement of individual WTP values do vary. Some studies have treated WTP as fixed [7] hence the use of descriptive statistics and the likert scale to measure WTP. Other studies have treated WTP as stochastic [56, 23 27, 44, 59, 55, 45] hence the use of other models like interval regression, random valuation model and random effects models to measure WTP values. The scope of analysis of WTP values have been expanded to understand one's true stated WTP value and the level of assurance that the individual will make good his stated WTP value [55, 5] hence understanding the effect of this preference uncertainty on the true stated WTP [43] would equally be informative on individual decision making process especially for RHP in Kenya.

The effects of changing PV on welfare estimates have been felt far and wide and it has often been applied in several studies ranging from recreational forests, beach management, conservation of marine fishery reserve and conservation of wetlands [8, 20]. Some scholars have categorized these vehicles into implicit (those with indirect costs) and explicit payment vehicles (those with direct costs). Both direct and indirect payment vehicles have been used in discrete choice experiment studies, where travel costs have been regarded as implicit payment vehicle and entrance fees as an explicit payment vehicle [39, 8] and it has been observed that they do affect individual's preferences and WTP across split samples. However, no similar study had been done on RHP in Nairobi county, hence the need for this study.

The rest of the paper is structured as follows: Section 2 presents the literature review. Section 3 describes the survey methodology. Section 4 presents the empirical results and discussion and Section 5 concludes the paper.

2. Literature Review

2.1. Theoretical Framework

The study used the consumer utility maximization theory which was first developed by Alfred Marshall in the year 1860. Following the theory, the aim of any rational consumer is to maximize utility subject to the budget constraint, or minimize expenditure subject to utility constraint. Hence, consider an expenditure function for a utility maximizing individual from RHP

$$e\ (p, n, x\ u) = y \tag{1}$$

where e is the expenditure function, p is a price vector, n is the state of the RH, x is the individual social economic characteristics, u is the level of utility, and y is the minimum income necessary to allow an individual to maintain utility level in the city. In addition, consider the situation where a policy is proposed for RHP through reduced degradation. The policy, prohibits degradation activities and promotes protection. An individual is then asked about the amount he/she would be WTP towards RHP through reduced degradation. The expenditure function for the initial period before the proposed policy would be:

$$e\ (p, n_o, x_o, u_{o)} = y_o \tag{2}$$

where u_o is the initial level of utility that an individual can enjoy given prices p, n_o is the un-protected state of RH, xo is the individual socio economic characteristics, and y_o represents the minimum level of income required to attain utility level u_o. Since the new policy is expected to improve the state of RH in the city from unprotected to protected, the new expenditure function would therefore be of the form:

$$e\ (p, n_1, x_o, u_o) = y_1 \tag{3}$$

where n_1 is the improved state of RH after the implementation of the proposed policy and y_1 represents the minimum income level required to attain utility level u_o after the implementation of the proposed policy. The level of utility, u_o, is held constant as per the Hicksian welfare measures assumption of utility remaining constant. Therefore, the individual's WTP for improved state of RHP would be a compensating variation (CoV) measure since an individual would have to part with a certain amount for the improvement to occur. The CoV is equal to the individual's WTP and is given by difference between the expenditure functions y_1 and y_0:

$$CoV = WTP = y_{1-}\ y_0 \tag{4}$$

$$\text{CoV} = \{e\ (p, n_1, x_o, u_o) - e(p, n_o, x_o, u_o)\} \tag{5}$$

The improved state of RH denoted by n_1, is supposedly greater than the initial state of the habitat, n_o. As utility and prices are held constant, y_1 (the minimum income level required to attain utility level u_o after implementation of the proposed policy) is less than y_0. Therefore, the CoV would be negative meaning that an individual has to pay some dollar amount to enjoy the improved state of RH. Assuming WTP is stochastic [59, 55], and an individual's true WTP, is known to lie within a given range say (Q_i, Q_{i+1}), then the two stage random valuation model can be used to determine both mean and standard deviation together with their determinants.

2.2. The Multiple Bounded Discrete Choice (MBDC) Card

This card was first developed by [59]. In the card, the respondent is provided with a broad range of bid amounts just like in the conventional payment card method. In addition to the bid amounts, certainty ranges are also provided to allow respondents to express their levels of uncertainty, similar to Polychotomous choice models. The multiple bounded discrete choice data elicitation format

requires individuals to state their preferred bid amounts, followed by individual expression of the level of voting certainty for each bid amount [59, 22] and by so doing the method is capable of introducing respondents' uncertainty into the analysis. The responses will lead to a two dimensional matrix where the first dimension (rows) will show the bid amounts and the second dimension (columns) will show the respondents level of certainty about each bid amount [22, 44, 41]. The certainty voting responses range from choices such as: "definitely yes', "probably yes", "not sure", "probably no" to "definitely no [54, 52].

