

Institutional Trust and Perceived Environmental Benefits Influence Willingness to Participate in Restoration of Illegal Mining-Affected Degraded Sites

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Abstract

Sustainable ecosystem restoration in resource-degraded landscapes depends on understanding the social, economic, and institutional factors that influence community participation. Illegal mining (galamsey) in Ghana has caused widespread degradation of forests, farmlands, and water bodies, threatening ecosystem services and rural livelihoods while creating an urgent need for effective restoration strategies. This study examined how institutional trust and perceived environmental benefits influence residents' willingness to participate in the restoration of illegal mining-degraded landscapes. Data were collected from 435 respondents across 25 selected mining-affected communities using structured questionnaires. A Double-Hurdle econometric model was employed to analyze the determinants of residents' willingness to pay (WTP), willingness to accept (WTA) compensation, and the factors influencing both participation and valuation decisions. Residents' institutional trust varied across governance actors, with NGOs recording the highest trust levels, followed by government institutions, while traditional authorities recorded the lowest trust levels. The results also revealed that while most respondents (71%; $n = 309$) were willing to participate in restoration activities, only 28.7% ($n = 89$) of these respondents were willing to make financial contributions, largely due to income constraints, perceived limited direct benefits, and low institutional trust. Some respondents were willing to participate through compensation arrangements, and their preferences were mainly oriented toward access to restored land for farming (35%) and cash payments (30%), while a smaller proportion preferred alternative livelihood assistance (19%) and agricultural inputs (11%). Double-Hurdle regression results showed that perceived environmental benefits significantly reduced WTA and increased WTP, while institutional trust had a similar positive influence on participation decisions. The interaction between trust and environmental benefits further strengthened willingness to engage in restoration. The findings suggest that ecosystem restoration is shaped not only by ecological considerations but also by governance credibility, livelihood dependence, and perceived welfare outcomes. This study has important policy implications, pointing to the need for trust-based and livelihood-sensitive approaches in environmental restoration governance.

Introduction

Globally, ecosystem degradation has become a critical environmental challenge, driven by unsustainable resource extraction, land-use change, and climate variability. Among these pressures, mining, particularly artisanal and small-scale mining (ASM) has been widely recognized as a major contributor to land degradation, water pollution, and biodiversity loss in developing regions (Hilson, 2016; Sonter et al., 2018). In response, global frameworks such as the United Nations Sustainable Development Goals (SDGs), especially SDG 6 (Clean Water and Sanitation) and SDG 15 (Life on Land), emphasize the restoration and sustainable management of ecosystems. Similarly, the United Nations Environment Programme and Food and Agriculture Organization have promoted the UN Decade on Ecosystem Restoration (2021–2030) as a global call to revive degraded landscapes and enhance human well-being (UNEP, 2020; FAO, 2021). These frameworks show that successful restoration is not only a technical or

ecological process but also a socio-institutional one, requiring strong governance systems, inclusive participation, and trust among stakeholders (Reed et al., 2017; Aronson et al., 2020).

Despite these global commitments, restoration efforts in many developing countries continue to face implementation challenges, especially in illegal mining-affected landscapes. Evidence suggests that restoration success depends not only on ecological interventions but also on institutional trust and community confidence in implementing agencies (He et al., 2015; Makwinja et al., 2019; Ni et al., 2021; Shan et al., 2021). Studies have shown that perceptions of fairness, transparency, accountability, and institutional capacity influence public participation and support for restoration initiatives (Sharp et al., 2013; Metcalf et al., 2015). Similarly, Shan et al. (2021) and Ni et al. (2021) found that institutional trust significantly enhances willingness to participate and contribute to ecological restoration and compensation programs. These findings suggest that beyond ecological interventions, social factors such as trust play a critical role in shaping restoration success. This becomes relevant in regions where environmental degradation is driven by complex socioeconomic activities, such as illegal mining, where restoration efforts must address both ecological damage and community perceptions of governance.

Illegal mining (galamsey) remains one of the most pressing environmental and governance challenges in Ghana, particularly in forested and mineral-rich regions. Rivers such as the Offin, Pra, Densu, and Ankobra have experienced severe pollution, while agricultural lands and forest reserves have been extensively degraded (Mensah et al., 2015; Obodai et al., 2023). These environmental impacts have significantly reduced the availability of critical ecosystem services, including clean water, soil fertility, agricultural productivity, biodiversity conservation, and flood regulation, thereby threatening local livelihoods and community well-being (Obeng et al., 2019; Boafo et al., 2019). Restoration of mined landscapes is therefore essential to rehabilitate degraded ecosystems and restore their productive and ecological functions. This process involves re-establishing vegetation cover, stabilizing soil and water systems, and recovering ecosystem goods and services (Obeng et al., 2019). Ghana's Minerals and Mining Act, 2006 (Act 703) requires mining operators to undertake Environmental Impact Assessments and implement reclamation measures such as topsoil management, slope stabilization, progressive restoration, and revegetation. However, weak enforcement and the widespread nature of illegal mining have limited the effectiveness of these regulatory measures, resulting in continued environmental degradation.

In response, the government and its partners have introduced interventions such as the National Alternative Employment and Livelihood Programme (NAELP) and the Ghana Landscape Restoration and Small-Scale Mining Project (GLRSSMP) to support restoration and livelihood recovery. However, the effectiveness of these initiatives has been challenged by limited community involvement, weak institutional credibility, and low trust in restoration actors (Kaye-Essien and Yankson, 2023). In illegal mining-affected communities, including the selected study areas, successful restoration requires not only technical rehabilitation efforts but also an understanding of how residents perceive restoration benefits and the institutions responsible for implementation. Although previous studies in Ghana have examined the environmental consequences of illegal mining and technical restoration approaches

(Obeng et al., 2019; Amoah et al., 2022; Mensah, 2022), limited attention has been given to how perceived environmental benefits and institutional trust jointly influence residents' willingness to participate in restoration initiatives. This knowledge gap is critical, as community acceptance and participation are central to achieving sustainable restoration outcomes in degraded mining landscapes.

This study addresses these gaps by examining the combined effect of perceived environmental benefits (including improvements in water quality, soil fertility, agricultural productivity, flood and erosion control and improved community well-being) and institutional trust on residents' willingness to pay or accept compensation to participate in ecosystem restoration in illegal mining-affected communities in Ghana. The study moves beyond previous studies that treated economic valuation and governance factors separately and integrate both dimensions to provide a more holistic understanding of restoration participation. Specifically, the study seeks to (i) examine residents' trust in key institutions (government, non-governmental organizations (NGOs), and traditional authorities) involved in ecosystem restoration initiatives; (ii) assess residents' willingness to pay or accept (WTP or WTA) compensation and their preferred forms of compensation for restoration of degraded mined sites within their community for the supply of environmental benefits (iii) analyze how perceived environmental benefits and institutional trust jointly shape residents' decisions to participate in degraded landscape restoration initiatives. The study contributes to advancing knowledge on restoration governance and offers practical insights for designing inclusive, credible, and effective ecosystem restoration policies that align ecological goals with community needs and expectations.

Methodology

Description of study area

The study was conducted in five districts in Ghana namely; Obuasi, Juabeso, Amansie West, Atiwa West, and Abuakwa South (Fig. 1). These areas are widely recognized as hotspots of illegal small-scale mining (galamsey) and its associated environmental degradation (Owusu et al., 2025) and have experienced significant ecological damage, including deforestation, land degradation, and water pollution, alongside social and livelihood disruptions. Five communities were purposively selected within each district based on the intensity of illegal mining activities, the extent of environmental degradation especially the destruction of forests, farmlands, and water bodies. In Juabeso, such as Kwawkrom, Abrokofe, Boinzan, Eluibo, and Mafia communities were selected, while in Amansie West, Antoakrom, Omanadwareye, Besease, Amankyea, and Esaase Bontefufuo were selected. In Obuasi, the study covered Kokoteasua, Adaase, Memiriwa, Abaamu, and Sanso; in Atiwa West, Akropong, Pampetia, Abomoso, Muoso, and Akyem Anom; and in Abuakwa South, Adukrom, Pano, Potroase, Odumasi, and Asiakwa. These communities represent areas where mining activities intersect strongly with agriculture and natural resource dependence.

Across the study areas, livelihoods were predominantly agrarian, with most residents engaged in smallholder farming, particularly cocoa production, alongside hunting and the collection of non-timber

forest products such as firewood, fruits, and honey (GSS, 2021). Gold mining also represents an important livelihood activity, often competing with agriculture for land and labour. Located within forest and semi-deciduous ecological zones, these districts have favorable conditions for farming but face increasing threats from illegal mining, logging, and slash-and-burn practices (MoFA, 2021). Despite their economic importance, the areas experience development challenges, including poor road infrastructure and limited access to potable water. All selected communities have previously been exposed to environmental management and restoration interventions by relevant institutions, providing residents with experiences that shape their perceptions of institutional trust and restoration initiatives. The combination of ecological vulnerability, dependence on natural resources, and governance challenges makes these districts suitable for examining how perceived environmental benefits and institutional trust influence participation in ecosystem restoration.

