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Escaping the Poverty-Environment Trap: Exploring the Nonlinear Relationship Between Poverty and Environmental Concern in Southern African Development Community Countries

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Abstract

The relationship between environmental degradation and poverty has gained importance in the context of the Sustainable Development Goals. While poverty is known to drive environmental degradation, environmental degradation disproportionately affects the poor and reinforces the poverty-environment trap. However, some argue that the poor often display pro-environmental behaviors, environmental stewardship and pro-environmental attitudes that challenge this notion. Understanding how poverty influences individual environmental attitudes is crucial for breaking this cycle. In this study, we examine the non-linear relationship between poverty and environmental concern in Southern African Development Community (SADC) countries, hypothesizing an inverted U-shaped Poverty Environmental Concern Kuznets Curve (PECKC). Utilizing data from the Afrobarometer Round 7 and employing fixed effect polynomial regression model, we confirm that the poverty-environmental concern relationship conforms to an inverted U-shaped PECKC. Specifically, environmental concern is high at low levels of poverty but reaches a poverty threshold beyond which further impoverishment leads to reduced environmental concern. These findings offer policymakers critical insight for designing environmental policies tailored to varying levels of poverty and provide new insight into the poverty reduction and environment degradation discussion.

Keywords: Poverty, Kuznets Curve, Pro-environmental attitudes, SADC, Africa

1. Introduction

Poverty remains a significant global issue, with 23 million more people living in extreme poverty in 2022 compared to 2019 (World Bank, 2024). While poverty affects all continents, Africa is often regarded as the most impoverished. Although the percentage of Africans living poverty fell from 56% in 1990 to 43% in 2012, rapid population growth has resulted in a greater number of people living in poverty (World Bank, 2016).

As the first of the Sustainable Development Goals (SDGs), poverty reduction is a critical national objective. High levels of poverty not only hinder economic development but also exacerbate inequality, lead to poor health and create social instability. Research shows that poverty is interlinked with various other SDGs, often through trade-offs or synergistic relationships (Wei et al., 2023). One prominent exploration is the relationship between SDG 1 (No Poverty) and SDG 13 (Climate Action). Both poverty reduction and climate action are at the forefront of policymakers' agendas and while numerous studies have examined the relationship between environmental degradation and poverty (Scherr, 2000; Masron and Subramaniam, 2019; Koçak et al., 2019; Baloch et al., 2020; Khan, 2021; Burki et al., 2021), the literature still lacks a definitive and comprehensive understanding of this complex relationship.

Some highlight the positive impact of poverty on environmental degradation, where those in poverty extract more natural resources for immediate survival (Masron and Subramaniam, 2019; Malerba, 2020), while others show that environmental degradation subsequently leads to further poverty (Duraiappah, 1998; Akinlo and Dada, 2021). This cause-and-effect relationship is often referred to as the "vicious cycle" or the "poverty-environmental degradation trap", where people in poverty,

due to their lack of natural resources, tend to overexploit resources, causing further environmental degradation that deepens poverty (Conde and Christensen, 2008; Kassa et al., 2018; Ssekibaala and Kasule, 2023).

This vicious cycle between poverty and environmental degradation have been confirmed in Sub-Saharan African countries, where poverty remains at extreme levels (Sadat and Kasule, 2023). With an estimated 413 million people in Africa currently living in extreme poverty and the disproportionate climate change effects on the poor, the poverty-environmental degradation trap becomes critically important for policymakers.

However, studies suggest that the vicious cycle hypothesis may be too simplistic to capture the complex relationship between poverty and environmental degradation, particularly since most studies are based on macro analysis (Meher, 2023). Moreover, the idea of a vicious cycle between environmental degradation and poverty has also been criticized since the poor might have strong support for environmental protection due to their understanding of the environment and time spent in the environment (Broad, 1994). For example, when the poor have a strong sense of environmental awareness and concern, they tend to have lower tendencies to over exploit the environment and transition from environmental degraders to environmental activists (Broad, 1994), weakening the poverty-environmental degradation link. If this is the case, how individuals in poverty perceive environmental issues becomes a crucial component in the poverty-environmental degradation trap.