The advantages of MBDC approach are as follows: respondents are given a wide range of bid values unlike in the conventional payment card, the MBDC circumvents incentives for starting point bias and the difficulty inherent to the process of bid selection. Moreover, MBDC method is slightly more efficient from a statistical point of view than other approaches such as the dichotomous choice (DC) method [2], hence it provides a higher level of precision of its estimated parameters and estimates of central tendency. MBDC format is cheaper to implement and is compatible with mail surveys, hence it avoids expensive personal or telephone interviews required by the DC approach [59, 55]. Lastly the approach is good for policy purposes. It allows benefits of a policy to be measured by respondents who answer definitely yes and if they exceed the budgeted policy costs, then the policy will pass [23]. With MBDC format there is a possibility of inducing the same type of range bias that has been found in conventional payment cards and Stochastic payment card applications. In addition, the approach assumes that the certainty levels are interpreted in the same way by all respondents which is impracticable [55].

2.3. The Stochastic Payment Card (SPC)

This type of payment card was first developed by [57] to establish individual valuation distributions. The SPC is an expansion of the payment card approach and is used capture uncertainty as noted by [55]. Under the SPC data generation format, one is presented with an array bid amounts represented in vertical axis of the payment card whereas voting uncertainty levels are accompanied by probabilistic values and represented on horizontal axis. The uncertainty ranges from as ‘‘definitely yes or strongly agree,’’ ‘‘probably yes or agree,’’ ‘‘not sure,’’ ‘‘probably no or disagree,’’ to ‘‘definitely no or strongly disagree [57, 44, 23, 27, 53].

The respondent is allowed to choose his/her preferred bid amounts accompanied with probability levels measured under uncertainty scale. The choices lead to a response likelihood matrix comprising of both numerical and probabilistic component, that can be interpreted as a record of an individual’s cumulative valuation distribution function [27]. The respondent’s matrix response is assumed to be stochastic and can be used to predict an individual’s true WTP for a commodity under uncertainty conditions [56]. Unlike other approaches, SPC method embeds uncertainty into the analysis by allowing respondents to state their own degree of certainty regarding their answers to each of the bid amounts offered and thereafter perform statistical analysis of the responses factoring the different levels of certainty.

The strength of SPC approach is based on the assumption that an individual’s valuation is best viewed as a random variable with an associated distribution [55]. The major shortfall of SPC method is that it assumes all respondents interpret the certainty levels in the same way, which is unrealistic. Besides, there is a likelihood of raising range bias such as that commonly found in PC applications, if the range values are not obtained from open ended approach. In brief SPC asks an individual to indicate the probability that he will actually pay the stated bid amounts on the payment card together with their associated probabilities which range from zero to one. The probabilities are distributed across uncertainty preferences ranging from definitely yes to definitely no.

3. Methods

3.1. Study Area

The study was conducted in Nairobi County which covers approximately 696 square kilometers with a population of 4.4 million people and a population density of 6,300 persons per square kilometer [14]. The county is located at the south-eastern end of Kenya’s agricultural heartland, at approximate longitude of 1° 9’S, 1° 28’S and latitude 36° 4’E, 37° 10’E. It has an altitude of between 1,600 and 1850 meters above sea level [45]. The county is endowed with well-drained, rich and fertile arable land which supports agricultural production. Almost 8 per cent of the Kenya’s total population and 25 per cent of Kenya’s urban population [13] live in Nairobi. The high population growth coupled with rural urban migration, act as drives of environmental change and major determinants of:- land-use patterns and settlement, consumption patterns and environmental quality [37, 44, 36].

3.2. Target Population and Sample

The study contacted both the riparian and non-riparian land owners available within the RH during the interview period. This population was estimated at 4.4 million people [32]. The composition of this population was heterogeneous due to their diverse socio economic and demographic characteristics besides their perceptions towards RHP. As such, multistage sampling technique was used to select 774 respondents from each of the sixteen locations. However, it is not clear whether this sampling technique is a probability or non-probability sampling method [1]. Most studies presume that it makes use of both probability and non-probability sampling methods, hence its regarded as flexible and broad in scope and that is why it was used in this study [21].

3.3. Survey Technique

Personal interviews (PI) together with interviewer administered questionnaires were used to collect data. PI were chosen to enable the interviewer to motivate respondents to participate fully in the interview process. In addition, PI allows one to probe for more information and also clarify unclear

questions to the respondent [44, 43]. The survey instrument used was a questionnaire, divided into six sections, namely: Section one which sought the respondents' general knowledge of current state of RH in Nairobi, description of the RHP plan, description of the effects of RHP plan, a section describing the costs of the protection plan, valuation questions and lastly questions on respondent's socioeconomic, environmental and demographic characteristics in line with environmental valuation literature [43, 41].

3.4. Survey Implementation

A pre-test of the survey instrument (questionnaire) was done on thirty respondents [7, 44] who were asked to complete the survey questionnaire [17, 43]. In the pretest, respondents were required to comment on the suitability of the questions posed to them, paying close attention to wording, clarity, relevance and interpretation of each question in the survey and other anomalies [5]. From the pretest exercise, the bid ranges for the study were collected and were used to determine the minimum, maximum and mean WTP values. Based on the responses and comments collected from the respondents during the pre-test, a final draft of the survey questionnaire was prepared.

