



## **ESTIMATING THE ECONOMIC VALUE OF URBAN ENVIRONMENTAL COMMONS: A CASE OF MWANZA CITY – TANZANIA**

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### **ABSTRACT**

Well valued resources call for proper management and sustainable use by all beneficiaries. Urban environmental commons are one of the most important resources that need the attention of all stakeholders in conservation. This study intended to find out the economic value of the urban environmental commons. Specifically, the study first investigated the determinants of peoples' Willingness to Pay for the conservation of urban environmental commons and secondly the value that people place on the conservation of urban environmental commons. To undertake this, the study used the Contingent Valuation Method (CVM) which is a surrogate market method for estimating the value of environmental resources. This was enhanced by a set of cross-sectional primary data from a sample of 240 respondents out of the total population of 426,154 Mwanza City residents. The results from the study showed that the WTP for the conservation of the urban environmental commons could be determined significantly by age of the respondent, education level of the respondent, respondent's domicile distance from the urban centre, respondent's origin and the value that the respondents give to the existence of the resources. It was also found that the mean value that people placed on the conservation of the urban environmental commons was Tanzanian Shillings (TSH) 5,442 per person per year and the total value that was placed on conservation was TSH 2,319,130,068 per year. It was therefore concluded that firstly, the willingness to conserve the urban environmental commons is influenced by age, education level, domicile distance from the urban centre, people's origin and the value that the respondents give to the existence of the resources. Secondly, the economic value of the urban environmental commons is substantial and people put a substantial value on the conservation of the resources. The study recommends that, for better conservation, there is a need to prioritise the usage of conservation resources based on the significant determinants of peoples' willingness to conserve the resources. There is also a need to devote more funds on conservation of the resources which are equivalent to the value of the resources.

**Keywords:** Economic Valuation, Contingent valuation method, Willingness to Pay, Mwanza, Tanzania.



## INTRODUCTION

### Background

Urban environmental commons (UECs) including the publicly owned open spaces, urban forests, urban parks, recreation areas and street trees provide a wide array of benefits to the community's residents. Besides providing soil protection against erosion and providing carbon sequestration, they provide a significant psychological service to the community residents including stress reduction, improved worker attitudes and reduction in the domestic and school violence, (Kuo & Sullivan, 2001). These benefits are often overlooked when making spatial and financial distributive decisions in urban areas, (Foster, 2010). Furthermore, one important characteristic of commons is that they are non-excludable. This means that given their nature, all the members of the society can access them with no restriction. Given the nature of environmental commons therefore, they are subject to unlimited human interactions (Hardin, 1968).

Mwanza city being one of the large cities in Tanzania, its urban area is endowed with various environmental commons. These among others include public spaces like open access areas in the city centre, trees along roads, public beaches for recreation and urban forests (MCC & NBS, 2017). Just like in many other urban areas these environmental commons for a long period have proved to be providing both the use and non-use amenities to Mwanza urban residents (MCC & NBS, 2017). Given this importance, the local government authority with the help of various stakeholders is making some efforts to conserve the environmental commons so that they can be sustainable and continue providing their immense support to the city residents. There are more than 15 Community Based Organizations (CBOs) that are fully engaged in waste collection across the city. Statistics show that the city uses more than 14 million TZS each month to pay CBOs and other firms overseeing the city cleanliness, (Dassu, 2012).

Despite their importance and the efforts being done to make sure that the commons are sustainable, they are constantly facing tremendous mismanagement. This is partly triggered by the rapid urbanization which is currently exerting pressures on the resources (MCC & NBS, 2017). On account of this situation, two knowledge gaps arise. First, the factors that determine the people's willingness to conserve the resources are not yet known. Secondly, it is not clear whether the urban residents and especially the users of the environmental commons know the true value of the resources and yet proceed with such mismanagement. It is imperative therefore to study the people's preferences for the UECs by estimating the determinants of people's Willingness to Pay (WTP) for the conservation of the UECs and then estimate the value that people place on the conservation of the resources. This study, therefore, seeks to answer two questions. First, what are the determinants of the people's willingness to pay for the conservation of UECs and second, what is the value that people place on the conservation of UECs. The answers to these questions will help in making the spatial and financial distributive decisions in urban areas, especially in the study area.