It is well known that the multifaced relationship between poverty and environmental degradation expands well beyond the objective sphere. Environmental sociologists have pointed out that environmental attitudes and beliefs are strongly linked to environmental sustainability. For instance, concerns about climate change and pollution are directly associated with renewable energy consumption in Africa (Nyiwul, 2017). Moreover, environmental concern plays a crucial role in the success of environmental policy (Liu et al., 2014).

Recent studies have integrated environmental concerns into the Environmental Kuznets curve (Ficjo and Bončina, 2019), illustrating the non-linear relationship between economic level of development and environmental degradation is influenced by environmental concern. Ficjo and Bončina refer to this modified version of the EKC as the Environmental concern Kuznets Curve (ECKC), where environmental concern initially rises with economic development but then begins to decline in the long run. Related to the poverty-environmental degradation framework a similar question arises could environmental concern influence the poverty-environmental degradation relationship and if so, what is the relationship between poverty and environmental concern.

While a large body of literature has explored the dynamics behind environmental and climate change concerns (Franzen and Meyer, 2010; Lui et al., 2014; Duijndam and van Beukering, 2020; Iyer and Jose, 2024) and many focusing on the role of income or some measure of material well-being (Van Liere and Dunlap, 1980; Li and Chen, 2018), few studies have integrated poverty into the environmental concern framework. Given the extreme level of poverty in Africa, the disproportionate impact of climate change on the poor and the significant literature gap in environmental sociology focus on Africa, this study aims to assess environmental concern among a sample of African countries and its relationship with poverty. By making use of the Afrobarometer dataset, we examine the nonlinear impact of poverty on environmental concerns for the SADC region, making several contributions.

Firstly, while many studies have assessed the dynamics behind environmental concern and income, very few have incorporated poverty as determining factor for environmental concern. Assessing the relationship between poverty and environmental concern should provide better insight into the underlying dynamics of the poverty-environmental degradation trap. Second, by

assessing the non-linear relationship this study builds on the modified ECKC by incorporating poverty and refers to this as the Poverty Environmental Concern Kuznets Curve (PECPC). While Ficko and co focused the ECKC on economic development within already highly developed countries, to our knowledge, this is the first paper to bring in the dimension of poverty, offering a fresh perspective on how prolonged poverty influences environmental concern. Third, countries in the SADC suffer from some of the highest poverty levels yet have been underrepresented in environmental sociology studies. Linking environmental sociology with poverty in these countries provides critical insight for policymakers on the implementation of successful environmental policies. Lastly, assessing the impact of poverty on environmental concern further broadens scope of coexistence of development and environmental policies and provides fresh insights into two critical SDG goals at play.

The following sections are structured as follows: Section 2 provides an overview of the relevant literature and theoretical background. Section 3 presents the data sources and methodology. Section 4 summarizes the descriptive statistics and the empirical findings, while Section 5 provides a summary and conclusion of the results.

2. Literature review

Environmental concern is defined as “the degree to which people are aware of problems regarding the environment and support efforts to solve them and/or indicate a willingness to contribute personally to their solution” (Dunlap and Jones, 2002; 485). With this broad definition numerous studies have shown the importance of knowing how concerned individuals about environmental problems and the forces behind it are (Franzen and Meyer, 2010; Lui and Shi, 2014; Xiao and McCright, 2015; Iyer and Jose, 2024). Previous studies have reported that public concern for climate change has been strongly linked to pro-environmental behaviour changes (Spence et al., 2011), policy support, and collective action (Smith and Leiserowit, 2023). However, very few studies have included poverty as a determinant of environmental concern.

The theoretical link between poverty and environmental concern can be based on three theories. The first is based on Maslow’s hierarchy of needs. According to Maslow’s theory of the hierarchy of needs, individuals prioritize fulfilling their most basic physiological and safety needs such as food, shelter, and security, before they can focus on higher level needs such as social belonging, self-esteem, and self-actualization (Maslow, 1970). Once these basic material needs are satisfied, individuals are more likely to pursue non-material or higher order needs, which include concerns for environmental quality. If economic security allows individuals to engage in pro-environmental behaviours because they can satisfy higher order needs, then poverty, at the same time, will restrict it. Those who live in poverty, unable to meet their fundamental needs, are less likely to prioritize environmental concerns, as their immediate focus remains on obtaining essential resources.