3.5. Environmental Good Valued

The environmental good valued were the RH's using contingent survey design. In Kenyan scenario, RH's have been presumed to be a public good which exhibit the characteristics of any environmental public good such as: - poorly defined property rights, externality and free riding problems, However, there is no empirical evidence to support that assumption. Moreover, the good is non- rivalrous and non-excludable besides being non- marketable hence the use of CVM to elicit WTP for their protection [9].

3.6. Payment Vehicle

A special fund was used as a payment vehicle. In this fund, the respondents were required to make a one-time contribution specifically for the purpose of RHP. The special fund could either be viewed as a trust fund or tax fund depending on an individuals preferred payment vehicle. The use of the special fund was considered given that in other studies it has been regarded as a neutral payment vehicle, which minimizes the emotional reaction and protests and its ability to enhance the plausibility of the hypothetical scenario compared to other alternative payment vehicles [7, 23, 44].

3.7. Valuation Format

The payment card (PC) format was used to elicit peoples' preferences for RHP. Respondents were given cards where they were asked to circle the highest amount they would be WTP for protection. Out of the responses given, inferences were made about their true WTP, which was equal to or greater than the circled value but less than the next higher value [7, 23, 44]. This format was chosen because respondents had the advantage of easily and visually scanning through a given set of value intervals [7, 27, 23, 44] and hence, determine the range within which their WTP lie. The format does not suffer from yeah-saying and starting point bias like other contingent valuation formats [22, 6]. Although PC questions are theoretically susceptible to range and mid-point bias, there is little empirical evidence of the existence of range or mid-point bias [17]. Besides, while the format still has the possibility of yielding protest zeros, it has not been found to give very high proportion of protest zero responses compared to other contingent valuation formats [44] Thus, the valuation question was formulated as follows:

"Suppose the presented policy to protect RH in the city of Nairobi will actually be implemented, what is the maximum amount of money you would be WTP per month for one-year to the special fund to achieve this? (circle or tick a single amount on the card)."

The PC included 15 different dollar amounts, namely: Kshs. 0, 50, 100, 150, 200, 250, 300, 400, 450,500, 550, 1000, 1950 and finally Kshs. 2,000, in which case respondents were only required to circle one single amount on the card.

3.8. Estimation Method

The two stage random valuation (RVM) model was used to test the overall hypothesis that changing the payment vehicle (PV) does not significantly affect individual welfare estimates towards RHP in Kenya. The model assumes that one's WTP denoted say by letter $W_{k,}$ is a random variable which takes a cumulative distribution function say $\lambda(t)$ and the mean value of $W_{k,}$ is μ_k and the standard variance is σ_j, then the WTP model can be formulated as:

$$W_{k,} = \mu_{k,} + \varepsilon_k \quad (6)$$

where ε_k is a random term. Suppose individual k knows her valuation distribution, given a bid price L_{ki}, then the probability of individual k saying 'yes' to the offer L_{ki} is possible, if the WTP is greater than the bid price, or 1 minus the probability distribution of the bid price as shown below.

$$P_{ki} = 1 - \lambda(L_{ki}) \quad (7)$$

Suppose the probability of the k^{th} person saying yes to the bid price L_{ki} is known either through assigning numerical values to the verbal MBDC likelihood data or through asking the individual to state his/her numerical probablistic data as with the SPC format, then equation (7) can be estimated for each individual using the following estimation model.

$$P_{ki} = 1 - \lambda(L_{ki}) + e_k \quad (8)$$

where e_k is the random term which is normally distributed with zero mean and constant variance (δ^2) for respondent k, but different for different respondents. P_{ki} is the regressand, taking any value between 0 and 1. On the other hand L_{ki} is the predictor variable representing bid price for individual k. Assuming the probability P_{ki} takes a normal cumulative density distribution function of the form $\lambda_j(.)$, with a mean μ_i and a standard variance σ_i, such that $\lambda(L_{ki}) = \phi\left(\frac{l_{ki}-\mu_k}{\sigma_k}\right)$,

then the model (8) becomes:

$$P_{ki} = 1 - \phi\left(\frac{l_{ki} - \mu_k}{\sigma_k}\right) + e_k \quad (9)$$

Given that the specific objective of this study is to estimate and analyze μ_k and σ_k, which are functions of personal characteristics and uncertainties among others, equation (9) can be estimated for each individual k using two stage RVM.