Research design and data collection

The study adopted a quantitative cross-sectional survey design to examine how perceived environmental benefits and institutional trust influence residents' willingness to participate in ecosystem restoration through willingness to accept (WTA) compensation and willingness to pay (WTP). The Contingent Valuation Method (CVM) was employed as the primary valuation approach to estimate residents' WTA and WTP for participation in restoration initiatives. CVM is widely recognized as one of the most effective methods for valuing non-market environmental goods, particularly where no observable market data exist (Amigues et al., 2002; Wang et al., 2019). The method constructs a hypothetical market scenario in which respondents state their WTA or WTP for environmental improvements, allowing researchers to estimate the economic value individuals place on ecosystem services (Amigues et al., 2002; Tadesse et al., 2021). A structured questionnaire was used to collect data on residents' WTA/WTP alongside key explanatory variables, including institutional trust, perceived environmental benefits, and socio-economic characteristics. Institutional trust was measured using a composite Trust Index guided by the OECD (2017) Guidelines on Measuring Trust, comprising five dimensions: fairness, transparency, competence, accountability, and reliability. A total of 435 respondents were surveyed across all selected communities.

The questionnaire consisted of four sections. The first assessed respondents' trust in key institutions involved in ecosystem restoration, including government institutions, NGOs, and traditional authorities. The second examined residents' willingness to pay (WTP) or willingness to accept (WTA) compensation for participating in restoration initiatives. The third measured respondents' perceptions of the environmental benefits associated with ecosystem restoration, while the fourth collected socio-demographic information. The questionnaire incorporated clearly defined hypothetical valuation scenarios that linked environmental benefits and institutional trust to ecosystem restoration participation, enabling respondents to make informed and realistic valuation decisions. The instrument was pretested with 10 respondents in Amanfrom, Abuakwa South District, and feedback from the pretest

was used to refine the questionnaire prior to the main survey. Data were collected between January and April 2026.

A combination of purposive and snowball sampling techniques was used to select respondents. Purposive sampling targeted individuals who had resided in the community for at least five years and were knowledgeable about illegal mining activities, with support from local community contact persons. Snowball sampling was further employed to identify key actors such as illegal miners, landowners, farmers, and other individuals who were difficult to locate through conventional means. This combined approach ensured the inclusion of information-rich participants with relevant experience and knowledge of the study context. Data collection was conducted in Twi, the commonly spoken local language, after obtaining informed consent from respondents. In addition, traditional community entry protocols were observed by seeking approval from community leaders (chiefs) prior to data collection. Ethical approval for this study was obtained from the Faculty of Renewable Natural Resources, Kwame Nkrumah University of Science and Technology (KNUST), Ghana. Participation was entirely voluntary and participants were assured that their responses would remain anonymous and confidential and would be used solely for academic purposes.

Contingent Valuation and the Valuation Scenarios

The Contingent Valuation Method (CVM) is widely used in environmental economics to estimate the value of non-market environmental goods by eliciting individuals' preferences through hypothetical scenarios (Amigues et al., 2002; Hanemann, 1984; Haab & McConnell, 2002; Wang et al., 2019). Grounded in consumer utility theory, CVM estimates either the maximum amount individuals are willing to pay for environmental improvements or the minimum compensation they are willing to accept for participating in environmental programmes or accommodating environmental changes (Tadesse et al., 2021).

In this study, respondents were presented with two hypothetical contingent valuation scenarios based on the same community ecosystem restoration programme targeting approximately 50 hectares of degraded land and polluted streams. The WTP scenario assessed voluntary financial contributions, while respondents unwilling to pay were presented with a WTA scenario to determine their willingness to participate if compensated for time, labour, or livelihood opportunity costs. This approach recognizes that limited financial capacity does not necessarily reflect unwillingness to support restoration and captures both monetary and compensation-based participation pathways. While sequential presentation can introduce order effects, this approach also reflects the practical realities of mining-affected communities, where financial constraints may limit monetary contributions despite a willingness to support restoration through compensated participation. The hypothetical scenarios were given as:

Hypothetical Scenario for Willingness to Pay (WTP)

“Imagine that a new ecosystem restoration program is to be implemented in your community to rehabilitate about 50 hectares of degraded lands and water bodies that have been severely degraded by illegal mining. The program will involve activities such as tree planting, restoration of polluted rivers and streams, reclamation of degraded farmlands, filling of mining pits, and soil improvement interventions. These efforts are expected to generate important environmental benefits, including improved soil fertility, cleaner and safer water, enhanced agricultural productivity, reduced health risks, and improved overall community livelihoods. The program will be implemented by an institution you trust most (either a government agency, a non-governmental organization (NGO), or traditional authorities) working in collaboration with community structures. To ensure transparency, accountability, and effective management, regular public reporting, community monitoring, and participatory decision-making mechanisms will be established. To finance these restoration activities, households will be asked to make voluntary monthly contributions to a community restoration fund for one year. If adequate funds are not raised, the restoration programme may not be implemented, and environmental degradation is likely to continue. Would you be willing to contribute financially? If yes, what is the maximum amount you would be willing to pay per month for one year? You are reminded to carefully consider their monthly income and household financial obligations before making any decision regarding financial contribution or participation”.

Hypothetical Scenario for Willingness to Accept (WTA)

Imagine that the same Community-Based Ecosystem Restoration Programme will restore approximately 50 hectares of degraded land and polluted water bodies in your community. Households will be invited to participate by providing labour, supporting tree planting, allowing temporary land access where necessary, and complying with restoration activities. In recognition of the time, labour, and livelihood opportunities forgone, participants will receive compensation. If the programme is not implemented, no compensation will be provided and environmental degradation will continue. Would you be willing to participate if compensation is offered? If yes, what form of compensation would you prefer? If you prefer cash compensation, what is the minimum monthly amount you would be willing to accept for your participation?.

These scenarios were designed to clearly communicate the environmental benefits, institutional arrangements, and participation requirements, enabling respondents to make informed decisions regarding their willingness to pay or accept compensation and engage in ecosystem restoration activities.

Econometric Model

To examine the effects of institutional trust and perceived environmental benefits on residents' willingness to accept compensation (WTA) and willingness to pay (WTP) for restoration of degraded mined sites within their community for the supply of environmental benefits, this study employed a Double-Hurdle (DH) econometric framework originally proposed by Cragg (1971). The Double-Hurdle model was considered appropriate because residents' participation decisions involve two distinct but related behavioral processes: first, the decision of whether to participate in ecosystem restoration

initiatives through willingness to pay or willingness to accept compensation (participation decision); and second, the determination of the amount respondents are willing to pay or accept once participation has been established (intensity model).

Unlike the Tobit model, which assumes that the participation decision and valuation amount are determined by the same stochastic process, the Double-Hurdle framework recognizes that these decisions may arise from different underlying motivations and constraints (Kamau et al., 2024). In the context of illegal mining-affected communities, a resident may support ecosystem restoration conceptually but may be financially constrained from making monetary contributions, while another respondent may only be willing to participate if compensation is provided. Therefore, separating the participation decision from the valuation amount provides a more realistic and behaviorally consistent estimation framework.

The Double-Hurdle approach has been widely applied in environmental valuation and natural resource economics studies where respondents first decide whether to participate and subsequently determine the level of contribution or compensation (Berhanu and Swinton, 2003; Kamau et al., 2024). Following these studies, the present research assumes that the two decision processes are related but governed by separate stochastic mechanisms.

The first hurdle estimates the probability that a respondent is willing to participate in ecosystem restoration initiatives through either WTP or WTA decisions. Because this stage involves a binary outcome, a logistic regression model was employed. The latent participation decision is specified as:

$$D^*_i = \alpha Z_i + V_i \text{ Eq. 1}$$

where:

D^*_i represents the unobserved latent variable indicating the respondent's propensity to participate in ecosystem restoration initiatives; Z_i denotes a vector of explanatory variables including perceived environmental benefits, institutional trust, interaction effects, and socio-economic characteristics; α represents the vector of parameters to be estimated; and V_i is the random error term assumed to follow a logistic distribution

The observed binary participation decision is expressed as:

$$D_i = \begin{cases} 1 & \text{if } D^*_i > 0 \\ 0 & \text{if } D^*_i \leq 0 \end{cases} \text{ Eq. 2}$$

where:

$D_i = 1$ indicates respondents' willingness to participate through WTP or WTA arrangements; and $D_i = 0$ otherwise.