The relationship between poverty and environmental concern is further supported by the post-materialist value theory proposed by Inglehart (1995). The post-materialist value theory shows that people need to focus on material needs and survival problems, but as economic development and welfare increases will allow people to start focusing on needs that are beyond materialist needs (Inglehart, 1995). These theories support the notion that deeper poverty or similarly lower income is associated with lower environmental concern given the more immediate need to secure basic resources

The third theory explains the link between environmental concern, environmental degradation, and poverty. The more widely known theoretical link describes the relationship between poverty and environmental degradation. This is often referred to as the vicious cycle hypothesis (Barbier and Hochard, 2019; Baloch et al., 2020). The vicious cycle theory originates from bi-directional and casual relationship between poverty and environmental degradation. Researchers frequently find that poverty leads to environmental degradation (Masron and Subramaniam, 2019; Malerba, 2020), as those in poverty tend to over-exploit

natural resources at their disposal, causing environmental degradation. Conversely, other studies show that environmental degradation exacerbates poverty (Kousar and Shabbir, 2021), creating a vicious cycle where poverty and environmental degradation feed into one another, potentially leading to a poverty- environmental degradation trap (Barbier and Hochard, 2018; Baloch et al., 2020).

The vicious cycle hypothesis is built on a few key assumptions. First, that poverty is viewed as primary determinant of environmental degradation. Second, that the poor are short-term maximizers and due to their current state of poverty cannot see the long-term benefits of environmental conservation. As a result, they choose to over-exploit their natural environment to satisfy immediate needs, which leads to environmental degradation (Broad, 1994). However as pointed out by Broad (1994), a critique for the vicious cycle hypothesis arises when the poor, due to time spent in the environment and a sense of knowledge about environmental dependency, often tend to protect the environment regardless of their poverty status. If the poor choose to not over exploit the environment due to taking environmental stewardship or have high environmental concern, the vicious cycle hypothesis breaks down. For example, a study by Meher (2023) found no significant relationship between poverty and environmental degradation, instead finding non-poor households are associated with higher forest degradation compared to poor households. Other studies suggest that the relationship between poverty and environmental degradation to be dependent on various external factors like institutional quality, education and population growth (Yusuf, 2004; Ria, 2019).

How the poor perceive the environment and their concern for environmental degradation complicates the relationship between poverty and environmental degradation. Environmental sociologists have long advocated for a deeper understanding of how environmental attitudes and perceptions influence climate action. A recent study by Ficko and Bončina (2019) derived a modified version of the Environmental Kuznets Curve (EKC) called the environment concern Kuznets (ECKC). While the original EKC assumes that environmental protection deteriorates in the early stages of economic development and subsequently improves in later stages – a relationship that can be represented with a U-shaped curve (Kuznets, 1955), Ficko and Bončina (2019) found that in most developed countries, environmental concern follows a pattern like the traditional Environmental Kuznets Curve (EKC), where concern initially increases with economic development but eventually decreases after reaching a certain point. Their findings challenge the assumption that environmental concern continuously increases with development, highlighting the complexities and changing dynamics of public attitudes toward environmental protection in highly developed nations. However, as they noted their limitation of assessing the ECKC for developed countries excludes different spectrums of development, especially among the developing countries.

There is still a large gap on environmental sociology in African context, and although the continent is suffering from the highest levels of poverty and bearing a large brunt of environmental challenges, little empirical work exists on the environmental sociology due to data constraints. The aim of this study is to incorporate the ECKC theory and assess the nonlinear relationship between environmental concern and poverty. Our hypothesis builds on the Ficko and Bončina inverted U-shaped ECKC, by assessing the relationship between poverty and environmental concern with a modified Poverty Environmental Concern Kuznets Curve (PECKC). We hypothesize that an inverted U-shaped PECKC would mean initially the level of environmental concern is high among those with low poverty level, however as poverty prolongs individuals, there is a poverty threshold after which those in deeper poverty start to have less concern about environmental issues and more focus is channeled towards meeting immediate survival needs.