In stage one assuming that e_K takes a normal distribution, then equation (9) can be transformed as follows:-

$$\frac{P_{Ki} - 1 + \phi\left(\frac{l_{Ki} - \mu_K}{\sigma_K}\right)}{\delta} \sim N(0,1) \quad (10)$$

The normalized log function would give rise to:

$$Log\,(L_K) = \sum_{k=1}^{i} Log\,\Omega\left\{\frac{P_{ki} - 1 + \phi\left(\frac{l_{ki} - \mu_k}{\sigma_k}\right)}{\delta}\right\} \quad (11)$$

where $\Omega(.)$ represents a standard normal distribution probability density function. In stage two, μ_k and σ_k can be estimated for each individual. For example from equation (11), μ_k and σ_k can be estimated for each individual k, and models can be constructed to estimate their determinants as follows.

$$Log\,\mu_k = z_0 + q_k' z + e_1 \quad (12)$$

$$Log\,\sigma_k = \alpha_0 + y_k' \alpha + e_2 \quad (13)$$

where q_k' and y_k' are determinants of the mean and SD respectively. z_0 and α_0 are parameter estimates to be estimated; e_1 and e_2 are random errors. Two stage approach was chosen because it provides a less biased estimation of the mean, variance and standard deviation of individual valuation distributions since no econometric models are introduced at the first stage, unlike in [55] one stage model. Moreover, the results of the mean values and variances and standard deviations can easily be modelled and compared to other CV approaches [55, 56].

4. Empirical Results and Discussion

Two payment vehicles were compared namely Trust and Tax based on data generated from Stochastic payment card and Multiple bound discrete choice card and the findings presented in Table 1. In addressing the above objective, a minor hypothesis was formulated to test for significant differences in mean WTP values as follows: -

H0: There is no significant difference in the mean WTP values between the samples.

HA: There is a significant difference in the mean WTP values between the samples.

Table 1 below presents results on WTP estimates for collection and spending of Tax and Trust fund payment vehicles based on SPC and MBDC formats. Of the two payment vehicles, Tax showed higher WTP values than Trust. When Tax was used as a vehicle, MBDC sample showed higher WTP value, which was one and a half times that of SPC sample, despite the fact that it was highly dispersed as shown by the coefficient of variation of 122% when compared to SPC samples coefficient of variation of 102%. Further, the results showed a significant difference in sample mean WTP values at 1% level, as shown by Mann-Whitney test statistics of (α =3.681, $p < 0.01$).

On the other hand, when Trust was used as a vehicle, MBDC sample equally showed higher WTP value, which was almost one and a half times that of SPC sample. MBDC sample equally exhibited higher dispersion as shown by the coefficient of variation of 125% when compared to SPC sample which exhibited a coefficient of variation of 106%. From the results, it was observed that MBDC format generated data overstated the WTP values whereas SPC data understated the WTP values. On the other hand, MBDC data gave rise to inconsistent WTP estimates when compared with SPC data, implying that SPC data generation format proved to be the best for valuation of RHP in Kenya, a finding similar to that of [23] in the developing nation context. A significant difference in sample mean WTP values was realized at 1% level, which led to the rejection of the null hypothesis.

Generally, it was noted that the use of Tax as a payment vehicle exhibited higher WTP values which were more consistent unlike when Trust was used as a payment vehicle, an observation slightly close to that observed by [51], where Tax elicited higher WTP than donation in a stated preference context. where Tax elicited higher WTP than donation in a stated preference context. It was observed that residents were willing to pay positive amounts for RHP and were supportive of the tax fund, hence if the policy was to be effected, it would face minimal resistance.

However, from environmental and contingent valuation literature, the policy implementers should adopt a payment vehicle which understates the WTP values than the one which overstates the values. Therefore, in this case, Trust would be the most preferred payment vehicle since it understated the WTP values. However, much debate is expected given that as much as Trust payment vehicle exhibited lower WTP estimates, the estimates were highly inconsistent which pauses a risk to any policy implementer, given that respondents interviewed under Trust vehicle were highly uncertain of making good their stated WTP amounts. In addition, the respondents had lost their confidence and trust in their local trust funds due to previous cases of mismanagement and embezzling of funds from the special fund.

Table 1. *Evaluating differences in Mean WTP estimates for the different payment vehicles based on the value elicitation formats.*

Descriptions	Tax		Trust	
	SPC	MBDC	SPC	MBDC
Mean WTP (μ)	941.54	1418.91	757.69	1110.94
Standard error of the mean (σ)	96.94	94.28	87.89	93.89
Coefficient of variation (σ/μ)	1.02	1.22	1.06	1.25
Number of observations	65	64	65	64
MWT-value(α)	3.681		2.749	
P-value	0.000		0.000	

Explanatory notes: MWT implies Mann Whitney Test; * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

When the samples were pooled based on payment vehicles and results compared for mean WTP values, still Tax payment vehicle elicited higher mean WTP value which was 1.3 times that of Trust as shown in Table 2. However, the higher WTP associated with tax was less dispersed by 4% compared to that of Trust payment vehicle. The higher mean WTP value elicited by using Tax as payment vehicle is contrary to previous studies [25, 23, 44, 45] where the use of tax was likely to cause objections and protest responses among survey participants leading to low WTP estimates. The finding that Tax elicited higher mean WTP value for RH is similar to that of [35, 42, 33] and their WTP value were more than 8 times that observed in this study. The reason for the lower WTP observed in Kenya could be associated with the fact that the study was conducted during hard economic times when most people were hit severely with Covid 19 pandemic. Moreover, the variation could be attributed to the currency conversion rates used and the fact that those studies were done in developed economies. The findings implied that Kenyans have confidence in Government managed projects given past incidences of collapsed community and private financial schemes and projects [23]. Moreover, given high cases of financial fraud in the country, respondents felt that their monies could be safe in a special pool set aside by the government and money deducted at source in form of tax to the pool.