The second hurdle estimates the magnitude of WTP or WTA among only those respondents reporting positive monetary values. Since the dependent variables contain only positive observations after the first hurdle, truncated regression models were employed to account for left-truncation at zero and to obtain unbiased and consistent parameter estimates.

The truncated regression model is specified as:

$$Y_i^* = \beta X_i + \mu_i \text{ Eq. 3}$$

subject to:

$$Y_i > 0$$

Assuming:

$$\mu_i \sim N(0, \sigma^2)$$

Where;

Y_i^* represents the latent WTP or WTA amount; X_i is a vector of explanatory variables; β denotes the vector of coefficients to be estimated; and μ_i is the stochastic error term assumed to be normally distributed.

The explanatory variables included in both hurdles comprised perceived environmental benefits (PEB), institutional trust (TRU), the interaction term between perceived environmental benefits and institutional trust (PEBxTRU), as well as socio-economic characteristics including age, gender, education, occupation, household income, land ownership, and length of residence in the community. The inclusion of the interaction term enabled the study to assess whether institutional trust moderates the influence of perceived environmental benefits on residents' participation decisions and valuation amounts for ecosystem restoration initiatives.

Marginal effects were computed to provide a more intuitive interpretation of the double-hurdle model results by quantifying the change in the probability of participation and the level of WTP/WTa resulting from a unit change in the explanatory variables. This allows for clearer policy-relevant insights into how institutional trust, perceived environmental benefits, and other factors influence both the decision to participate and the magnitude of contributions.

Measurement of Willingness to Pay (WTP)

The elicitation of WTP followed the standard Contingent Valuation Method (CVM) approach grounded in consumer utility theory (Bishop and Heberlein, 1979; Hoehn and Randall, 1987). Respondents were first presented with a hypothetical ecosystem restoration programme aimed at restoring degraded lands and

water bodies while improving water quality, soil fertility, agricultural productivity, and community well-being. They were then asked whether they would be willing to make a financial contribution toward its implementation. The contribution was framed as a monthly payment into a community restoration fund for a period of one year, managed by the institution they trusted most (government agency, NGO, or traditional authority). Respondents who indicated willingness to contribute were then asked to state the maximum amount they would be willing to pay annually, using an open-ended format. This approach allowed respondents to express their true valuation without restriction. The use of an open-ended WTP format was considered appropriate given the sensitivity of income levels and to prevent starting-point bias and accommodate local unfamiliarity with complex bids (Shan et al., 2021).

Measurement of Willingness to Accept (WTA)

For respondents who were unwilling to make financial contributions, the study elicited their willingness to accept compensation (WTA) for participation in ecosystem restoration activities. These respondents were first asked to indicate their preferred form of compensation, and those who selected cash were further asked to state the minimum monthly amount they would require per hectare of affected land (or equivalent participation unit) to participate in restoration activities.

An open-ended elicitation format was adopted to allow respondents to freely state their valuation without influence from pre-determined bid amounts. This approach was preferred over closed-ended formats because respondents in closely-knit communities often compare responses, which can influence their stated preferences and reduce response credibility. Additionally, providing suggested monetary values could have led to either protest responses (if values were perceived as too low) or inflated expectations (if values were perceived as unrealistically high), thereby compromising data reliability (Amigues et al., 2002).

Data Analysis

The collected data were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics such as means, frequencies, and standard deviations were used to summarize respondents' socio-demographic characteristics, levels of institutional trust, perceived environmental benefits, and willingness to accept (WTA) and willingness to pay (WTP) for ecosystem restoration. The Overall Trust Index was computed by aggregating respondents' scores across the five trust indicators (fairness, transparency, competence, accountability, and reliability) using an unweighted arithmetic mean, where each indicator was assigned equal importance in measuring institutional trust. To examine the determinants of WTA and WTP. The Double-Hurdle model was used to estimate the effects of institutional trust, perceived environmental benefits, and socio-economic characteristics on residents' valuation responses.

Results

Socio-demographic characteristics of respondents

Table 1 presents the demographic characteristics of the 435 respondents surveyed in this study. The results show that males constituted the majority of respondents (57.0%), while females accounted for 43.0%. The mean age of respondents was 38.6 years (SD = 12.4) and more than half of the respondents were married (56.8%). In terms of educational attainment, the largest proportion of respondents had attained Junior High School education (29.4%), followed by Senior High School education (22.3%). Farming emerged as the dominant occupation (42.8%), followed by trading (17.7%) and mining (12.4%). The average monthly household income was GHS 1,245.00 (SD = 685.40). Additionally, most respondents owned farmland within the community (69.2%), and majority were natives (68.05%) with average length of residence being 16.8 years (SD = 9.7).

Table 1
Demographic characteristics of respondents (N = 435)

Demographic Characteristics	Category	Mean (SD)	Frequency	Percentage
Gender	Male	-	248	57.0
	Female	-	187	43.0
Age (years)	-	38.6 (12.4)	-	-
Marital Status	Single	-	128	29.4
	Married	-	247	56.8
	Divorced	-	34	7.8
	Widowed	-	26	6.0
Highest Educational Level	No formal education	-	72	16.6
	Primary	-	61	14.0
	Junior High School	-	128	29.4
	Senior High School	-	97	22.3
	Vocational/Technical	-	39	9.0
	Tertiary	-	38	8.7
Main Occupation	Farming	-	186	42.8
	Mining	-	54	12.4
	Trading	-	77	17.7
	Artisan	-	42	9.7
	Public sector employment	-	31	7.1
	Private sector employment	-	26	6.0
	Other	-	19	4.4
Average Monthly Household Income (GHS)	-	1,245.00 (685.40)	-	-
Farmland Ownership	Yes	-	301	69.2
	No	-	134	30.8
Residency status	Native	-	296	68.05
	Migrant	-	139	31.95

Demographic Characteristics	Category	Mean (SD)	Frequency	Percentage
Length of Residence in Community (years)	-	16.8 (9.7)	-	-

Institutional Trust in Ecosystem Restoration

Respondents from all selected illegal mining-affected communities were asked to rate their level of trust in key institutions involved in ecosystem restoration initiatives. They rated their level of trust on a five-point Likert scale ranging from 1 = *No trust at all* to 5 = *Very high trust*. The results revealed varying levels of institutional trust among residents. Non-governmental organizations (NGOs) recorded the highest level of trust among respondents (Mean = 3.94, SD = 0.88), while government institutions/agencies recorded a moderate to high level of trust (Mean = 3.41, SD = 1.02). Traditional authorities recorded the lowest trust levels among the three institutions (Mean = 2.92, SD = 1.11) (Table 2).

Table 2
Institutional Trust in Ecosystem Restoration (n = 435)

Institution	Mean	Standard Deviation
Government institutions/agencies	3.41	1.02
Non-governmental organizations (NGOs)	3.94	0.88
Traditional authorities	2.92	1.11

Institutional Trust Dimensions Across Governance Actors

Table 3 presents respondents' perceptions of institutional trust across three major governance actors involved in ecosystem restoration in illegal mining-affected communities: government institutions, non-governmental organizations (NGOs), and traditional authorities. Institutional trust was assessed using five indicators: fairness, transparency, competence, accountability, and reliability through a set of statements rated on a five-point Likert scale ranging from 1 = *Strongly Disagree* to 5 = *Strongly Agree*. The institutional trust scale demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.91. NGOs recorded the highest trust index (Mean = 3.92, SD = 0.82), indicating relatively stronger public confidence in their ability to effectively and transparently implement restoration initiatives. Government institutions recorded a moderate overall trust index (Mean = 3.30, SD = 1.04), with competence receiving the highest rating among the trust dimensions (Mean = 3.82, SD = 0.98). Traditional authorities recorded the lowest overall trust index (Mean = 3.06, SD = 1.07), particularly in accountability and transparency. Across all governance actors, transparency and accountability emerged as comparatively weaker dimensions of trust.

Table 3
Institutional Trust Dimensions Across Governance Actors (n = 435)

Trust Indicator	Measurement Statement	Government Institutions Mean (SD)	NGOs Mean (SD)	Traditional Authorities Mean (SD)
Fairness	"This institution treats community members fairly in restoration-related decisions."	3.21 (1.04)	3.88 (0.85)	3.15 (1.01)
Transparency	"This institution openly shares information about restoration projects and the use of restoration funds."	3.05 (1.10)	4.01 (0.82)	2.98 (1.12)
Competence	"This institution has the capacity and expertise to effectively implement ecosystem restoration projects."	3.82 (0.98)	3.75 (0.79)	3.20 (1.00)
Accountability	"This institution can be held accountable by community members for restoration-related actions and decisions."	3.11 (1.08)	3.89 (0.87)	2.90 (1.15)
Reliability	"This institution can be relied upon to fulfill promises made regarding restoration activities."	3.33 (1.01)	4.06 (0.76)	3.08 (1.07)
Overall Trust Index	Composite institutional trust score based on all indicators	3.30 (1.04)	3.92 (0.82)	3.06 (1.07)

Level of Trust in Government Institutions Involved in Ecosystem Restoration

Respondents were further asked to rate their level of trust in selected government institutions involved in environmental management and ecosystem restoration in illegal mining-affected communities. Trust levels were measured on a five-point Likert scale ranging from 1 = *No trust at all* to 5 = *Very high trust*. The findings showed that the Environmental Protection Agency (EPA) recorded the highest level of trust among respondents (Mean = 3.76, SD = 0.93), suggesting relatively stronger confidence in its environmental regulatory role. The Minerals Commission followed with a moderate level of trust (Mean = 3.48, SD = 1.01), while the District Assembly recorded slightly lower trust levels (Mean = 3.27, SD = 1.08). The Forestry Commission recorded the lowest trust level among the institutions assessed (Mean = 3.05, SD = 1.12) (Table 4).

