sustainability

Article

Navigating Land Conservation, Utilization, and Market Solutions: Insights from the Lanyang River Watershed, Taiwan

Wan-Jiun Chen [1], Jihn-Fa Jan [2], Chih-Hsin Chung [3] and Shyue-Cherng Liaw [4,*]

1 Institute of Natural Resources Management, National Taipei University, No. 151, University Rd., Sanxia District, New Taipei City 237303, Taiwan; chenwanjiun@mail.ntpu.edu.tw or chenwanjiun@gmail.com
2 Department of Land Economics, National Chengchi University, No. 64, Section 2, Zhinan Rd., Taipei 116, Taiwan; jfjan@nccu.edu.tw
3 Department of Forestry and Natural Resources, National Ilan University, No. 1, Section 1, Shennong Rd., Yilan City 260, Taiwan; chchung@ems.niu.edu.tw
4 Department of Geography, National Taiwan Normal University, No. 162, Section 1, Heping E. Rd., Taipei 106, Taiwan
* Correspondence: liaw@ntnu.edu.tw; Tel.: +886-7749-1649

Abstract: In the current fraught relationship between nature and human society, land conservation and utilization have spawned intensive conflicts that require mediation. The present study explores this issue of coordination between nature and society in a fragile watershed located in northeastern Taiwan: the Lanyang River Watershed. Land zoning in this area has been historically classified and legally implemented, and additional development is constrained by an application review process. Currently, additional land utilization is still in demand in sensitive areas of this watershed, such as for mining and tilling. Due to the geographically, geologically, and climatically fragile characteristics of the watershed, the hillside residents have benefited from the conservation of nature with comprehensive ecosystem services but are at the forefront of the loss of life and property caused by forest ecosystem degradation. They are one of the key local resource users and main stakeholders. Applying the contingent valuation method to survey the hillside residents, the present study assessed the economic value they receive from the comprehensive ecosystem services offered by the natural forest ecosystems. Their opinions are explored using a survey on their awareness of ecosystem damage, their opinions on damage compensation, and on the feasible compensation channels for damage. As the study results ascertained the high value of the comprehensive ecosystem services continuously delivered by the conserved forest ecosystem, the study affirmed that conservation in the area classified and zoned as sensitive is an economic beneficial policy. With a high regard for ecosystem services and awareness of the impact of degradation and of the general agreement for the feasibility of channels of damage compensation, the continuity of conservation for these comprehensive ecosystem services is the preferred strategy for the local hillside residents. To emphasize this further, the opinions of the local community at the intersection of nature and society, where there is a delineated land zoning framework, strongly favor conservation over intensive resource exploitation and agricultural expansion, making further development an unfavorable strategy.

Keywords: market solutions; comprehensive ecosystem services; economic valuation; hillside; stakeholders

Citation: Chen, W.-J.; Jan, J.-F.; Chung, C.-H.; Liaw, S.-C. Navigating Land Conservation, Utilization, and Market Solutions: Insights from the Lanyang River Watershed, Taiwan. *Sustainability* **2024**, *16*, 4326. https://doi.org/10.3390/su16114326

Academic Editor: Hossein Azadi

Received: 18 March 2024
Revised: 18 May 2024
Accepted: 19 May 2024
Published: 21 May 2024

1. Introduction

Ecological economists have proposed the concept of a "full world" to describe our planet [1–4], suggesting that the human population and human economic activities and consumption patterns are reaching or exceeding the biophysical limits of the Earth's ecosystems [5]. Ecological economists argue that continued expansion of economic activities beyond the planet's ecological limits can lead to environmental degradation, resource depletion and, ultimately, collapse. Therefore, they advocate for a transition to a more sustainable economic model that respects the planet's ecological constraints and operates within its carrying capacity [6,7].