For the case of protection of Kenyan RH, tax as a payment vehicle has proved to be appropriate and hence can be used for future valuations given the higher and consistent WTP estimates elicited. However, caution should be taken when choosing the payment vehicles given that the Table 2 findings have shown that when Tax is used as a vehicle for valuation of RH, the WTP values are overstated as much as they seem consistent. On the other hand, Trust as a payment vehicle exhibited lower WTP values which were highly inconsistent. Contingent valuation literature advices policy implementers to go for vehicles which understate the welfare estimates and as such Trust vehicle would be preferred. However, it is imperative to note that it is upon any policy implementer to choose whether to trade in the understated values for high levels of inconsistencies or to adopt the overstated values with a lot of consistency?

In addition, a significant difference at 5% level was noted in pooled mean WTP values between the two samples as revealed by the Man-Whitney test statistic of MWT-value (α =1.865, $p < 0.063$), which led to the rejection of the null hypothesis.

Table 2. *Evaluating differences in Mean WTP estimates for different payment vehicles.*

Details	Tax (n=129)	Trust (n=129)
Mean WTP (μ)	1180.93	934.42
Standard error of the mean (σ)	95.61	90.84
Coefficient of variation (σ/μ)	1.12	1.16
MWT-value (α)	1.865	
P-value (MWT)	0.063	

Explanatory notes: MWT implies Mann Whitney Test* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 3 presents results of the mean WTP values and their determinants based on different payment vehicles. The following hypothesis was tested to establish whether the determinants were significantly different from zero across the models.

HO: The parameter estimates are not significantly different from zero.

HA: The parameter estimates are significantly different from zero.

The overall results show that, Age had a significant effect on mean WTP values across the three models with anticipated positive signs. This implies that older people were more willing to pay towards RHP unlike the young. The reason could be that older people felt susceptible to effects of unprotected RH [10, 44] which might compromise their quality of life [24]. For Tax model, Income was significant with a positive sign just like in [35] meaning that an individual will spend more on environmental goods and services that give him/her higher satisfaction [10, 23, 27]. Equally Certainty of future incomes was significant and positive both in Tax model and the pooled models, implying that a household can only pay more for a good if he/she is certain of his/her future incomes [25, 56].

WTP values declined with Household size in the Tax only model. Respondents with larger household sizes had lower WTP given the more financial implications associated with larger families, and probably because of the trade-offs they may be required to make within the household like paying school fees, buying food and paying amenity bills [45]. Education level of the household head was positive and significantly influenced WTP values both in Tax only and Trust only models. Implying that respondents who had attained post primary education were willing to pay more given their improved access to information and processing which is key in creating awareness on the need for RHP [45, 44, 41].

For respondents who were interviewed using Trust as payment vehicle, the findings showed that Gender was significant and positive, implying that male headed households were willing to pay on average significantly more than women towards protection, a finding similar to [23]. A possible explanation for this positive effect is that men culturally decide on financial matters in a household and control the household budget [23, 45, 44].

Necessity to protect RH was significant and positive in Trust only model. The implication is that for those respondents who found it necessary to protect RH, their WTP was higher compared to those of their counterparts. The study revealed that educated respondents found it necessary to protect RH. This is because studies have shown that from economic perspective, the more informed a consumer is about a good the greater the WTP [27, 34]. Besides it could happen that those who found it necessary to protect might have suffered more from the effects associated with unprotected RH such as diseases and insecurity.

Distance was significant and positive in the Trust and Tax-Trust models. Meaning that people who resided far from RH were willing to pay more unlike those who resided near contrary to [4] and [46]. A plausible explanation could be that those who stayed far incurred more expenses to visit the

habitat hence had higher WTP [10, 42]. Elicitation format significantly and negatively influenced mean WTP values across the three models. Implying that change in elicitation format from SPC towards MBDC, decreased mean WTP values, contrary to previous findings in Table 1 where MBDC sample exhibited higher WTP values unlike SPC sample. A unique observation which requires further investigation.

Payment vehicle was significant and negatively influenced WTP in the pooled model, implying that as the payment vehicle changed from Tax towards Trust, WTP declined. This observation could be closely attributed to the findings in Table 2, where Trust exhibited lower WTP values unlike Tax. A Plausible explanation could be that respondents who had confidence in the hypothetical local trust fund were willing to pay less for the implementation of the RHP policy, than individuals who had confidence in the Tax fund. An observation similar to [51] but contrary to [27], where confidence in the trust fund increased peoples WTP. On the other hand, it could happen that individuals who previously participated in locally initiated community development projects, were willing to pay less given their previous experiences on unsuccessful policies and projects. In addition, given that most current decisions of households with regard to payment for public goods and services are largely influenced by past experiences [23], people's confidence on the trust fund within the city of Nairobi had reduced a great deal following the rise in cases of conman ship and fraudulent financial schemes.