Table 4
Level of Trust in Government Institutions (n = 435)

Government Institution	Mean	Standard Deviation
Environmental Protection Agency (EPA)	3.76	0.93
Minerals Commission	3.48	1.01
District Assembly	3.27	1.08
Forestry Commission	3.05	1.12

Respondents' Willingness to Participate and Pay for Ecosystem Restoration for Environmental Benefits

The results indicate that the majority of respondents (71%; n = 309) expressed willingness to participate in ecosystem restoration activities within their communities, while 29% (n = 126) indicated unwillingness to participate.

Out of the 309 respondents who expressed willingness to participate in ecosystem restoration activities, only 28.7% (n = 89) indicated willingness to make financial contributions, while the majority, 71.3% (n = 220), were not willing to pay. Among those willing to contribute, the average willingness to pay was GHS 10.00 (USD 0.91) per month for a period of one year, with a standard deviation of 4.20. The minimum contribution reported was GHS 2.00 (USD 0.18), while the maximum willingness to pay reached GHS 25.00 (USD 2.27). per month (Table 5).

Table 5
Residents' Willingness to Pay (WTP) for Ecosystem Restoration (n = 435)

WTP Indicator	Description	Result
Willing to Pay	Respondents willing to contribute financially to restoration fund	28.7% (n = 89)
Not Willing to Pay	Respondents not willing to contribute financially	71.3% (n = 220)
Mean WTP	Average monthly contribution (GHS/month)	10.00 (USD 0.91)
Standard Deviation	Variation in monthly contributions	4.20
Minimum WTP	Lowest amount willing to pay (GHS/month)	2.00 (USD 0.18)
Maximum WTP	Highest amount willing to pay (GHS/month)	25.00 (USD 2.27).
<i>Note: USD equivalents were calculated using the May 2026 Bank of Ghana exchange rate of USD 1 = GHS 11.00.</i>		

Reasons for Unwillingness to Pay for Ecosystem Restoration (n = 220)

Among the 220 respondents who were unwilling to contribute financially to the ecosystem restoration fund, the most commonly reported reason was limited income or inability to afford financial contributions (42.9%), indicating that economic constraints significantly influence residents' participation decisions. This was followed by the belief that government or illegal miners should bear the restoration costs (24.2%). Dependence on illegal mining activities for livelihood accounted for 12.9% of responses. Also, 11.9% of respondents believed that the restoration program would not provide direct benefits, while 8.1% cited lack of trust in institutions managing the program (Fig. 2).

Willingness to Accept Compensation (WTA) for Participating in Ecosystem Restoration Activities

Among the respondents who were unwilling to contribute financially toward ecosystem restoration activities (71.3%, n = 220), further inquiry was made to determine whether they would be willing to participate if compensation was provided. The results show that a large majority of them expressed willingness to participate in ecosystem restoration activities if compensation is provided. Specifically, 82.7% (n = 182) indicated that they would accept compensation and participate, while 17.3% (n = 38) were unwilling to participate even when compensation is provided. Regarding preferred forms of compensation, respondents showed varied preferences. The most preferred option was access to portions of restored land for farming (35%), indicating strong interest in securing productive land resources. This was followed by cash payments (30%), reflecting the importance of immediate financial compensation. Alternative livelihood support (19%) and farming inputs (11%) were also preferred, though to a lesser extent. The least preferred option was community infrastructure development (5%) (Fig. 3).

Regarding those (30%, n = 55) who preferred cash payment as their preferred form of compensation, the estimated willingness to accept (WTA) compensation for participation in ecosystem restoration averaged GHS 850 (USD 77.27) per month over a 12-month period, with a standard deviation of GHS 350.00. The minimum amount reported was GHS 200 (USD 18.18) per month, while the maximum reached GHS 1,500 (USD 136.36) per month.

Out of the respondents who initially indicated unwillingness to participate (n = 126), and those who remained unwilling even when compensation was offered (n = 38), the most frequently mentioned reason was perceived lack of personal benefit (31%), indicating that some respondents did not see direct gains from participating in restoration activities. This was followed by time and labour constraints (25%). Skepticism about the sustainability of restoration projects (21%) also featured prominently. Also, dependence on illegal mining activities for livelihood and income (10%) influenced unwillingness, as participation was seen as potentially conflicting with existing income sources. Low trust in implementing

institutions (8%) were also mentioned and the environmental risk involved (5%) was the least cited (Fig. 4).

Perceived Environmental Benefits of Ecosystem Restoration

The results in Table 6 show that respondents generally held strong perceptions regarding the environmental benefits associated with ecosystem restoration in illegal mining-affected communities. A scale ranging from 1 = *Strongly Disagree* to 5 = *Strongly Agree* was used. The measurement scale demonstrated high internal consistency, with a Cronbach’s alpha coefficient of 0.83. Among the assessed indicators, most respondents strongly agreed that restoration would improve soil fertility and agricultural productivity (Mean = 4.45, SD = 0.70), followed by improvements in community health and well-being (Mean = 4.38, SD = 0.75) and water quality (Mean = 4.32, SD = 0.78). Respondents also acknowledged the potential of restoration to reduce flooding, erosion, and related environmental hazards (Mean = 4.20, SD = 0.82), as well as improve livelihoods through farming, fishing, and other natural resource-based activities (Mean = 4.10, SD = 0.88).

Table 6
Statements Used to Assess Perceived Environmental Benefits of Ecosystem Restoration

No.	Measurement Statement	Mean	Std. Deviation
1	“Ecosystem restoration will improve the quality of water sources in my community.”	4.32	0.78
2	“Restoration of degraded mining lands will improve soil fertility and agricultural productivity.”	4.45	0.70
3	“Ecosystem restoration will help reduce flooding, erosion, and other environmental hazards in the community.”	4.20	0.82
4	“Restoration activities will improve livelihoods through better farming, fishing, or other natural resource opportunities.”	4.10	0.88
5	“Restoring degraded ecosystems will improve the health and well-being of people in this community.”	4.38	0.75

Double-Hurdle Regression Analysis of Residents’ Willingness to Accept (WTA) and Willingness to Pay (WTP) for Ecosystem Restoration Participation

The results from the Double-Hurdle regression model indicate that perceived environmental benefits (PEB) and institutional trust significantly influence both residents’ decisions to participate in ecosystem restoration and the magnitude of their willingness to pay (WTP) or willingness to accept compensation (WTA). In the first hurdle (participation decision), PEB and institutional trust exhibited significant and contrasting effects on WTA and WTP decisions. Specifically, higher perceived environmental benefits reduced the likelihood of seeking compensation (WTA: $\beta = -0.73, p < 0.05$) while increasing the likelihood

of making financial contributions (WTP: $\beta = 0.62, p < 0.05$). Similarly, institutional trust significantly reduced WTA participation decisions ($\beta = -0.68, p < 0.05$) but positively influenced WTP decisions ($\beta = 0.79, p < 0.01$). The interaction effect between PEB and institutional trust was also significant, although with varying magnitudes across the two models (WTA: $\beta = -0.29, p < 0.10$; WTP: $\beta = 0.36, p < 0.05$), suggesting that trust strengthens the influence of perceived environmental benefits on restoration participation decisions. Among the socioeconomic variables, education (WTA: $\beta = -0.27, p < 0.05$; WTP: $\beta = 0.33, p < 0.05$), income (WTA: $\beta = -0.46, p < 0.01$; WTP: $\beta = 0.52, p < 0.01$), farmland ownership (WTA: $\beta = -0.21, p < 0.10$; WTP: $\beta = 0.19, p < 0.10$), and length of residence (WTA: $\beta = -0.19, p < 0.10$; WTP: $\beta = 0.22, p < 0.10$) significantly influenced participation decisions. These results demonstrate that residents' restoration choices are shaped not only by economic considerations but also by their perceptions of environmental improvements and confidence in institutions responsible for restoration implementation.

