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WILLINGNESS TO PAY FOR IMPROVED CLIMATE AND ENVIRONMENTAL SERVICES: TOWARDS HEALTHY WELL-BEING, WASTE-TO-WEALTH CREATION, FLOOD AND CLIMATE CRISIS SECURITY IN AFRICA AND NIGERIA

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Abstract

This paper investigates the willingness to pay (WTP) for enhanced climate and environmental services with a particular focus on Nigeria. Utilizing a comprehensive dataset and regression analysis, factors influencing individuals' WTP were explored for improved environmental conditions and healthy well-being. The study emphasized the potential for waste-to-wealth initiatives and their implications for flood management and climate crisis mitigation. Result indicates significant determinants of WTP, such as household income and environmental conditions, while highlighting the need for effective policy measures to address the identified challenges.

Keywords: Willingness to Pay, Healthy well-being, Climate and environmental services, Waste-to-wealth

Introduction

Climate crisis and other environmental hazards has become one growing global problem for utmost concern. Besides, Africa faces unique challenges related to environmental degradation, including waste management, flood risks, and climate change. In Nigeria, these issues are compounded by rapid urbanization and inadequate infrastructure (FFP, 2021; Eneh *et al.*, 2012; World Bank, 2019; Karak *et al.*, 2012; Nwosu *et al.*, 2020; Idris, Moe, Yusoh & Abas, 2021; Bikash & Ichihashi, 2022; Zhang *et al.*, 2018; Ndunda, 2018; Boateng, Amoako, Appiah, Poku & Garsonu, 2016; Addai & Danso-Abbeam, 2014; Basiru, Yacob, Randam, Manafl, Adamu, Ibrahim, Umaru & Khalil, 2017; Adepoju, Ibrahim and Peter, 2016).

In addition, and, possibly due to the lack of an appropriate system of regulation and poor planning, improvement in environmental quality weans astronomically and historically. In many cities particularly across Nigeria, the volume of waste that accumulates in a matter of hours exceeds what waste collectors could reasonably transport in a day. Much of the waste generated is burnt or indiscriminately dumped into illegal landfills or roads, where it causes health hazards, clog drains, contributing to flooding and further environmental problems (Orhorhoro & Oghoghorie, 2019).

Given these and consequent far-reaching consequences on public health of climate and environment crisis heated arguments for or against the notion of the environment as an economic good and asset continues (Zainu & Songip, 2017). In addition, the increasing volume and attendant complexity of waste generation as a result of; rapid population growth, changing public consumption patterns, deficiencies in the existing regulatory framework, waste disposal facilities; lead to; large unsustainable waste management practices and further, decrease in global environmental quality. As a result, several studies posit earth's environment a 'complex resource' characteristic of environmental goods – goods that are not traded in the market and/or whose economic value needs to be defined efficiently hopefully not by market forces of demand, price and supply (Hanley, Barbier & Barbier, 2009; Ugwuishiwu, Nwoke & Echiegu, 2020).

Climate and environmental conflict and fragility landscape is getting increasingly complex as the influence of non-state actors, technology and renewed geopolitical competition has accelerated. In 2020 the devastating impacts of Covid-19 added further fuel to the fire, while climate change has not gone away. 2020 was one of the three warmest years on record with floods, bushfires and rapidly melting glaciers and ice caps making the climate change crisis impossible to ignore. It is however the poorest communities in contexts with high levels of fragility that are paying the heaviest price (World Meteorological Organization, 2021; Odoemene & Ofodu, 2016).

Unfortunately, fragility is increasingly linked to climate change impacts and unprecedented environmental degradation. It is considered one of the biggest obstacles to reaching the Sustainable Development Goals. Although the causal link between climate change and conflict is not straightforward and is highly context specific, there are a number of identifiable common pathways. Firstly, loss of livelihoods due to environmental degradation and extreme weather, and the crippling effect on people's food security can increase social tensions. Secondly, climate change can contribute to increased population mobility whereby the influx of people can place an additional burden on local economies which increases the risk of local resource conflicts. At the same time these contexts with large in-migration lack shared institutions for conflict resolution. Thirdly, the disruption and desperation caused by increased competition over resources and extreme weather events can be exploited by elite, criminal or violent extremist groups for political and economic purposes, particularly where governments are unwilling or unable to effectively respond. Inequality of access to, and control over, resources such as land, water or forests, coupled with unsustainable resource exploitation, has been a contributing factor in the occurrence of violence in various countries (FFP, 2021).