The linear models that analyzed the effects of the independent variables on respondents' WTP values were fit and significant at 1% level as shown by the adjusted R^2 of about ($59\%<R^2<65\%$) across the three models, an observation almost two times that observed by [23] in a developing economies context, owing its explanation to the changes in payment vehicles used. It was realized that determinants (Age, Gender, Household size, Distance, Necessity to protect RH, Elicitation format used, Income, Certainty of future income, Payment vehicle used and Education level) significantly and differently influenced mean WTP values across the three models at 1% level as shown by the F values ($p<0.01$, F=29.45; $p<0.01$, F=32.39; $p<0.01$, F=37.94) respectively leading to rejection of null hypothesis in favor of the alternative (the parameter estimates were significantly different from zero) and hence they significantly influenced WTP values differently across the models.

Table 3. *Mean WTP estimates and the determinant factors for the different payment vehicles.*

Characteristics	Tax Model DV=Log(μ_i)		Trust Model DV=Log(μ_i)		Tax-Trust Model DV=Log(μ_i)	
	Coefficient	Std error	Coefficient	Std error	Coefficient	Std error
Age (Years)	0.014**	0.007	0.019**	0.009	0.024**	0.011
Gender (1=Male)	0.107	0.092	0.303*	0.154	0.078	0.178
Income (KES)	0.225*	0.132	0.344	0.228	0.107	0.260
Distance (Metres)	0.157	0.113	1.347***	0.231	0.485**	0.229
Education (1= Post primary)	0.073**	0.032	0.114**	0.053	0.013	0.060
Household size (No. of persons)	-0.214**	0.096	-0.151	0.130	-0.223	0.165
Necessary to RH (1=Yes)	0.226	0.157	0.554*	0.328	0.230	0.333
Certainty of future income (1=Yes)	0.202**	0.093	0.072	0.185	0.852***	0.184
Owning land with riparian area (1=Yes)	-0.137	0.112	-0.151	0.172	-0.164	0.210
Elicitation format (1=MBDC)	-0.180*	0.095	-0.318***	0.154	-2.508***	0.174
Payment vehicle (1=Trust)	-	-	-	-	-1.908***	0.175
Constant	0.352	0.533	3.013***	0.978	1.813*	1.048
Summary statistics						
F-statistic	29.45		32.39		37.94	
Prob > F	0.0000		0.0000		0.0000	
Adjusted R-squared	0.5934		0.6423		0.6126	
Number of observations	129		129		258	

Explanatory notes: the character 'μ_i' refers to the mean willingness to pay for the ith individual;* p < 0.1; ** p < 0.05; *** p < 0.01.

Table 4 presents results of standard deviation of the mean WTP values and their determinants based on different payment vehicles. The following hypothesis was tested to establish whether the determinants were significantly different from zero across the models.

HO: The parameter estimates are not significantly different from zero.

HA: The parameter estimates are significantly different from zero.

The findings show that factors (Age, Distance and Certainty of future incomes) significantly and positively influenced deviations across the models. Older people had higher dispersions in their WTP values unlike young respondents, despite the fact that they had earlier indicated higher WTP values from the WTP results. This is due to the tendency of the old to save for unforeseen contingencies [10].

Respondents who stayed far from RH had highly dispersed WTP values, probably because of higher travelling costs to the habitats which in turn could have reduced the respondents travelling frequency leading to greater dispersion in their distributions [46, 10]. Deviations increased with Certainty of future incomes. From the descriptive statistics the findings had indicated that majority of the respondents were uncertain of their future incomes and for the few who were certain, their valuation distribution was highly inconsistent. This could be associated with the fact that the study was conducted during hard economic times when respondents

were constrained financially and were struggling to meet urgent family needs and some were spending sparingly [28].

Table 4. *SD of the WTP estimates and the determinant factors for different payment vehicles.*

Characteristics	Tax Model DV=Log(σ_i)		Trust Model DV=Log(σ_i)		Tax-Trust Model DV=Log(σ_i)	
	Coefficient	Std error	Coefficient	Std error	Coefficient	Std error
Age (Years)	0.008*	0.004	0.008**	0.004	0.005*	0.003
Gender (1=Male)	-0.072	0.062	-0.098	0.064	-0.022	0.044
Income (KES)	-0.108	0.089	-0.092	0.094	-0.085	0.064
Distance (Metres)	0.261***	0.076	0.287***	0.096	0.292***	0.056
Education (1= Post primary)	-0.048**	0.021	-0.046**	0.022	-0.021	0.015
Household size (Number of persons)	0.156**	0.065	0.080	0.054	0.035	0.040
Necessary to protect riparian habitat (1=Yes)	-0.162	0.106	-0.180	0.135	-0.173**	0.082
Certainty of future income (1=Yes)	0.134*	0.063	0.162**	0.076	0.078*	0.045
Owning land with riparian area (1=Yes)	0.088	0.076	0.077	0.071	0.087*	0.051
Elicitation format (1=MBDC)	0.067	0.064	0.180***	0.064	0.150***	0.043
Payment vehicle (1=Trust)	-	-	-	-	0.130***	0.043
Constant	0.959***	0.359	0.178	0.404	0.548**	0.257
Summary statistics						
F-statistic	4.20		4.26		7.39	
Prob > F	0.0000		0.0000		0.0000	
Adjusted R-squared	0.6219		0.6579		0.5827	
Number of observations	129		129		258	