In the second hurdle (valuation intensity model), the findings further demonstrate that PEB and institutional trust significantly influence the amount of compensation demanded or financial contributions offered among respondents who crossed the participation threshold. PEB was negatively associated with WTA amounts ($\beta = -2.41, p < 0.05$) but positively associated with WTP amounts ($\beta = 2.17, p < 0.05$). Likewise, institutional trust significantly reduced compensation requirements (WTA: $\beta = -2.26, p < 0.05$) while increasing financial contributions towards restoration (WTP: $\beta = 2.71, p < 0.01$). The interaction between PEB and institutional trust remained significant in the valuation stage (WTA: $\beta = -0.84, p < 0.10$; WTP: $\beta = 0.91, p < 0.05$), highlighting the reinforcing role of institutional credibility in translating perceived environmental benefits into stronger restoration support. Among socioeconomic factors, household income emerged as the strongest determinant of valuation intensity, negatively influencing WTA ($\beta = -1.42, p < 0.01$) and positively influencing WTP ($\beta = 1.76, p < 0.01$). Education, farmland ownership, and length of residence also showed significant effects, indicating that socioeconomic capacity and attachment to local landscapes influence restoration valuation. The model diagnostics, including significant Wald Chi-square statistics, improved log-likelihood values, and highly significant model probabilities ($p < 0.001$), confirm the robustness and appropriateness of the Double-Hurdle framework for distinguishing between residents' participation decisions and their subsequent valuation responses. To address potential multicollinearity associated with the interaction term, perceived environmental benefits (PEB) and institutional trust (TRU) were mean-centered before generating the interaction term (PEB $\times$ TRU). Variance Inflation Factor (VIF) diagnostics were conducted, with all variables recording VIF values below the recommended threshold of 5, indicating no serious multicollinearity concerns (Table 7).

Table 7
Double-Hurdle Regression Analysis of Residents' Willingness to Accept (WTA) and Willingness to Pay (WTP) for Ecosystem Restoration Participation

Variable	First Hurdle-WTA Logit Coef. (z/t)	dx/dy	First Hurdle-WTP Logit Coef. (z/t)	dx/dy	Second Hurdle-WTA Truncated Coef. (t-stat)	Second Hurdle- WTP Truncated Coef. (t-stat)
Perceived Environmental Benefits (PEB)	-0.73** (-2.06)	-0.17**	0.62** (2.14)	0.14**	-2.41** (-2.18)	2.17** (2.05)
Institutional Trust (Tru)	-0.68** (-2.01)	-0.15**	0.79*** (2.63)	0.18***	-2.26** (-2.03)	2.71*** (2.76)
PEB × Tru	-0.29* (-1.79)	-0.06*	0.36** (2.01)	0.08**	-0.84* (-1.88)	0.91** (2.02)
Gender	-0.09 (-0.52)	-0.02	0.14 (0.71)	0.03	-0.31 (-0.61)	0.47 (0.79)
Age	0.18* (1.72)	0.04*	-0.05 (-0.63)	-0.01	0.86* (1.69)	-0.21 (-0.58)
Education	-0.27** (-2.04)	-0.06**	0.33** (2.19)	0.07**	-1.08** (-2.01)	1.28** (2.14)
Occupation	0.11 (0.81)	0.02	-0.08 (-0.71)	-0.02	0.38 (0.83)	-0.29 (-0.70)
Income	-0.46*** (-2.84)	-0.11***	0.52*** (3.04)	0.12***	-1.42*** (-2.86)	1.76*** (3.18)
Farmland Ownership	-0.21* (-1.66)	-0.05*	0.19* (1.61)	0.04*	-0.67* (-1.65)	0.73* (1.74)
Length of Residence	-0.19* (-1.63)	-0.04*	0.22* (1.77)	0.05*	-0.59* (-1.61)	0.68* (1.79)
Log Likelihood	-219.36	–	-203.14	–	-207.81	-192.44
Wald Chi ²	96.42	–	115.27	–	108.56	121.83
Prob > Chi ²	0.0000	–	0.0000	–	0.0000	0.0000
Sigma	–	–	–	–	5.72***	5.34***
N (sample size)	220	–	309	–	55	89
Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; WTA = Willingness to Accept Compensation; WTP = Willingness to Pay						

Discussion

Institutional Trust Dimensions Across Governance Actors in Ecosystem Restoration

Institutional trust emerged as a central determinant of public confidence in ecosystem restoration governance within illegal mining-affected communities. The significantly higher trust placed in non-governmental organizations (NGOs) relative to government institutions and traditional authorities suggests that community perceptions of restoration governance extend beyond institutional mandates to encompass perceived legitimacy, responsiveness, and procedural integrity. Trust therefore appears to function as a form of governance capital that shapes citizens' willingness to accept restoration interventions, cooperate with implementing agencies, and participate in long-term environmental recovery initiatives. This finding reinforces the proposition that restoration success depends not solely on ecological effectiveness but equally on the credibility of the institutions responsible for implementation (Baker et al., 2014; Metcalf et al., 2015). The comparatively stronger trust in NGOs is likely attributable to their perceived proximity to local communities, participatory engagement approaches, and visible implementation of restoration activities. Such direct engagement may have enhanced both cognitive trusts based on demonstrated technical capability, which develops through repeated interactions and perceived concern for community welfare. These findings support Floyd et al. (2024), who argue that trust reduces stakeholder conflict, enhances collaborative decision-making, and strengthens long-term commitment to restoration initiatives.

Van Oosten et al. (2021) also emphasized that effective restoration governance requires institutions that can effectively engage communities, build collaborative relationships, and sustain public confidence. The stronger trust in NGOs may therefore reflect perceptions of better communication, accountability, and direct engagement with local communities in restoration-related activities. However, unlike many restoration contexts where state institutions remain the dominant actors, the stronger confidence in NGOs observed in this study may reflect growing public frustration with the politicization of *galamsey* governance and perceived inconsistencies in state-led enforcement interventions in Ghana. This suggests that institutional legitimacy in restoration is earned through demonstrated performance and sustained community engagement rather than formal statutory authority alone. It further implies that residents evaluate restoration actors based on their ability to deliver tangible environmental and livelihood outcomes, reinforcing the performance-based perspective of institutional trust in collaborative environmental governance.

The moderate trust observed in government institutions reflects the complex governance challenges surrounding illegal mining and environmental management in Ghana. Although institutions such as the Environmental Protection Agency and Minerals Commission may retain some technical credibility, public skepticism likely stems from perceptions of weak enforcement, corruption, political interference, and inconsistent regulation of illegal mining activities. Similar findings have been reported in other environmental governance contexts where distrust in state institutions undermines participation in conservation and restoration programs (Sharp et al., 2013; Metcalf et al., 2015). In Tanzania, for example,

Baird and Leslie (2013) found that conservation initiatives generated tensions and weakened systems-based trust where communities perceived environmental interventions as threatening livelihoods and excluding local interests. The lower trust ratings for transparency and accountability across governance actors in the present study further reinforce arguments by Mohr et al. (2015) that trust in restoration processes must be continuously built through procedural fairness, open communication, and inclusive stakeholder engagement. Shan et al., (2021) similarly observed that greater institutional credibility increases residents' willingness to engage in environmental management while reducing resistance and compensation demands.

The relatively lower trust in traditional authorities is particularly important given their historical role as custodians of communal lands and natural resources in Ghana. This finding complicates conventional assumptions within community-based natural resource management frameworks that traditional authorities automatically command local legitimacy and social trust in environmental governance processes (Dapilah et al., 2013; Abrefa-Busia and Adjei, 2022). The results may indicate growing concerns about elite capture, land allocation disputes, and perceived involvement of some traditional leaders in illegal mining activities, which could weaken their legitimacy in restoration governance. This suggests that restoration initiatives in mining-affected areas require governance systems that prioritize accountability, fairness, and meaningful public participation across all institutional actors. The findings align with emerging international restoration and environmental governance frameworks such as the United Nations Decade on Ecosystem Restoration and the Public Trust Principle, which emphasize that ecological restoration must be accompanied by socially legitimate and trustworthy governance structures (Rong, 2025). The study therefore contributes to restoration governance scholarship by demonstrating that rebuilding trust and strengthening institutional legitimacy are essential for achieving sustainable and socially inclusive ecosystem restoration outcomes in illegal mining landscapes.