## **Theoretical Literature Review**

### **Economic Value**

Economic value expresses the degree to which a good or service satisfies individual preferences. These preferences can be expressed in terms of utility which is an unobservable ranking of preferences, or a less theoretically appealing, but more practical in money terms. Economic value can, therefore, be measured by the amount that an individual is willing to pay (WTP) to obtain some benefits from a resource or the amount that a person is willing to accept (WTA) to give up the benefits from a certain resource (Perman, Ma, McGilvray, & Common, 2003). Many goods and services are exchanged on markets and so their value is automatically revealed. The market, however, is capable of revealing only one component of the total economic value which is the direct use-value of the goods or services (Kwak, Yoo, & Han, 2003). The indirect use and non-use values of the total economic value of goods cannot be revealed by the market. What is seen therefore is the WTP for the actual use of the resource or the WTA the loss of the actual use of the good or service. Some natural resources like the environmental commons are highly valued for their direct use although direct use may be only one of several components that contribute to their overall worth (Treiman & Gartner, 2006).

### **Economic Valuation**

Environmental resources fall in the category of the non-market goods since they pose a large component of the non use-value. In this regard, valuing these resources becomes a great challenge because most of the services they provide can not be captured in real markets (Perman, Ma, McGilvray, & Common, 2003). Economists have tried to develop some non-market approaches for solving this problem and these are revealed preference (or observed behaviour) towards some market good with a connection to the amenity of interest. These stated preference methods include the Contingent Valuation Method (CVM), the Choice Experiment Method (CEM) and the Conjoint Analysis (CA). Other methods used in the valuation of environmental assets are in the category of revealed preference methods and these among others include the Travel Cost Method (TCM) and the hedonic pricing method (HPM).

This study has employed the CVM which is one of the stated preference methods. CVM is praised for being more capable in capturing the non-use values of non-market environmental resources, (Mitchel & Carson, 1989). Since the urban environmental commons have a large component of non-market value, this becomes a justification for the choice of this method.

## **Empirical Literature Review**

Empirically, several studies have been conducted to estimate the economic value of urban environmental commons. Among others these studies include, (Treiman & Gartner, 2006) who estimated the residents' willingness to pay for their community forests using the CVM in Missouri USA; (del Saz Salazar, & Menendez, 2007) who estimated the non-market benefits of an urban

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park in Valencia (Spain) while taking care of proximity to the park. (Foster, 2010), who did a contingent valuation of Tampa's urban forest resource and (Lo & Jim, 2010) who estimated the willingness of residents to pay and motives for the conservation of urban green spaces in the compact city of Hong Kong. Other studies included (Kwak, Yoo, & Han, 2003) who estimated the public's value for urban forest in the Seoul Metropolitan area of Korea; (Udziela & Bennett, 1997) who did a Contingent Valuation of an Urban Salt Marsh Restoration in New Haven, Connecticut and (Willis, Powe, & Garrod, 2005) who estimated the value of improved street lights to households. So far in Tanzania, there is scanty literature in the field of economic valuation of environmental resources and specifically on the valuation of urban environmental commons. This study stands out to bridge this gap.