3. Method of the research

3.1 Data and study area

The study used the Afrobarometer round 7 dataset released in 2019. The Afrobarometer dataset is a representative cross-national survey conducted since 1999 ([Afrobarometer – Let the people have a say](#)). Using a multi-stage, stratified, random probability sampling method (aged 15 and above) the Afrobarometer round dataset consists of 17 209 respondents from 12 SADC countries. The Southern African Development Community (SADC) is a regional economic community that consist of 16 member states. The reason for choosing the SADC is due to them sharing certain historical, socio-political, and economic characteristics that make them more comparable to each other than to countries in other regions. This comparability strengthens the internal validity of our study.

3.2 Variables of the study

The study aims to assess the non-linear relationship between poverty and environmental concern in SADC countries. To measure poverty and environmental concern two proxies were drawn from the Afrobarometer survey. Measuring poverty, we make use of the Lived Poverty Index (LPI), a measure of poverty in the Afrobarometer that that is based on a series of survey questions about how frequently people go without necessities during a year (Afrobarometer, 2020). The battery of questions includes questions about how often the respondent and their family have gone without necessities like food, clean water, Medicines or medical treatment, fuel to cook your food, cash income, and school expenses for your children (like fees, uniforms or books). Respondents then respond on a 5-point scale. These batteries of questions are then combined into a continuous scale that consists of an average score from the responses and ranges from 0 (no lived poverty) to 4 (a constant lack of all necessities). Although the LPI is a subjective measure poverty, the measure has been shown to have strong cross-sectional individual level construct validity and reliability within any national sample, as well as cross-national validity and reliability across country samples. The measure aligns with Senn (1999) hypothesis that one's standard of living lies in living itself, in this case the shortage of necessities in life leads to information about the experiential core of poverty. Moreover, the LPI is very strongly related to country level measures of political freedom (Mattes, 2008).

For Environmental concern, we make use of a question in the Afrobarometer about the impact of climate change. The question reads *Do you think climate change is making life in [ENTER COUNTRY] better or worse, or haven't you heard enough to say?* Respondents are then asked to respond on a five-point scale of *much better, somewhat better, Neither or no change, about the same, somewhat worse and much worse*. This measure of negative climate change perceptions has been used as a valid measure of concern in both environmental psychology and public opinion research (Gonzalez and Sanchez, 2021). This approach is justified by the strong relationship between perceived negative impacts and expressions of concern about environmental issues.

3.3 Method

The data was subjected to descriptive analysis and pre-estimation tests. We make use of the fixed effect polynomial regression. Polynomial regression is an extension of the linear regressions that allows for non-linear assessment. When combined with the fixed effect, which accounts unobserved heterogeneity, the model function is as follows:

$$\text{Environmental concern}_{it} = \beta_0 + \beta_1 x \text{Poverty}_{it} + \beta_2 x \text{Poverty}_{it} \text{Squared} + \alpha_i + \epsilon_{it}$$

The α_i (fixed effect) accounts for unobserved, time-invariant characteristics specific to each country. β_1 and β_2 represents the coefficient for the short run and long run impact of poverty on environmental concern. According the ECKC the relationship

should follow an inverted U-shape, where β_1 is positive and β_2 is negative. The threshold effect is the point poverty where environmental concern reaches its peak and is then calculated as