Residents' Willingness to Pay (WTP) or Accept (WTA) Compensation and Preferred Forms of Compensation for Participation in Ecosystem Restoration

The findings suggest that although residents generally expressed positive attitudes toward ecosystem restoration, their willingness to contribute financially remained relatively low, reflecting the complex socioeconomic realities within illegal mining-affected communities. The high proportion of respondents willing to participate in restoration activities demonstrates strong community recognition of the environmental degradation caused by illegal mining and the need for ecological rehabilitation. However, the relatively low proportion willing to make direct financial contributions indicates that support for restoration does not necessarily translate into monetary commitment, particularly in economically vulnerable rural settings. Similar findings have been reported in other environmental valuation studies where households supported restoration objectives but demonstrated limited financial capacity to contribute due to poverty and livelihood insecurity (Endalew and Wondimagegnhu, 2019; Amoah et al., 2022). The estimated monthly WTP of GHS 10.00 over a one-year period would generate approximately GHS 10,680 annually from the 89 respondents willing to contribute, suggesting that while local financial contributions may support minor restoration activities, large-scale restoration initiatives would still

require substantial external support from government agencies, NGOs, and mining-related compensation schemes. Comparable studies in Ghana have similarly shown that willingness to pay for environmental restoration is often constrained by household income levels, livelihood dependence, and perceived economic trade-offs (Damnyag et al., 2017; Obeng et al., 2019; Ansong et al., 2023; Owusu et al., 2025). This finding suggests that residents evaluate restoration participation based on perceived costs and expected returns, with limited economic resources reducing their ability to engage financially despite recognizing environmental benefits. This highlights the well-documented attitude-behaviour gap in environmental economics, where positive environmental attitudes do not necessarily translate into financial contributions because economically constrained households prioritize immediate livelihood needs over long-term environmental investments (Brummer, 2020; Fabio, 2025).

The reasons provided for unwillingness to pay further reinforce the importance of economic vulnerability and governance perceptions in shaping restoration participation. The dominance of limited income as the primary reason for unwillingness to contribute highlights the reality that many residents in mining-affected communities face precarious livelihoods and may prioritize immediate household survival over long-term environmental investments. Similar patterns have been observed in watershed restoration studies in China and Ethiopia, where lower-income households demonstrated weaker financial participation despite acknowledging ecological degradation (Endalew and Wondimagegnhu, 2019; Wang et al., 2026). The perception that government or mining actors should bear restoration costs also reflects the growing expectation that environmental responsibility should lie with those directly benefiting from resource extraction. This aligns with ecological compensation principles and the “polluter pays” framework widely discussed in environmental governance literature (Jun-lin and Yang, 2023). Additionally, the influence of livelihood dependence on illegal mining demonstrates the socioeconomic contradictions surrounding restoration efforts. For some residents, mining simultaneously represents environmental destruction and a critical income source, creating tension between conservation objectives and livelihood security. Similar findings have been reported in Tanzania, Jordan, and China where households dependent on environmentally harmful activities often show lower willingness to financially support conservation unless viable livelihood alternatives are provided (Wang, 2016; Al-Assaf et al., 2021). The relatively smaller proportion citing lack of institutional trust nonetheless highlights the continued importance of governance credibility in shaping environmental cooperation.

The WTA findings provide important insights into residents’ restoration preferences, showing that participation is strongly influenced by perceived livelihood benefits and compensation arrangements. The high proportion of respondents willing to participate when compensation was introduced suggests that residents are not opposed to restoration itself but evaluate participation based on livelihood implications and opportunity costs. The preference for access to restored land over direct cash payments indicates that residents prioritize long-term livelihood security and productive resource access rather than short-term financial incentives alone. Similar observations were reported in Jordan, where communities prioritized grazing rehabilitation and sustainable land access over direct monetary benefits (Al-Assaf et al., 2021). However, unlike studies that found stronger preference for direct monetary incentives in conservation participation (Lindhjem and Mitani, 2012; Adhikari et al., 2022), the present

study revealed that residents prioritized long-term access to restored land and livelihood security over immediate cash compensation, reflecting the distinctive livelihood realities of illegal mining-affected communities in Ghana.

The estimated WTA of GHS 850 (USD 77.27) per month over 12 months, equivalent to approximately GHS 10,200 (USD 927.27) annually among respondents preferring cash compensation, reflects the substantial opportunity costs associated with restoration participation in mining-dependent communities. Similar studies in the United States, Finland, and China have shown that land users often demand significant compensation where conservation activities may restrict income-generating opportunities (Lindhjem and Mitani, 2012; Wang et al., 2019; Adhikari et al., 2022). However, the persistence of unwillingness among some respondents despite compensation offers demonstrates that financial incentives alone may not guarantee participation. Factors such as skepticism about project sustainability, perceived lack of direct benefits, and dependence on mining livelihoods indicate that restoration requires credible governance, livelihood alternatives, and meaningful community engagement. These findings suggest that compensation should be integrated into broader livelihood transition strategies that enhance resource access and strengthen long-term stewardship, consistent with the principles of Nature-based Solutions and integrated landscape restoration. Thus, the study contributes to restoration governance scholarship by demonstrating that participation in illegal mining-affected landscapes is shaped by the interaction between economic considerations, institutional legitimacy, and long-term livelihood security, with broader relevance for restoration initiatives across resource-dependent regions of Africa and the Global South.

How Perceived Environmental Benefits and Institutional Trust Shape Participation in Ecosystem Restoration

The findings show that residents' participation in ecosystem restoration is strongly shaped by their perceptions of the environmental and livelihood benefits associated with restoration activities. Respondents largely believed that restoration would improve soil fertility, water quality, public health, and livelihood opportunities, suggesting that environmental rehabilitation is viewed not only as an ecological intervention but also as a pathway toward socioeconomic recovery in illegal mining-affected communities. The significant negative relationship between perceived environmental benefits and WTA, alongside the positive relationship with WTP, indicates that residents who recognize tangible ecological and livelihood gains require lower compensation and are more willing to financially support restoration initiatives. Similar findings were reported by Shan et al. (2021), who found in China that positive environmental benefits significantly reduced WTA while increasing WTP among residents affected by municipal solid waste treatment projects. Comparable evidence has also been documented in Ghana, Ethiopia, and Jordan, where perceptions of improved ecosystem services positively influenced willingness to support conservation and restoration interventions (Obeng et al., 2019; Endalew and Wondimagegnhu, 2019; Al-Assaf et al., 2021; Amoah et al., 2022). The findings further align with studies emphasizing that restoration participation is often driven by expected improvements in ecosystem

services, household well-being, and livelihood resilience rather than purely environmental concerns (Sarvilinna et al., 2018; Ansong et al., 2023). In contrast, studies in some highly industrialized or downstream ecological compensation settings have reported weaker environmental motivations where residents prioritize direct financial incentives over ecological outcomes (Wang et al., 2026). Thus, the present study highlights the continued importance of ecosystem dependence in shaping restoration preferences within rural mining-dependent communities in Ghana. This finding advances existing restoration literature by demonstrating that in degraded mining landscapes, perceived ecosystem service recovery functions as a social incentive that can transform restoration from a compensatory obligation into a shared community investment.

The study also demonstrates the critical role of institutional trust in shaping restoration participation decisions. Trust in government agencies, NGOs, and traditional authorities significantly reduced residents' WTA while increasing their WTP, suggesting that confidence in implementing institutions enhances public willingness to support environmental restoration programs. These findings reinforce previous scholarship which argues that restoration success depends not only on technical interventions but also on governance legitimacy, transparency, and stakeholder confidence (Baker et al., 2014; Metcalf et al., 2015; Floyd et al., 2024). In many natural resource governance contexts, distrust emerges where communities perceive institutions as unfair, politically biased, or incapable of fulfilling commitments, thereby weakening participation and cooperation (Sharp et al., 2013; Van Oosten et al., 2021). The significant interaction effect between institutional trust and perceived environmental benefits further suggests that residents are more likely to support restoration when they simultaneously perceive strong ecological benefits and trust the institutions responsible for implementation. This findings align with observations by Shan et al. (2021), who reported that institutional credibility strengthened residents' support for environmental management programs in Beijing. Similarly, Metcalf et al. (2015) found that trust-building through communication, accountability, and public engagement was central to restoration success in complex social-ecological systems. In contrast, studies from Tanzania and other conservation-conflict settings have shown that weak institutional trust can undermine participation even when environmental restoration goals are acknowledged as beneficial (Baird and Leslie, 2013). Therefore, this study extends current debates on restoration governance by showing that institutional trust operates as a social multiplier that strengthens the influence of perceived environmental benefits on restoration participation decisions.

The influence of socioeconomic factors such as education, income, land ownership, and length of residence further illustrates the multidimensional nature of restoration participation. Higher education and income levels were associated with lower WTA and higher WTP, suggesting that more educated and economically stable residents possess greater awareness of long-term environmental benefits and stronger financial capacity to support restoration. Similar relationships between income, environmental awareness, and restoration participation have been reported in Ghana, China, and coastal resource management studies elsewhere (Liu and Wirtz, 2010; Damnyag et al., 2017; Owusu et al., 2025). However, the findings contrast with studies by Wang et al. (2026) and Ren and Kuang (2023), which found that education did not significantly influence ecological compensation decisions, highlighting

contextual differences between mining-affected rural communities and broader watershed compensation systems. The positive influence of farmland ownership and long-term residence also suggests that residents with stronger attachment to local ecosystems are more invested in restoration outcomes because of their direct dependence on land-based ecosystem services. This supports broader theories of place attachment and environmental stewardship in restoration governance. Importantly, this study advances existing literature by jointly integrating perceived environmental benefits, institutional trust, and compensation preferences within a single analytical framework in illegal mining-affected communities, an area that remains underexplored in restoration governance scholarship.