The same concept was proposed by geologists. Under current advanced human development, our current planet is defined as being in the geological epoch of the Anthropocene [8–12]. While the formal acceptance of the Anthropocene epoch is still under debate, it underscores the critical importance of sustainability and maintaining human habitation on the planet [9]. As human development intensifies, conflicts arise between the exploitation of natural resources and the maintenance of ecosystem services [10–12]. Scown [13] and Leach et al. [14] pointed out the significant role of the interaction between social and ecological systems alongside human intensive development. This necessitates a careful consideration of how humans can coexist harmoniously with nature, particularly in regions with fragile conditions.

The present research investigates the case of a location with geologically, ecologically, and climatically fragile watershed governance: the Lanyang River Watershed (LRW) in northeastern Taiwan. The governance of this watershed had historically aimed to mitigate the threats of vulnerability through land zoning policies informed by scientific knowledge, with the overarching goal of safeguarding natural resources and ensuring the safety of the local population [15–20]. Land use affects human wellbeing, especially in the context of the "full world" in the field of Ecological Economics and in the Anthropocene. Land use zoning to classify its usage and conservation in fragile zones can help in providing ecosystem services, and plays a crucial role in balancing human needs with ecological conservation efforts [21–24]. The notion that land use zoning with viable environmental protection can enhance ecosystem services has earned consensus in a growing body of literature on the interaction between land use changes and the provision of multiple ecosystem services [25–27]. Land use zoning policies affect the future provision of ecosystem services. The analysis of land use planning with a deep realization of the key driving forces in a locality can help in the achievement of policy targets for environmental protection and conservation [28,29].

The steep slopes in the hillside and high mountain areas are covered with forests in Taiwan [30,31], except for altitudes above the upper limit of the forest, where they are no longer present. Mountain forests could provide valuable ecosystem services [32,33]. However, the hillside regions are vulnerable to natural hazards, such as flash floods and landslides, and the availability of arable land is limited. To regulate land use in these areas, Taiwan's government has implemented stringent legal regulations governing land classification and usage, including those specific to the LRW [34].

Mountain agriculture and upland fruit cultivation have led to increased land use and afforestation in Taiwan's slope land areas. Despite past forest exploitation, a shift toward afforestation and hillside forest conservation is evident, driven by the recognition of the value of soil and water protection and ecosystem services. Scientific observations by Tu and Chen [35] affirmed this shift as a beneficial policy. Lin et al.'s investigation [36] highlights the growing public awareness of ecosystem services in Taiwan. Strong demand for development in the LRW region for mining [37] and mountain agriculture [38,39] exacerbates conflicts over development versus nature conservation, highlighting tensions at the fragile LRW frontier.

Through the construction of a framework for eco-social interaction, the important role of resource users and stakeholders was highlighted by Ostrom. Understanding local perceptions is crucial for effective environmental governance. Local acceptance and public opinion about market solutions may vary depending on local contexts and stakeholder preferences [40–45], based on the economics of negotiation proposed by Coase, subjected to no transaction costs or wealth effects [42].

As environmental awareness of the public is rising in a local observation report on the LRW [46] and various characteristics from extraction have been recognized [46–49], addressing LRW's diverse ecosystem services and policy implications is imperative. Moreover, being one of the most vulnerable watersheds in Taiwan, the LRW exemplifies cautious and prudent development through careful land planning and regulation [34]. The strong, wide, and diversified properties of the ecosystem services are affirmed by different characteristics of these ecosystem services stemming from hillside forests in the fragile LRW [50–56]. In contrast, the devastating flash flooding caused by intensive rainfall in Libya in 2023 claimed thousands of lives and caused extensive property damage [56].

This study focuses on the perspectives of key stakeholders—residents living in the hillside communities of Sanshing, Yuanshan, and Dongshan townships within the LRW. By integrating information from a resident survey, the study provides insights into the governance of intricate interactions between nature and society in the LRW. The resident survey is used to investigate the local perceived value of comprehensive ecosystem services and three aspects of residents' opinions, including resident awareness of forest ecosystem damage, resident views on developer compensation, and resident views on feasible compensation channels.