## **METHODOLOGY**

### **Theoretical Model**

#### **The Contingent Valuation Method**

This is a stated preference method in which the respondents are directly asked to state their preferences for environmental good. It is commonly used to value the non-market value of the environmental goods since these cannot be marketed in the normal market situation. The method involves creating a hypothetical market where the users and/or non-users of this resource are asked to state the amount they are willing to pay (WTP) to obtain the benefits from the resources or the amount they are willing to accept (WTA) to forego the benefits from the resources ((Perman, Ma, McGilvray, & Common, 2003). Under this method, the compensating welfare is estimated and this assumes that an individual knows his/her utility function with certainty, (Hanemann, 1984)

In accordance with the National Oceanic and Atmospheric Administration (NOAA) panel recommendations for CVM studies, (Arrow, Solow, Portney, Leamer, Radner & Schuman, 1993), the researcher conducted a CVM survey by administering interviewer-administered questionnaires. Mitchell and Carson, (Mitchel & Carson, 1989) argued strongly in favour of personal interviews because they are claimed to be of significant advantage over the less controllable self-administered questionnaires. In the questionnaire, the researcher formed a hypothetical scenario where respondents were asked to state their WTP for a proposed fund designed to conserve and manage the Mwanza urban environmental commons. The payment vehicle was proposed to be an annual contribution by each individual.

#### **Data type and Unit of Analysis**

This study used cross-sectional data that were collected in January 2016 covering individuals in two districts of Nyamagana and Ilemela in Mwanza city. The unit of analysis was individuals and so the data set was comprised of individuals as observations and the various characteristics of individuals and other relevant information from an individual as variables related to each observation.



## Population Sample and Sampling Procedures

Mwanza city is formed by the two districts of Ilemela which has 11 wards and Nyamagana which has 10 wards. Out of these, the study covered 4 wards out of the total wards in the two districts. The city has a total population of 363,455 inhabitants, (MCC & NBS, 2017). Out of this, a sample of 240 individuals was calculated using the sampling formula by Nassiuma, (Nassiuma, 2000). To arrive at this sample, the study employed the multistage sampling. This type of sampling was used because of the nature of this study and the nature of the targeted population. In the first stage, the purposive sampling was used in choosing 2 wards in the urban area and these were Nyakato ward in Ilemela district and Nyamagana ward in Nyamagana district. 2 wards were also chosen in the sub-urban area which included Igoma ward in Ilemela district and Igogo ward in Nyamagana district. This was done with the intention of capturing the impact of the proximity of a household to the urban environmental commons. Secondly, the systematic random sampling was used to choose a percentage of individuals in each ward this made a sample of 240 individuals. The systematic random sampling was chosen with the aim of avoiding the sampling bias which may occur as a result of favouring some units in the sample.

## Data Analysis

After the data entry and the necessary cleaning, the data collected were analysed using the standard econometric techniques. The Binary logistic econometric model was used to estimate the people's WTP for urban environmental amenities. The WTP was estimated as a function of age, gender, education level, income, proximity to the amenity, frequency of visits, the origin / where the respondent was brought up, the expectation of reaping some future benefits and the willingness to let the amenities exist. Assuming that the respondents WTP is the function of his / her characteristics, the functional form of the WTP will be as follows:-

$$WTP = f(\text{Age, Gender, Education, Distance, Origin, Expectation, Existence}) \dots\dots\dots 1$$

Equation 1 was further expressed in econometric form as seen in equation 2.

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 \text{Age}_i + \beta_2 \text{Gender}_i + \beta_3 \text{Income}_i + \beta_4 \text{Education}_i + \beta_5 \text{Distance}_i + \beta_6 \text{Origin}_i + \beta_7 \text{Expectation}_i + \beta_8 \text{Existence}_i + \varepsilon_i \dots\dots\dots 2$$

Where  $P_i$  is the probability of individual's WTP for the urban environmental commons, "Age" is the age of the respondent measured by the number of years lived by the respondent, "Gender" is the gender of the respondent 1 if a male 0 otherwise, "Income" is the income of the respondent measured by the individual's consumptive expenditures per day, "Education" is the education of the respondent measured by the years spent in formal schooling, "Distance" is the distance of the respondent's domicile from the environmental amenity approximated in kilometres, "Origin" is where the respondent was brought up, 1 if in the urban area 0 otherwise, "Expectation" is the respondent's expectation of reaping future benefits from the resource, 1 if the respondent expects



future benefits 0 otherwise, “Existence” is the value that the respondents give to the existence of the resources, 1 if the respondent values the existence of the resources 0 otherwise and  $\varepsilon_i$  is the error term assumed to be normally distributed with zero mean and a standard deviation  $\sigma_i$ .