$$Poverty\ threshold = -(2 \times \beta_2) / \beta_1$$

For robustness, the random effects and Pooled OLS reported similar results for impact of poverty and poverty squared on environmental concern (results in the appendix table A1). Moreover, to assess the possibility of multicollinearity we estimated the variance inflation factor (VIF) in table A2 in the appendix. As expected, the VIF for poverty and poverty squared is relatively high at 8.69 and 8.30 respectively. These values, although relatively high, do not exceed the commonly accepted threshold of 10, suggesting that multicollinearity is present but not severe. However, to account for multicollinearity we use a centering approach. Specifically, the LPI variable was centered by subtracting its mean before generating the squared term. This approach reduces multicollinearity while preserving the nonlinear relationship (results in the appendix). Other variables showed VIF scores ranging from 1.02 to 5.39, indicating low to moderate multicollinearity. Overall, the mean VIF is 3.39 which indicates that multicollinearity is not a major concern. For the fixed effect estimates we also implemented the Modified Wald test for groupwise heteroskedasticity, with a chi-square of 884.80 and a p-value of 0.000 we confirm the presence of heteroskedasticity. To account for this, we use the fixed effect estimates with robust standard errors to account for the heteroskedasticity

4. Descriptive statistics

From the descriptive statistics in table 1 we report the number of observations, mean, standard deviations, minimum and maximum values. The sample shows a relatively high mean for environmental concern (3.87) with moderate variability and 8 204 observations. The reason for the drop in observations is because the environmental concern question was not applicable for a few of the sampled countries. Poverty has a lower mean (1.146) but a similarly moderate standard deviation. The squared poverty variable indicates greater variability, with values ranging up to 16. Gender is evenly distributed across the sample, as reflected in a mean close to 1.5. The average age of participants is 38.02 years, with a broad age range from 18 to 106 years. Education levels vary, with a mean of 1.580. The rural variable suggests that a significant portion of the sample resides in rural areas, with a mean close to 1.6. Religious affiliation is somewhat diverse, as indicated by the mean value of 1.426. Finally, demand for democracy has a mean of 2.849, showing variability in participants' support for democracy. These statistics provide a snapshot of the characteristics and diversity within the study's sample population.

Table 1. Summary statistics of the variables used in the study

Variables	Number of observations	Mean	Standard deviations	Min	Max
Environmental concern	8 204	3.87	1.25	1	5
Poverty	17 209	1.146	0.881	0	4
Poverty-squared	17 209	2.088	2.602	0	16
Gender	17 203	1.502	0.500	1	2
Age	17 193	38.02	15.417	18	106
Education	17 064	1.580	0.839	0	3
Rural	17 209	1.595	0.491	1	2
Religion	17 053	1.426	0.7522	1	3
DemandDemo	15 907	2.849	1.228	0	4

We also report the Lived Poverty, and environmental concern means for all the SADC countries in table 2. Countries like South Africa, Botswana and Namibia with relatively low poverty levels exhibit low levels of environmental concern. While countries like Malawi, Lesotho and Madagascar have both high levels of poverty and environmental concern. The heterogeneity among countries points out the complex relationship between poverty and environmental concern across SADC countries, with higher poverty levels not necessarily reducing environmental concern.

Table 2. Poverty and environmental concern by county level

Country	Environmental concern	Poverty
Botswana	3.6411	0.7961
eSwatini	4.3469	1.2994
Lesotho	4.6475	1.3513
Madagascar	4.1444	1.5957
Malawi	4.6220	1.4715
Mauritius	3.6838	0.1585
Mozambique	2.8725	1.1770
Namibia	3.6699	0.7240
South Africa	3.5386	0.8652
Tanzania	4.4187	1.0091
Zambia	3.6178	1.1236

5. Results

5.1 Main findings

Table 3 presents the regression results for the fixed effect polynomial model. The significant positive coefficient of Lived Poverty Index (LPI) and a negative coefficient of LPI squared suggest an inverted U-shaped relationship between poverty and environmental concern. At lower levels of LPI, the positive coefficient suggests that as poverty increases slightly, environmental concern initially increases. This could imply that individuals who are not at the extreme levels of poverty might have some capacity to be concerned about environmental issues. However, the significant negative coefficient of the LPI-squared suggests that as poverty intensifies, the initial increase in environmental concern reaches a peak and then begins to decline. This finding is logical, as individuals facing severe poverty are more likely to prioritize basic needs such as food, water and shelter over environmental concerns.