The survey questionnaire comprised three parts: the first focused on respondents' socio-economic attributes and forest ecosystem interaction history, the second assessed willingness to pay for ecosystem services using the contingent valuation method, and the third examined awareness of ecosystem damage and compensation preferences. Economic evaluation of comprehensive ecosystem services utilized primary data from the second part, employing a two-stage eliciting approach with closed-ended questions followed by open-ended questions. Analysis was conducted using the Logit and Tobit models, respectively.

Market solutions have been extensively discussed and are of wide concern [57–66]. In addition to the long-term zoning laws and regulatory policies, practical adoption of market solutions for environmental issues is discussed but not locally adopted.

The perceived economic value of the comprehensive ecosystem is grounded in beneficial information to offer viable solutions for the multiple land use conflicts. The conceived ecosystem services have long been protected by land zoning policy. Comprehensive ecosystem services are currently offered by a sound forest ecosystem, while damage compensation is a price incentive to promote resident compliance for development on land that is currently conserved and protected. To highlight the significance of conservation by land zoning, the market solutions of damage compensation and payment for ecosystem services (PES) are addressed. Damage compensation is a sanction as well as an incentive. The increase in public acceptance for an associated risk from development promoted by compensation differs case-by-case [43–45]. Long-term environmental protection and conservation with a land zoning policy enable the preservation of natural resources, and hypothetical compensation for hotspots of ecosystem degradation caused by exploitation could act as a sanction after the damage has occurred. How the hillside residents in the LRW regard hypothetical damage compensation is investigated in this study.

Moreover, PES is a subsidy payment that people receive in exchange for implementing land management practices, incentivizing landowners to design, provide or facilitate ecosystem services, particularly in areas in which the land is already highly developed and typically privately owned. PES is not a feasible scheme for implementation in the LRW since the generally well-protected ecosystem services continuously provide for the public in the LRW. The residents do not currently need to pay to enjoy their ecosystem services. Once the natural ecosystem is severely destroyed, it is hard to imagine how these LRW residents will pay for these ecosystem services.

Understanding the social welfare benefits derived from forest ecosystem services is crucial for informing regional planning and policy development, especially in areas like the LRW hillside communities where these services play a significant role in livelihoods and well-being. The present study focuses on assessing hillside residents' willingness to pay for comprehensive ecosystem services in this watershed. Alternatively, the economic value of the ecosystem services was assessed in a variety of ecosystem categories, reflecting the broad and diverse nature of these services [50,52]. Chen et al. [50] investigated the economic values of four embedded categories of forest ecosystem services, i.e., provisioning, regulating, cultural services, and supporting services for hillside residents within the LRW.

As the risks of climate change have become emergency issues, Chen et al. [52] estimated the LRW residents' willingness to pay for ecosystem services for climate adaptation in the fragile LRW. Moreover, agriculture is a sector highly reliant on land use, and Chen et al. [51] evidenced that the conventional farming transformation to leisure–agriculture is a local, feasible and viable climate adaptation measure in the LRW. All this research is academically and practically significant in aiding policymakers in tailoring interventions to garner community support and effectively manage land use in the LRW. Research can provide insights into the relevant governance of the complex interactions between nature and society. Ultimately, the study findings can inform policy decisions that promote sustainable development while preserving the region's ecological integrity.

2. Materials and Methods

2.1. Study Site—The Lanyang River Watershed

2.1.1. Vulnerability of the Study Site

The LRW, located in northeastern Taiwan, encompasses most of the area of Yilan County, Taiwan (Figure 1). Taiwan is a mountainous island, sitting on the junction of the Eurasian Plate and the Philippine Plate, and the pushing pressure of the plates has created high mountains and a broken geological terrain. About two thirds of Taiwan's land is mountainous, and the island covers an area of 36,197 square km with an altitude of 3952 m. Because of the steep mountain topography, fragile geology, short rivers, frequent earthquakes, and frequent heavy rainfall, it is very easy for floods, soil erosion, landslides, and large amounts of sediment to occur [15].

Figure 1. Study site: Sanshing, Yuangshan, and Dongshan Townships in Yilan County, Taiwan.