In certain parts of Asia for instance, droughts more than five-years long together with prolonged unsustainable use of water to irrigate agricultural land forced up to 1.5 million farming families to move to urban areas which is widely believed to have contributed to the conflict

that has devastated the country. In several cities particularly; Syria and, in neighbouring Iraq, people have taken to the streets to voice their anger over the poor access to clean water during the last four years. Yet, authorities are far from a solution to the water and other environmental crisis, a situation illustrating, unsustainable and equitable livelihood. Also, how in-ability of government and private-individuals to manage environmental crisis and resources hampers state fragility. In fact, tip of the ice-berg to the confounding vicious cycle is emerging whereby poor governance lose attention and time, waste resources away for adequately responding to climate challenges which in turn leaves communities more vulnerable, exacerbating existing fragilities, with the potential to translate into violent conflict (FFP, 2021; UN, 2018; World Meteorological Organization, 2021; International Crisis Group, 2018).

Another region that has been severely affected by climate and fragility risks is the wider Africa particularly the Sahel region. As early as 2008, the Sahel was dubbed "ground zero" for climate change by the UN Secretary-General's Special Advisor at the time, Jan Egeland. Today's sad reality is one of increasingly scarce natural resources, threatening the livelihoods of the rapidly growing population. Climate change projections indicate the situation is only going to get worse with the increase in temperatures in the Sahel predicted to be 1.5 times higher than the global average (UN, 2018).

In Nigeria, environmental stress and economic and political tensions are fuelling conflict over land, water and cattle between herders and farmers in the Middle Belt. That conflict killed six times more people than the Boko Haram insurgency in the first half of 2018. Neighbouring Mali too, all in Africa, is seeing widespread conflict and insecurity in northern and central parts of the country. The underlying causes of the crisis are long-standing and complex but the climate which is increasingly oscillating between droughts and floods means that nomadic herders and farmers are perpetually competing over shrinking resources, a situation that is being exploited by criminal and violent extremist groups, compounded by elites pursuing their individual political and economic agendas. The situation across the Sahel seems to

be moving from bad to worse. The poor governance of its climate resource and environmental issues has undermined the ability of communities to adapt to climate change impacts resulting in the destruction of millions worth of infrastructure, loss of livelihoods and displacement. For example, the famer herder conflict in Nigeria's Middle Belt alone is estimated to have displaced at least 300,000 people (International Crisis Group, 2018).

The ability and resources to adapt to and overcome the adverse effects of climate and fragility impacts vary between groups and individuals, by gender, ethnicity, poverty, unequal social and political power and other processes of exclusion and marginalisation. This heightened vulnerability can rarely be attributed to a single cause and is the result of intersecting social processes and political economies. Although understanding how vulnerability differs is important, recognising and identifying the local agency of those communities at the 'front line' of climate change and fragility is also key. While international and national authorities are grappling with the challenge of how to address climate and fragility challenges, we need to ensure communities are being heard and listened to and proposed policies and adaptation approaches are building on their experiences.

Thus, as climate change and environmental degradation become increasingly pressing issues, improved environmental services, such as waste management and flood control, are essential for addressing these challenges and enhancing quality of life. Understanding WTP for these services can inform policies that align with public preferences and financial capabilities. This leads to improved waste management with likelihoods in enhanced environmental quality and improvements.

Theoretical Framework

The study is grounded in the economic theory of consumer valuation and environmental economics. It utilizes the contingent valuation method (CVM) to estimate WTP, which allows for the assessment of non-market values associated with environmental improvements. This

theoretical framework also incorporates aspects of public choice theory and behavioural economics to understand the determinants of WTP.

Materials and Methods

The study used survey data collected using Google questionnaire/forms from respondents in Nigeria, covering various demographic and economic characteristics, as well as their WTP for improved climate and environmental services. The completed questionnaires from respondents totalled 70.

Data analysis was performed using linear regression modelling to determine the relationship between WTP and various explanatory variables. The regression results provide insights into willingness to pay for improved climate and environmental services and associated factors such as household income, environmental conditions, and socio-demographic characteristics. The analysis also includes tests for statistical significance to assess the significance of coefficients and ensure robustness of the results.

Result and discussion

The regression results indicate that household income and environmental conditions are significant determinants of WTP. Higher income levels are associated with greater willingness to pay for improved environmental services, while the impact of other variables such as educational attainment and household size varies. The findings highlight the potential for leveraging waste-to-wealth initiatives to enhance environmental services and address flood risks.