Conclusion

This study explored residents' willingness to participate in ecosystem restoration in illegal mining-affected communities in Ghana, with emphasis on the roles of institutional trust and perceived environmental benefits. The findings show that restoration is not only an ecological challenge but also a social and institutional process shaped by trust, perceived benefits, and livelihood considerations. Residents recognized the importance of restoration for improving soil fertility, water quality, agricultural productivity, and community well-being. While economic constraints limited willingness to make direct financial contributions, institutional trust and appropriate compensation or livelihood support mechanisms enhanced residents' willingness to participate in restoration initiatives.

The findings have important policy and practical implications, showing that successful ecosystem restoration in mining-degraded landscapes requires not only technical rehabilitation but also inclusive governance, transparent institutions, and fair compensation mechanisms. Restoration interventions should prioritize livelihood-sensitive approaches such as access to restored lands, alternative livelihood programs, farming support, and community participation frameworks that strengthen trust between communities and implementing institutions. The strong influence of institutional trust also highlights the need for accountable, transparent, and participatory restoration governance systems capable of sustaining long-term community support. Globally, the study contributes to ongoing debates on ecological restoration, environmental justice, and community-based natural resource governance, particularly in regions experiencing resource extraction pressures across Africa, Asia, and Latin America. Despite these contributions, the study was limited by its reliance on use of non-probability sampling may limit the generalizability of the findings beyond the selected study communities. Also, the reliance on stated preference methods based on hypothetical restoration scenarios may not fully reflect actual participation behaviour in real-world restoration programmes. Future studies could adopt longitudinal and mixed-method approaches to examine how trust, compensation preferences, and restoration outcomes evolve throughout the implementation process.

Declarations

Declaration of Competing Interest

The authors declare that there are no known competing financial interests or personal relationships that could have influenced this work.

Human Ethics and Consent to Participate

Ethical approval was obtained from the Review Board of the Faculty of Renewable Natural Resources at Kwame Nkrumah University of Science and Technology (KNUST) in accordance with the ethical principles outlined in the Declaration of Helsinki and established guidelines for social science research involving human participants. Participation was voluntary, and respondents were informed of the study's purpose, with confidentiality, anonymity, and informed consent assured throughout the research process.

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Author Contribution

Prince Owusu: Conceptualization, methodology, investigation, data curation, formal analysis, visualization, writing-original draft, writing-review and editing. Lawrence Damnyag: Conceptualization, supervision, validation, writing—review and editing. Michael Ansong: Methodology, supervision, validation, writing—review and editing. Elizabeth Asantewaa Obeng: Formal analysis, validation, writing—review and editing. Joana Akua Serwaa Ameyaw: Methodology, investigation, writing—review and editing. Jewel Andoh: Investigation, validation, writing-review and editing. Kofi Essibu Ansah: Formal analysis, visualization. Derrick Werekoh Asaah: Investigation, data curation, writing—review and editing.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Figures