The LRW covers an area of 978 square km with an altitude of 3740 m. It is an especially vulnerable area in Taiwan. The main rivers are the Lanyang River and two tributaries, the Yilan River and the Dongshan River, which converge at the estuary of the Lanyang River near the sea before flowing into the Pacific Ocean. Lanyang River originates from the high mountains at Nanhu Great Mountain at an altitude 3740 m. The land under the residents' feet near the river is alluvial. The water they drink and the ecosystem services they enjoy are all from the watershed. The vulnerability of the geological structure, seismic activity, and hydrological systems cause significant effects, particularly profoundly influenced by the local natural systems and human activities [15,16].

The LRW is a fragile area. Since the influx of immigrants and settlements into the LRW in its early years, residents have frequently met with disasters, including floods, river surges, landslides, and soil and mud flows, which are especially significant after heavy rainfall induced by typhoons, and excessive precipitation causing waterlogging. These disasters have often impacted residents, agricultural land, urban infrastructure, and the environment, potentially leading to casualties, property losses, and ecological degradation [15–17].

2.1.2. Long-Term Zoning Laws and Regulatory Policies

Most of the mountain and steep slope areas in the LRW are covered with forests that provide ecosystem services [31–33], based on long-term zoning laws and regulatory policies [34]. The land on the hillside in the LRW is classified into "land suitable for agriculture", "grazing land", "land suitable for forestry", and "land suitable for conservation". Following these classifications, land use restrictions are regulated to ensure that land use and resource utilization in hillside areas are sustainable. For the purpose of long-term water and soil protection, zoning has been formulated and implemented by the government, and land utilization and water soil conservation are legally enforced [34] by the SCAUT (Slope Land Conservation and Utilization Act), ERSCUA (Enforcement Rules for Slope Land Conservation and Utilization Act), SWCA (Soil and Water Conservation Act), and ERSWCA (Enforcement Rules for Soil and Water Conservation Act). Through land zoning and legal enforcement of land utilization, life, production, and ecosystem—the three dimensions of natural and social metasystems—are balanced and harmonized as the strategies for land security, slope stability, and natural resources are maintained. Most of the fragile areas in the LRW, including high mountains and hillside lands, are owned by the government; in the flat valley along the river, small villages nestled in the mountains have residents who own private land, and the middle reaches and lower reaches are mostly densely populated areas.

2.1.3. Pressure from Additional Development in the Fringe Area of Nature and Society

Continued socioeconomic development in the LRW region has caused high awareness in hillside residents and conflicts between the local public and the exploiters. Mining exploitation [46] and mountain cultivation [67] are current problems in the LRW. Mining and additional agriculture farming in the LRW is legally constrained [34]. It is necessary to undergo an application review process to obtain permission on government-managed land. In order to obtain approval from the government, the additional development should fulfill the conditions of soil and water conservation. However, this additional development constitutes the main cause or direct pressure that threatens the security of local residents and is the main driver of environmental pressures on the environment in the vulnerable watershed.

High demand in the raw material market has driven additional mining development on land [37]. The related issues have been widely reported [46–48]. Mining activities in extremely rock-fragmented mountainous areas often lead to the depletion of forest cover and the loosening of soil and rocks. This not only leaves the soil exposed, increasing the risk of disaster due to climate and seismic factors, but also compromises vital ecosystem services provided by forests, such as soil stabilization, water regulation, and biodiversity conservation. Furthermore, mining contributes to social disadvantages, including dust pollution affecting local communities and increased transportation accidents due to heavy traffic associated with mining operations. The local community on the hillside has negative regard for this mining and is highly concerned about the future for local children [46–48].

Additional farming includes uphill agriculture due to rising temperatures associated with climate change, and riverbed watermelon planting in the middle and lower reaches [38,39]. A study by Abdulmana et al. [38] reported long-term trends and acceleration patterns of surface temperatures and a shift in vegetation conditions and tilling and irrigation issues [39] in Taiwan, which is also the case in the LRW.