After the parameters of our model were estimated the mean WTP was, therefore, be calculated using equation 3. This was adopted from Hanemann, 1984 (Hanemann, 1984).

$$E(Y) = \bar{x}'\hat{\beta} \dots\dots\dots 3$$

Where;  $\bar{x}$ , is a vector of sample averages of the regressors and  $\hat{\beta}$  is the vector of maximum likelihood estimates of the parameters.

## FINDINGS AND DISCUSSION

### Descriptive Findings

The respondents were presented with a positive likert scale question proposing to them that UECs are important and they provide a wide array of benefits to both direct and indirect users. The responses were as shown in figure 1.

Figure one shows that the largest percentage (56%) of the respondents strongly agreed that UECs are important and they provide a wide range of benefits to both users and non-users, directly and indirectly. 39% of the respondents just agreed to the statement and the remaining smaller percentages who disagreed and strongly disagreed with the statement were as seen in the diagram. These findings likely imply that people were aware of the benefits provided by the existence of the UECs.

*Figure 1: Individuals Agreement with the Statement that, UECs have many Benefits to Them*



The other important descriptive finding was the individuals' willingness to participate in the conservation of the UECs. The findings on this were captured using a participation question which was asked after narrating a hypothetical UECs conservation project to the respondent then the respondent was asked whether he or she was willing to participate in the project through contributing annually to a conservation fund established for the project. The answers to the participation question were as presented in table 1.

*Table 1: Respondent's Willingness to participate in the Conservation of UECs*

	Willingness to Participate in Conservation	
	Yes	No
<b>Frequency</b>	168	72
<b>Percentage</b>	70	30

*Source: Author's Computation from the Survey Data*

### **The Determinants of the People's WTP for the UEC**

One of the objectives of this study was to test the determinants of the People's WTP for the Urban Environmental Commons. This was done by estimating equation 2. The logit regression results were obtained and thereafter, for more intuitive and easy interpretation, the marginal effects after the logit regression were obtained and were presented as in table 1.

Since the researcher based the interpretation on the marginal effects, the interpretation was as "the increase (decrease) in the probability that the individual would be willing to pay for conservation of the UEC given one more unit (or a change<sub>1</sub>) of the explanatory variable with the other variables held at their mean. The interpretation of the significant variables is therefore as follows:-

*Table 2: Marginal Effects after Logit Regression*

<b>Variables</b>	<b>Dy / dx</b>	<b>Standard Error</b>	<b>P - value</b>
<b>Age</b>	-0.0190***	0.00663	0.004
<b>Gender</b>	0.6686	0.12742	0.220
<b>Education</b>	0.0108*	0.02945	0.055
<b>Income</b>	0.1562	0.12324	0.205
<b>Distance</b>	- 0.1911*	0.10705	0.074
<b>Origin</b>	0.6873***	0.15891	0.000
<b>Expectation</b>	0.1500	0.19956	0.452
<b>Existence</b>	0.0085**	0.00622	0.042

Note: - \*, \*\* and \*\*\* represent significance at 10%, 5% and 1% levels respectively.

<sup>1</sup> The interpretation considered a change from 0 to 1 in the case of dummy variables.



Age of the respondent (*Age*) was significant at 1% significance level with a parameter estimate of - 0.0190. This means that holding other variables constant at their means, a unit increase in age of the individual decreases the probability of the individual willingness to pay for conservation of UECs by 1.9%. This could also be interpreted to mean that elderly persons were less willing to conserve the UECs than the young ones. The reason behind this could be that since conservation was expected to bring returns mostly in the long run, the elderly people found it difficult to accept changes that would not yield returns immediately. These results are consistent with the researcher's expectations.