This study highlights the nonlinear relationship between poverty and environmental concern. People facing moderate poverty levels may still care deeply about environmental issues, however as poverty worsens, these concerns diminish. This pattern suggests a critical point (threshold) at which the burdens of poverty become too overwhelming to maintain focus on environmental issues, particularly in the context of Africa. The threshold effect is calculated as 2.0255 and indicates the level of poverty where environmental concerns begin to decline. Below this threshold, increasing poverty is associated with heightened environmental concern, suggesting that individuals at moderate levels of poverty are highly aware of how environmental degradation affects their livelihoods. However once poverty exceeds this threshold, further increases in poverty

are associated with declining environmental concerns, as the struggle to meet basic necessities overshadows concerns about environmental issues.

In terms of the control variables, gender, education, religion and demand for democracy significantly predict environmental concern, while age and location are insignificant. The negative coefficient of gender suggests that females, on average, exhibit lower environmental concern compared to males. This finding is consistent with other studies who support the importance of gender differences on environmental attitudes, however the findings in this study contrasts with broader literature that typically findings females to be more concerned about environmental issues (Hunter et al., 2004). This could be due to country specific factors that may influence women’s attitudes towards environmental issues in this setting. Also, when controlling for multicollinearity and heteroscedastic tendencies the gender variable is insignificant.

The positive coefficient for education indicates that higher education levels are associated with greater concern for environmental issues., This is consistent with the existing literature, where education is a key predictor of environmental awareness (Li and Chen, 2018). Religious affiliation also positively predicts environmental concern, especially those who identify as Christian are more likely to be concerned about environmental issues compared to those who don’t affiliate with any religion. Lastly, the positive relationship between demand for democracy and environmental concern underscores the connection between political attitudes and environmental awareness. These findings are in line with other studies observing the predicting factors of environmental concern (Li and Chen, 2018; Azeez et al., 2024).

Table 3. Fixed effect polynomial regression model of environmental concern

VARIABLES	(1) Fixed effect
Lived Poverty	0.175*** (0.0476)
Lived Poverty-squared	-0.0432*** (0.0159)
Age	-8.06e-07 (5.53e-07)
Female	-0.0521** (0.0258)
Primary education	0.149** (0.0589)
Secondary education	0.0962* (0.0583)
Tertiary education	0.200*** (0.0645)
Rural	-0.0318

	(0.0284)
Christian	0.129***
	(0.0444)
Muslim	0.0214
	(0.0376)
Demand for democracy	0.105***
	(0.0128)
Constant	3.311***
	(0.0764)
Observations	7,448
R-squared	0.016
Number of COUNTRY	10

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2 Robustness analysis

To account for the high multicollinearity between Lived Poverty and Lived Poverty Squared, as well as and heteroskedasticity, we employed a fixed effects model with standard errors and used a centering approach. Despite these statistical adjustments, the results in table 4 remain consistent with our earlier findings, reinforcing the presence of an inverse U-shaped (or quadratic relationship between poverty and environmental concern. The inverse U-shaped relationship suggests that individuals in extreme poverty prioritize immediate economic survival over long-term environmental sustainability. As poverty levels increase initially, people may become more aware of environmental degradation, particularly if it exacerbates their living conditions. However, once poverty reaches a certain threshold, individuals may no longer have the capacity or inclination to be concerned with environmental issues, as their focus shift towards meeting basic survival needs. This finding aligns with previous research that highlights the trade-off between economic insecurity and environmental concern, where individuals facing severe poverty often deprioritize environmental issues (Martinez-Alier, 1995). Moreover education, religion and demand for democracy remains positive and significant in explaining environmental concern.

Overall, the robustness of this inverse U-shaped relationship underscores the importance of addressing poverty as part of environmental policy, suggesting that poverty reduction initiatives could play a dual role, not only improving people's quality of life but also fostering greater environmental awareness and stewardship.