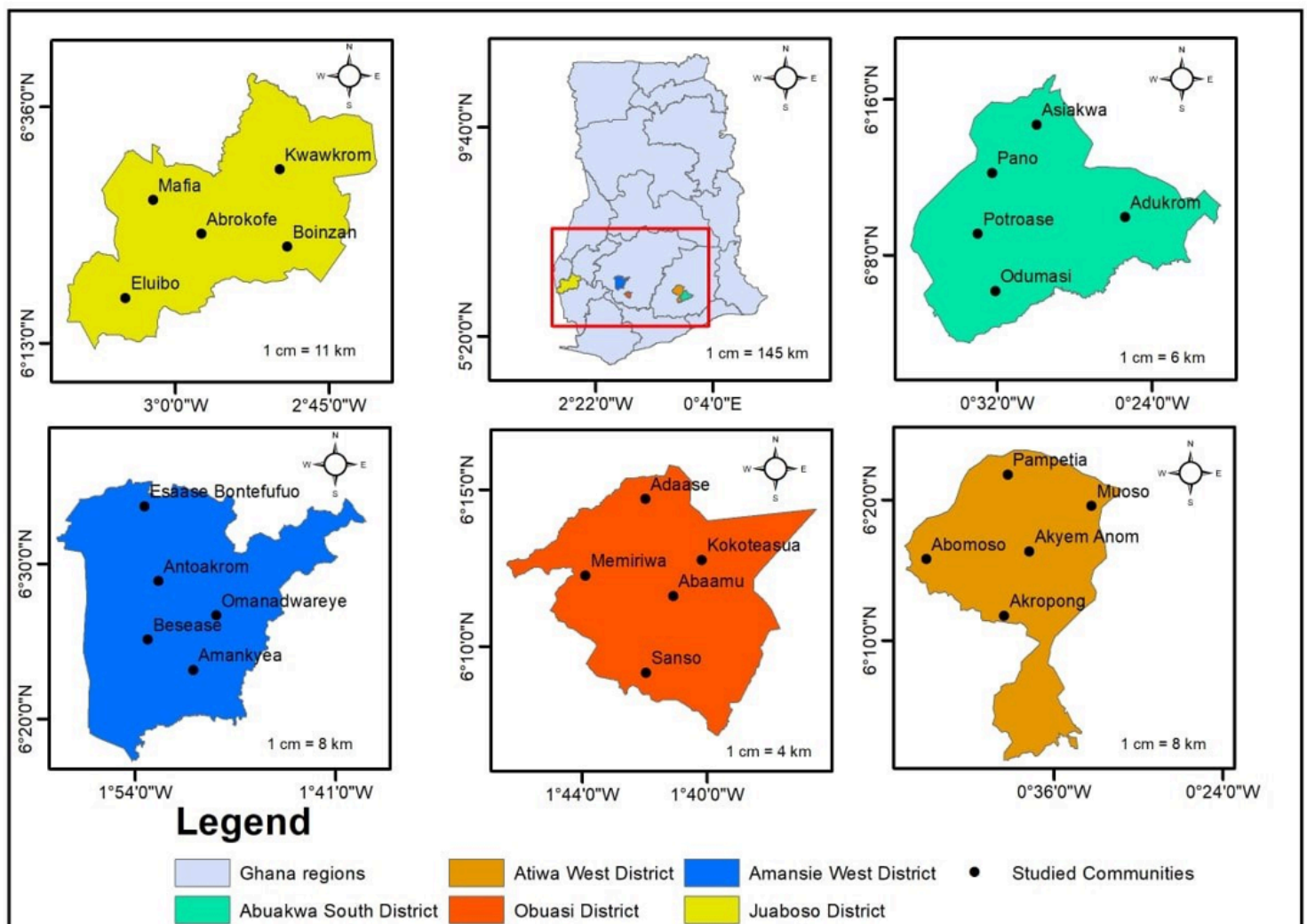


Figure 1

Map of the study districts and selected study communities

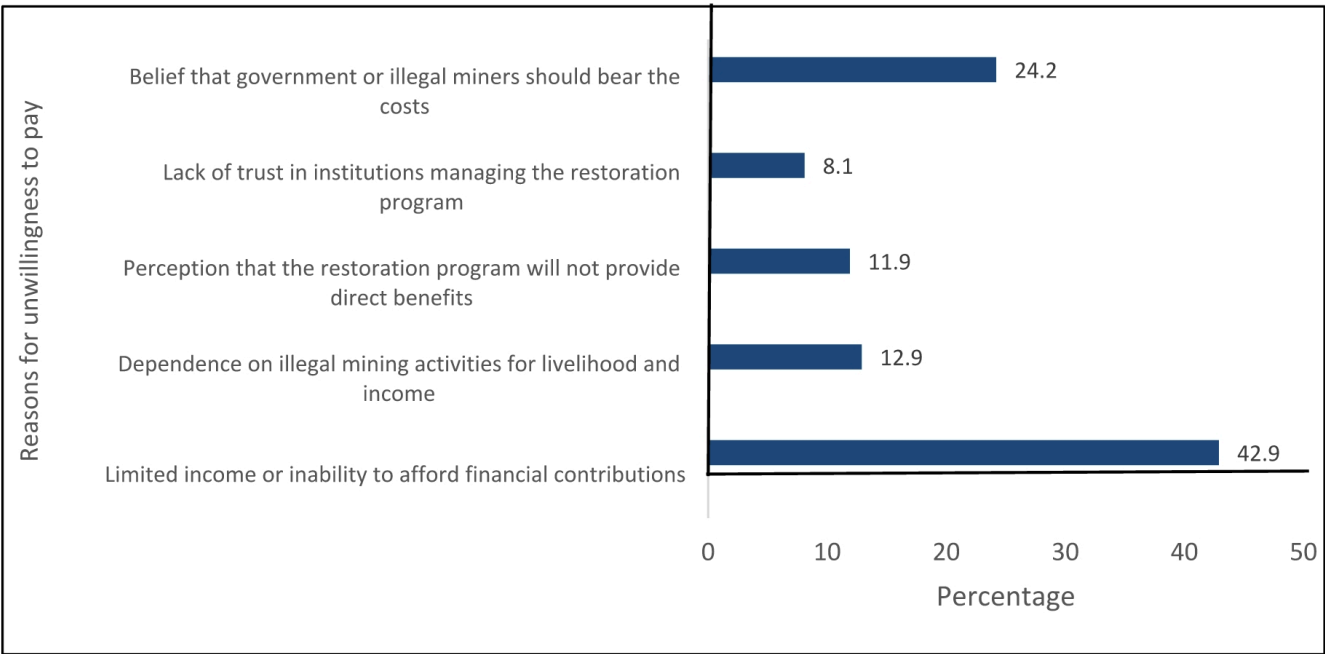


Figure 2

Reasons for Unwillingness to Pay for Ecosystem Restoration

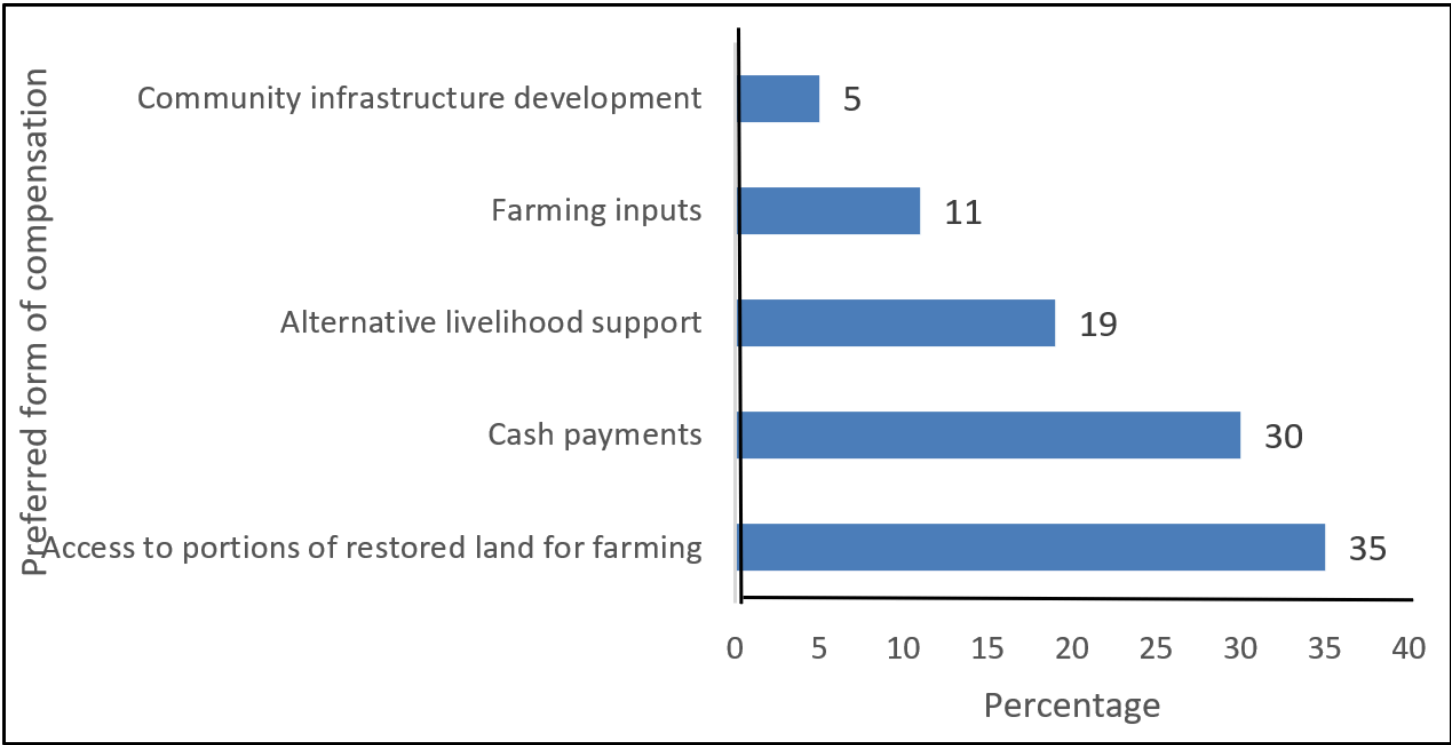


Figure 3

Preferred Form of Compensation

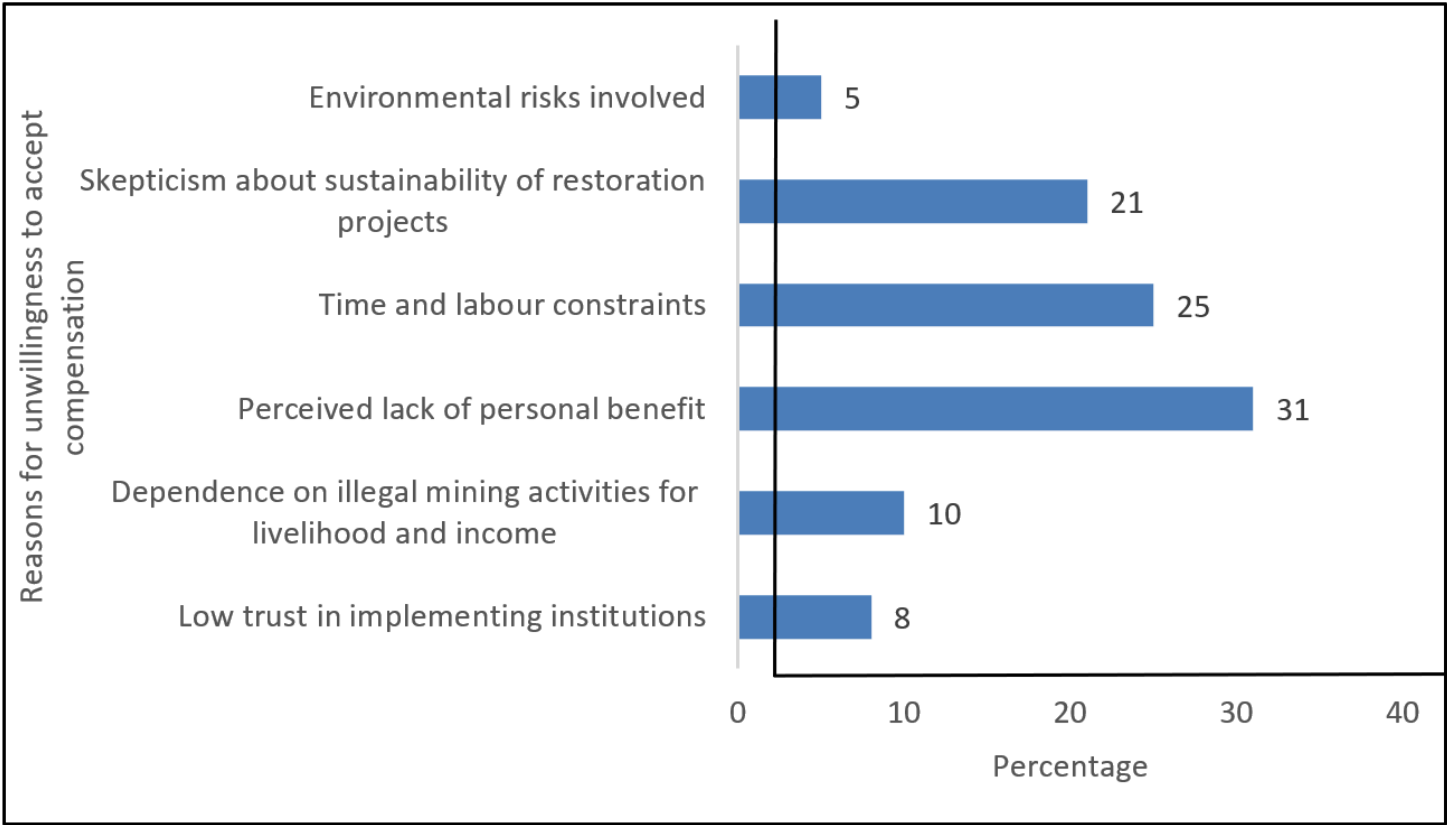


Figure 4

Reasons for unwillingness to accept compensation