The education level of the respondent (*Education*) was significant at 10% significance level. The parameter estimate of this variable was 0.0108. This means that holding other variables at their mean, the increase in the education level of the respondent increased the probability to pay for the conservation of the UECs by 1.08%. In a simpler language, more educated respondents were more willing to pay for conservation than less educated ones. The reason behind this could be that more educated respondents were more willing to participate in the conservation of the UEC since they are more aware of the true value of the resources. These results also were consistent with the researcher's expectations that more educated individuals would be more willing to pay for conservation.

The distance of the respondent's domicile from the environmental amenity (*Distance*) was also found to be significant at 10% significance level and its parameter estimate was found to be - 0.1911. This meant that one unit increase in the distance of the respondent's domicile from the environmental amenity decreased the probability of his / her willingness to pay for conservation by 19.1% holding other variables constant at their means. In other words, this implied that the respondents whose domiciles were far from the UEC were less willing to pay for their conservation. The reason that can likely explain this is that distant users of the UEC were reaping less direct benefits from the resources.

Origin of the respondent (*Origin*) turned up to be significant at 1% significance level and its parameter estimate was 0.6873. This could be interpreted to mean that a change from an individual not originating from the urban area to originating from other places increases the probability of the individual to pay for the conservation of the UECs by 68.7% holding other variables constant at their means. This implied that individuals who originally grew up in urban place were more willing to pay for conservation compared to the ones who were originating from other places. This finding can be defended by the fact that originating from the same place where the resources were meant more awareness about the true value of the resources and thus more willing to conserve.

The value that people gave to the existence of the resources (*Existence*) was found to be significant at 5% significant level with a parameter estimate of 0.0085. This was another interesting finding which meant that holding other variables at the mean, a change from the respondents who valued the existence of the UECs to the ones who did not value their existence increased the probability of the respondents WTP for conservation by 0.08% holding other variables at their means. In other words, individuals who valued the existence of the UECs were more willing to participate in the





conservation of the resources than individuals who did not value their existence. This is likely because some of the respondents who were aware of the true value of the resources were willing to pay even for their non-market value (Existence value).

### **The mean WTP for the UEC**

To meet the second objective of the study, the mean WTP for the conservation of the UECs was estimated using equation 3. The parameters in the equation were obtained from the logit regression results that were obtained by running equation 2. The sample averages of the regressors were multiplied by the maximum likelihood estimates of the parameters and so the mean WTP was found to be TSH 5,442 per person per year. To obtain the population mean WTP this figure was multiplied by the study population which was 426,154 and so the populations mean WTP was found to be TSH 2,319,130,068 per year.

## **CONCLUSION AND RECOMMENDATIONS**

Age, education level of individuals, the distance of the individual's domicile from the urban centre, the origin of the individual and the value that the individual place on the existence of the UECs significantly influence the individual's willingness to pay for conservation of the UECs. Age and distance are negatively related to the individual's WTP while education level, the origin of the individual and the recognition of the existing value of the resources have a positive influence on the individual's WTP for the conservation of the UECs.

Individuals including both the users and non-users of the UECs place value on them. This value is far much higher than the resources that are currently being used to conserve the resources. This is consistent with the finding that the majority of people in the urban area are willing to participate in the conservation of the UECs.

### **Recommendations**

Environmental education should be emphasized to people of all ages and all places. This will make every user and non-user of the UECs to know their true value and thus avoid any mismanagement that could have been caused by the ignorance of the truth. The environmental education should also emphasize on the non-use values of the UECs such as the bequest value, option value and the existence value. This will make people understand better the true value of the environmental resources and thus put enough importance in their conservation.

The financial resources devoted to conserving the UECs in Mwanza City are far much below the true value of the resources. The Mwanza city authorities should think of honouring the true value of the UECs by devoting financial resources for conservation that are equivalent to the value of the environmental resources.



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