Explanatory notes: the character 'σ' refers to the standard deviation of the mean willingness to pay estimates for the ith individual; * p < 0.1; ** p < 0.05; *** p < 0.01.

Education level significantly and negatively influenced deviations in Tax model and Trust models. This implies that respondents who had attained post primary level of education had lower deviations unlike their counterparts. A plausible explanation could be that higher levels of education are associated with more knowledge and high level of awareness hence decreased inconsistence in payments [19].

Household size was significant with positive sign as expected in Tax only model, implying that families with many households had more financial obligations to meet, leading to more deviations in the respondents WTP values [45, 44]. Necessity to protect RH significantly and negatively influenced deviations in the pooled model. This is because respondents who found it necessary to protect RH had higher WTP for riparian habitat protection given that they were aware and educated on the dangers associated with unprotected riparian homes thus lower dispersions. Moreover, given their perception and preferred RH quality which might have positively influenced their WTP valuations leading to lower deviations [27].

Dispersion increased with Land ownership within the riparian area in Tax-Trust model. This is attributed to the fact that some of respondents who owned land within riparian area had engaged their lands in alternative land uses hence were less WTP for RH protection leading to higher dispersions. Elicitation format significantly and positively influenced the deviations in the Trust only and pooled models. This implies that deviations increased with change in elicitation format from SPC towards MBDC. A plausible explanation is that MBDC format was generally associated with higher coefficient of variations unlike the SPC format (Table 1).

Equally Payment Vehicle variable significantly and positively influenced deviation in the pooled model. Meaning that movement from Tax towards the use of Trust as payment vehicle increased deviations thus causing a lot of uncertainty, a finding similar to that observed by [51]. The reason could be due to the lower WTP values associated with Trust as a payment vehicle (Table 2) coupled with individual previous experiences on unsuccessful policy implementations and projects, rampant cases of conmanship and fraudulent schemes within the city which caused low confidence on local trust fund [23].

It was noted that the significant determinants influenced standard deviation of WTP estimates at 1% level ($p<0.01$, F=4.2; $p<0.01$, F=4.26; $p< 0.01$, F=7.39) respectively across the three models leading to rejection of null hypothesis in favor of the alternative (the parameter estimates across the three models were significantly different from zero) and hence they influenced dispersions differently. The models were fit and significant at 1% level with adjusted R^2 of about ($58\%<R^2<66\%$) across the three models, an observation almost two times that observed by [23] who had used SPC data generation format and trust as payment vehicle. The difference in the observed R^2 values could be attributed to the use of Tax as a vehicle and change in elicitation formats as variables.

The overall effect of change in payment vehicle on welfare estimates are explained by statistical differences in mean WTP values, different effects of determinants on both the mean WTP and standard deviation of the mean WTP values. The results showed that there were significant differences in: - mean WTP values between tax and trust payment vehicles respectively based on elicitation formats as shown by Mann-Whitney test ($p<0.01$, α=3.681 and $p<0.01$, α=2.749); difference in pooled sample mean WTP based on Tax and Trust payment vehicles ($p<0.063$, α=1.865). Moreover, the parameter estimates for mean WTP determinants were significantly different from zero across the three models and their joint effects on WTP values significantly varied as one moved from Tax model, Trust

model and Tax-Trust model as evidenced by their respective F tests ($p<0.01$, F=29.45; $p< 0.01$, F=32.39; $p<0.01$, F=37.94). In addition, the estimates for dispersion of WTP determinants were significantly different from zero and their joint effects on dispersion significantly varied across the three models at 1% level as can be shown by their respective F tests ($p<0.01$, F=4.2; $p< 0.01$, F=4.26; $p<0.01$, F=7.39). When payment vehicle was regressed on both mean WTP and SD estimates, the results were significant leading to the rejection of the overall null hypothesis in favor of the alternative (Changing the payment vehicle does significantly affect individual welfare estimates towards RHP in Kenya). Further it was realized that the use of Trust as a payment vehicle led to lower WTP values which were highly dispersed. However, caution should be taken when using taxes as a payment vehicle given that involuntary taxes can act as a form of coercion which might affect WTP estimates given that they don't provide the warm glow to the tax payer [51]. In this study the tax vehicle was regarded as voluntary.