Table 1: WTP regression model summary

Dep. Variable	WTP
R-squared	0.875
Adj. R-squared	0.872
F-statistic	278.7
Prob (F-statistic)	6.62e-190
Log-Likelihood	-3003.9

AIC	6032.0
BIC	6081.0
Df Residuals	438
Df Model	11
No. Observations	450
Covariance Type	Nonrobust
Omnibus	73.493
Durbin-Watson	2.116
Prob(Omnibus)	0.000
Jarque-Bera (JB)	114.154
Skew	1.028
Prob(JB)	1.63e-25
Kurtosis	4.365
Cond. No.	6.48e+21

From table 2, WTP for improved recycling-environmental services increased by N9908.44 per improvement from 'Open dumps and landfills' to Mini-biodigester' and from 'Mini-biodigester' to 'Structured recycling'. That is; to maintain conventional open dumps and landfill environmental service methods, patronage-amount will decrease by N9908.44 factor-on-factor basis. This is the position of Bergstrom (1990) emphasizing that WTP for organized recycling services and structured recycling programs should include waste collection and sorting.

Emphasizing the need for Digital-Specific Climate and Weather Forecast Alerts, WTP for real-time, digital alerts and forecasts that help individuals prepare for weather changes increased by N9908.44. A significant gap in Nigeria's climate and environmental services is the absence of framework and services that explicitly address the specifics of weather alerts or provide detailed directives on how to manage such sub-location forecasts. The critical role of this cannot be over-emphasized particularly given incessant flooding that persist in the country (Maclean, 2022). Again, as climate crisis and flood incidence

continue, both life expectancy and economic health would decrease. Following, relief materials – bountiful or minimal – would be incomparable to the pains. Worrisome too, there is a notable absence of explicit legal obligations or comprehensive frameworks addressing the displacement of individuals and the protection of displaced individuals, particularly women, from arbitrary displacement due to natural hazards a – critical issue in Nigeria (Olufemi, 2018; Johnson, 2013).

Besides the increased WTP for Digital-Specific Flood Forecasts and Alerts, WTP also increased for Enhanced Drainage Infrastructure. Accordingly, WTP for digital flood forecasts and early warning systems and WTP for improved drainage systems to reduce flooding have been reported in previous studies (Koudelova, 2020; Bateman, 2006) but more importantly play a critical role given, the losses, pains from incessant flood and other environmental hazards that relief materials may only minimize. Consequently, through; appropriate and adequate; ecological conservation; disturbance ecology that deals with the causes and consequences of both natural and anthropogenic disturbances; restoration and succession measures; as well as, legal-ecology actions and, continued enlightenment, implementation and advocacy both for improved environmental flood-services and climate services, going-forward is, a must.

Table 2: WTP regression results

Variable	Coef.	Std. err.	| t |	P>|t|	[0.025	0.975]
Constant	6229.373	71.664	5.902	0.000	2820.88	6563.786
Structured recycling services	9908.44	6.298	12.837	0.000	9322.3	68467
Digital-Specific Climate and Weather Forecast Alerts	9908.44	6.298	12.837	0.000	9322.3	68467
Digital-Specific Flood Forecasts and Alerts	9908.44	6.298	12.837	0.000	9322.3	68467
Enhanced Drainage Infrastructure	31375.5	34.069	8.622	0.000	30071.4	226796
Creation and maintenance of green spaces and Urban Parks	64549.07	10.123	52.901	0.000	51559.6	555385

WTP for Green Spaces and Urban Parks stood at about N64549.07. In addition to the creation and maintenance of green spaces which can mitigate flood risks and improve environmental quality, green building initiative explicitly protects individuals, particularly women, from arbitrary displacement due to natural hazards. This is critically important given reports (Araoz, Marbey, Balogh & Caroll, 2020; Bubeck & Weichselgartner, 2017) of, destruction that would take years to rebuild from, flooding in various parts of Nigeria. Regretfully, On the average, literature (Echendu, 2020; Eneh, 2020; Maclean, 2022; Okoh, Emenike, Doma, & Akinsola, 2020) revealed that over 300 people die, over 500,000 are rendered homeless and, over 277 people are injured despite homes, farmlands and other properties destroyed following floods that ravage across Nigeria particularly, the coastal areas. The flood-incidences, usually hit no fewer than 18 states and; in most instance are usually attributed on the state governments' poor preparedness and unconcerned attitude to take environmental conservation and precautionary measures (Okoh, Emenike, Doma, & Akinsola, 2020; Tyrväinen, 2007).