Table 4. Fixed effect estimates with centering approach

VARIABLES	(1)
LPI centered	0.0791*** (0.0189)
LPI centered squared	-0.0452*** (0.0159)
Age	0.00395***

	(0.000927)
Female	-0.0399
	(0.0259)
Primary education	0.178***
	(0.0592)
Secondary education	0.162***
	(0.0600)
Tertiary education	0.266***
	(0.0660)
Rural	-0.0282
	(0.0284)
Christian	0.128***
	(0.0444)
Muslim	0.0181
	(0.0376)
Demand for democracy	0.101***
	(0.0128)
Constant	3.260***
	(0.0847)
Observations	7,444
Number of COUNTRY	10
R-squared	0.018

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

The aim of this was to assess the nonlinear impact of poverty on environmental concerns in the SADC region. Poverty and environmental degradation remain critical issues in the African continent and to address the poverty-environmental degradation trap more insight is needed into the underlying dynamics behind poverty and environmental attitudes and perceptions. Individuals' attitudes towards the environment plays a critical role in shaping environmental policy, however, there lacks research on the relationship between poverty and environmental concerns, especially in an African context. The aim of the study was till fill this research gap and explore uncharted waters on poverty and environmental attitudes by assessing the non-linear relationship between poverty and environmental concern.

The results confirm the existence of an inverted U-shape relationship between poverty and environmental concern. Specifically, at low levels of poverty, higher levels of poverty are associated with higher environmental concern. However, as poverty intensifies and persists, the relationship becomes negative, and further higher levels of poverty are associated with lower environmental concerns. This finding makes empirical sense and there is a turning point of poverty whereafter the poor would reduce their concern for the environment since immediate survival needs like food, water and shelter are lacking.

This study is not without limitations. First, the measure for Lived Poverty is a subjective measure of poverty and does not capture income-based poverty. Although continuous income data is rarely available for cross-comparative African studies, efforts should be made to obtain more objective measures of poverty that could further analyze the nonlinear impact of poverty on environmental concerns. Additionally, the definition of environmental concern is broad, and assessing different measures of environmental concern or an environmental attitude index should provide more insight for the poverty – environmental concern relationship.

From a policy-making perspective, there are several insights. Firstly, the relatively high level of environmental concern among those with moderate levels of poverty presents an opportunity for policymakers to integrate environmental education and stewardship programs that target populations at moderate poverty levels. As poverty intensifies, the focus shifts away from environmental concern and more towards immediate survival needs. Policymakers should focus on providing sustainable livelihoods that promote basic needs while considering environmental conservation. Initiatives like eco-tourism, sustainable agriculture and agroforestry can help communities create income streams without overexploiting the natural environment. Thirdly since environmental concern is low among those with high levels of poverty, environmental policy should integrate social safety needs and poverty reduction as a measure to simultaneously address immediate basic needs of the poor and promote environmental sustainability.

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Appendix

Table A1. Random effects and Pooled OLS results

VARIABLES	(1) Pooled	(2) Random
LivedPoverty	0.367*** (0.0480)	0.367*** (0.0480)
LivedPoverty squared	-0.0765*** (0.0168)	-0.0765*** (0.0168)
Age	0.00569*** (0.001000)	0.00569*** (0.001000)
Female	-0.0388 (0.0286)	-0.0388 (0.0286)
Primary education	0.319*** (0.0651)	0.319*** (0.0651)
Secondary education	0.121* (0.0659)	0.121* (0.0659)
Tertiary education	0.227*** (0.0724)	0.227*** (0.0724)
Rural	0.0517* (0.0303)	0.0517* (0.0303)
Christian	0.0390 (0.0459)	0.0390 (0.0459)
Muslim	-0.0839** (0.0396)	-0.0839** (0.0396)
Demand for democracy	0.182*** (0.0131)	0.182*** (0.0131)
Constant	2.630***	2.630***

	(0.0963)	(0.0963)
Observations	7,444	7,444
R-squared	0.053	
Number of COUNTRY		10

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2. Variance Inflation Factor estimates

Variables	VIF	1/VIF
LivedPoverty	8.69	0.115
LivedPoverty squared	8.30	0.120
Age	1.12	0.895
Gender	1.02	0.982
Primary education	4.49	0.223
Secondary education	5.39	0.185
Tertiary education	4.01	0.249
Rural	1.15	0.871
Christian	1.04	0.963
Muslim	1.08	0.925
Demand for democracy	1.05	0.949