5. Conclusion and Recommendation

On comparison of WTP values elicited using Tax and Trust as payment vehicles, the results showed that Tax yielded higher WTP values which were more consistent unlike Trust. This implies that use of Trust as payment vehicle underestimates welfare values for RHP and hence from contingent valuation literature it would be preferred for valuation of RH's. Kenyan respondents had showed positive willingness to pay amounts towards RHP. They preferred and trusted government more than other agencies hence they would like their monies to be managed and controlled by the government unlike private entities. The collective tax fund was perceived to reduce inconsistencies in payments. Moreover, given past individual experiences on unsuccessful policy implementations and projects coupled with rampant cases of conmanship and fraudulent schemes within the city, residents had low confidence on local trust fund unlike the tax fund.

Payment vehicle WTP values were positively influenced by age. This implies that the old people had higher WTP unlike the youth hence this observation calls for the need to sensitize the youth on the need to protect RH by the Kenyan National Environmental Conservation Authority, conservationists' area chiefs and even the public. The results also showed that WTP increased with respondent's Income besides their Certainty of future incomes. However, given that the study was conducted during hard economic times when respondents were uncertain of their future incomes and some had temporarily lost their jobs while others were financially cautious for the future, similar studies can be done after the economy as recovered.

Families with few Households had shown support of the RHP policy with a lot of certainty if the policy was to be implemented. However, larger families could also support the policy by 21% if they could be given time to plan, reorganize and pay their financial obligations. Given that women participation in RHP was limited, there is need to encourage and sensitize women on the need to protect RH and involve them in key decisions which affect our environment right from household level to national level.

Education level and Necessity to protect RH fully supported the RHP policy with a lot of certainty, hence the Ministry of Education should inculcate the knowledge of protecting RH and conserving our environment to pupils early enough in their competency based curricula.

Distance was key determinant of RHP. Given that those who stayed near RH didn't realize the need for RHP given that they had converted their lands to other alternative uses, there is need to sensitize them and educate them on eco-friendly practices which are sustainable and which can promote tourism given that such practices have succeeded in other countries. The Kenyan government should also consider privatization of those habitats through leases, renting, and other mechanisms to promote their protection and conservation.

Elicitation Format (EF) significantly and negatively influenced mean WTP values across the three models. Implying that change in EF from SPC towards MBDC, understated mean WTP values with a lot of uncertainty/inconsistency. SPC overstated mean WTP values which were associated with high levels of certainty/consistency for the riparian habitats. Therefore, if the RHP policy could pass, the policy implementers should consider using data generated by MBDC format given that it has proved favorable for valuation of RHP in Kenya due to its understatement of WTP values despite the fact that many respondents wouldn't pay the stated amounts. However, further studies should be done to establish the tradeoff between understated WTP values which seem desirable for most studies at the expense of making good the stated WTP values. Should we choose EF's and PV's based on the overstated/understated WTP values or emphasis should be given on whether one will surely pay the stated bid amount? Or both?

However, this observation was contrary to what was observed in Table 1. Where MBDC format generated data overstated the WTP values whereas SPC data understated the WTP values.

From the results, it was observed that MBDC format generated data overstated the WTP values whereas SPC data understated the WTP values. On the other hand, MBDC data gave rise to inconsistent WTP estimates when compared with SPC data, implying that SPC data generation format proved to be the best for valuation of RHP in Kenya, a finding similar to that of [23] in the developing nation context.

The change in Payment Vehicle from Tax towards Trust decreased WTP in the pooled model. This means that from contingent valuation point of view, Trust would be the preferred vehicle for valuation of RH's, However, the WTP values seemed highly inconsistent portending that most respondents wouldn't pay the amounts they stated in the cards. This is supported by lower WTP amounts associated with trust in Table 1, and with loss of Kenyans confidence in

the local trust funds. This finding creates a dilemma as far as valuation studies are concerned. Should we prioritize the probability levels of payment or the stated amounts whether you pay or not? In the Kenyan scenario, the use of tax was found to be suitable in valuation of RH given the fact that it overstated the WTP values and the respondents were consistent in making good their payments/paying the stated amounts with confidence. Thus future studies should consider using tax for valuation of other environmental goods and services given that they have proved to have an influence on both WTP and Standard deviation of WTP estimates. Moreover, given that Tax yielded higher WTP values than Trust, the Kenyan government should consider setting up a voluntary environmental tax fund exclusively for protection of riparian habitats in Kenya, as a way of providing more context for welfare valuation. This is empirical prove that this payment vehicle doesn't cause objections neither does it lead to protest responses as perceived in previous literature, as long as the study is well conceived and the payment card well designed.

It was also evident that the use of Tax as a payment vehicle should be accompanied with SPC data generation format, given that they all overstated the WTP values and they seemed consistent. On the other hand Trust as a payment vehicle should go hand in hand with MBDC data generation format since they all understated the WTP values, a desirable finding however limited by the fact that the WTP values were highly inconsistent and uncertain, implying that if the policy was to be passed, less people will actually pay for RHP.

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