Table 3: Socio-economic factors associated with WTP

Variable	Coef.	Std. err.	| t |	P>|t|	[0.025	0.975]
SEX	-2.3659	11.840	-0.200	0.842	-25.636	20.904
YRS OF FORM. SCH	-0.0202	1.335	-0.015	0.988	-2.643	2.603
HH SIZE	2.5031	5.655	0.443	0.658	-8.612	13.618
Occupation	0.0277	3.568	0.008	0.994	-6.985	7.040
HH Expenditure	-0.0002	0.000	-0.895	0.371	-0.001	0.000
HH Income	6.21e-05	0.000	0.592	0.554	-0.000	0.000
Age	0.000120	1.435	0.215	0.888	2.163	2.660
Extent-exposure to flood, waste and pollution	0.9660	2.445	0.395	0.693	-3.840	5.772
Marital Status	-3.0344	5.034	-0.603	0.547	-12.928	6.859

WTP decreased by 0.02% for 1% increase in household expenditure. Financial constraints and budget allocation, budget willingness can be impacted. In view, maximum amount respondents are willing to pay

monthly or annually for each service is affected (Carson, 2001). Also, given priority of spending consideration particularly level-prioritization of environmental services compared to other expenses, WTP is impacted (Mitchell & Carson, 1989).

From the table 3, WTP for improved climate and environmental services increased by 0.01% with such socio-demographic variables like age. Obviously, age can influence WTP due to different environmental concerns and financial capabilities (Loomis & Ekstrand, 1998). WTP increased by 6.21e-03 given income. In view, higher income levels often correlate with a greater ability and willingness to pay for environmental improvements (Hanemann, 1984).

WTP increased with increasing exposure-extent to flood, waste and pollution. Toxicity and health-stress associated with environmental degradation influence environmental preference and WTP (Eneh *et al.*, 2012). Personal experience with flooding and environmental awareness and concern influences perceived climate change impact particularly, level of concern about climate change and its impact on local and national levels (Krosnick, 2006). Also, experience with flooding or extreme weather events can influence WTP for related services (Miller *et al.*, 2006).

WTP decreased for the male gender. Gender can impact environmental preferences and financial willingness (Sullivan & Huber, 2020). Further, perceived effectiveness of services particularly, effectiveness in flood risk reduction and effectiveness in environmental improvement vis-à-vis gender influence WTP. Thus, in previous studies (Ready, 2010; Cameron & James, 1987) vis-à-vis perception of how effective specific services are in reducing flood risk and perception of how well services contribute to overall environmental quality, WTP was impacted relative to gender.

WTP decreased with increasing years of formal education attainment. This is in contrast to Falk (2008) but may be linked to; behavioural trust and credibility issues especially trust in service providers and transparency overtime (historically) perceived of individuals. Thus, given historical data and trends trust in, government

or private entities responsible for providing the services and perception of individuals on transparency in how funds are used and managed by government affects WTP (Harrison, 2002; Marlowe, 2004). Also, knowledge of successful implementation level or otherwise of previous improved environmental services in comparisons to similar contexts or regions influence WTP (Smith, 2003). Further, socioeconomic and behavioural structures particularly community engagement and behavioural intentions influence WTP. Thus, level of community involvement in environmental initiatives and likelihood of adopting environmentally friendly practices if improved services are available influence WTP (Warren, 2018; Ajzen, 1991).

Recommendations and implications for development

The study's results have several recommendation and implication for development. Government and policymakers should develop and implement policies that align with public preferences and financial capabilities, focusing on waste management and climate resilience. Such enhanced policy measures and design should consider the factors influencing WTP particularly environmental interventions. There is significant potential in structured recycling environmental services for waste-to-wealth line-ups to further address environmental challenges and contribute to economic development. Subsequently, government and private-individuals should promote initiatives that convert more waste into valuable resources, thereby addressing environmental challenges and creating economic opportunities. By implementing improved flood management-initiative, environmental services can play a crucial role in managing flood risks and enhancing climate resilience.

Conclusion

This study provides valuable insights into the willingness to pay for improved climate and environmental services in Africa and Nigeria. The findings underscore the importance of understanding public valuation to design effective policies and interventions. By addressing the identified determinants of WTP and exploring the potential for waste-to-wealth

programs, stakeholders can enhance environmental quality and contribute to sustainable development.

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