2.2. Stakeholders

2.2.1. Stakeholders and the Framework of Natural and Social Systems

The users of natural resources are key stakeholders who play a critical role in shaping resource management decisions and outcomes. Ostrom explored the dynamics between nature and human society using a systematic framework, and pointed out that the users of the natural resources are the key stakeholders. Ostrom demonstrated the important role of users in a dynamic relationship for sustainable development of nature and human society. The determinant roles of users were also investigated by Gual and Norgaard [68] with the interaction of key variables in the socio-economic system, as they elucidated the coevolution of ecological and social systems in their study. Moreover, a change in the land use would alter the ecosystem services [68], and the perception of the stakeholders regarding the changing services concerning nature plays a key role in ecosystem governance and land utilization [35].

The interconnections between humans and nature are intricate and complex. People's understanding of the processes involved in the improvement or degradation of natural resources is limited. Moreover, because different scientific disciplines have independently developed diverse concepts and languages to describe and explain complex social, economic, and ecological systems, Ostrom suggested integrating the isolated knowledge within each field in an interdisciplinary framework, which can help organize the results from various fields and sustainably accumulate a common impact across disciplines. Ostrom established a general framework to analyze the sustainability of environmental resources, based on system variables organized by resource users, the main interest groups themselves. Four components comprise the systematic framework proposed by Ostrom: 1. natural systems; 2. characteristics of resource units; 3. social systems; and 4. characteristics of resource users. These elements interact within different contexts, such as social, economic, and policy settings, resulting in corresponding outcomes. The user is a critical component in this framework.

Upon recognizing these frameworks, human societies have formulated corresponding policies and measures. In the framework proposed by Ostrom, resource users may self-organize to maintain their resources. Hence, the resource users are the most critical stakeholders, and these users directly utilize natural resources in a range of ways. Moreover, Ostrom pointed out research which found that, in addition to using resources, some users also invest time, energy, and economic costs in achieving the sustainability of key resources. Users' self-regulation can cooperate in the governance of significant potential losses in fisheries, forests, and water resources, which are often observed within current socio-economic development and in alternative measures when failures in government intervention and normative mandatory activity have been observed and when government policies have accelerated the destruction of resources.

The critical role of the user of the resources is emphasized in a series of interdisciplinary literature works on resource governance and climate change adaptation [69,70]. Individuals or industries that rely on natural resources must face multiple utilization and the related crisis brought about by development and by the increasing risk of climate change [71]. The interdisciplinary research that illuminated and connected natural and socioeconomic domains highlighted the role of the user, including that conducted by Loehr and Becken [72] in a knowledge system study, by Hopkins [73] in a comprehensive climate change vulnerability framework setting, and by Nitivattananon and Srinonil [74] in sustainable environmental governance.

2.2.2. Hillside Residents and Their Roles in Environmental Governance

Due to additional development in the LRW, parts of the tree-covered mountainous areas have been targeted for land-based utilization for mining and farming, increasing the risk of localized damage to the long-protected ecosystem and the corresponding services. This local additional development has escalated conflicts among stakeholders, who vie for multiple utilization purposes within the local natural and social systems. These conflicts have created a dilemma, pitting development against nature conservation at the frontier boundary of nature and society in the fragile LRW. This has highlighted the local tension between development and nature conservation. Local hillside residents within the LRW directly receive and enjoy ecosystem services. Their views on ecological compensation are important in the formulation of relevant policies for resource conservation. They constitute one of the crucial stakeholders, especially in playing a role in the conservation of ecosystem services.

The local hillside resident and their opinions on resource management have a local political role in local village affairs [46]. In recent years, the perspectives of the environment and local community have garnered significant societal attention. The revised Mining Act in Taiwan, effective since 26 May 2023, removes two unreasonable provisions: mining without landowner consent and automatic approval for mining period extensions. The updated law now addresses environmental, indigenous, and social concerns, emphasizing environmental protection, regulating mineral extraction, mitigating impacts on residents, fostering public engagement, and curbing environmentally harmful mining practices. These amendments aim to strike a balance between economic, environmental, and industrial needs, ensuring sustainable development [34].

This study specifically targets hillside community residents. Their perceptions regarding the economic value of comprehensive ecosystem services are surveyed to capture the overall benefits of these diverse ecosystem services. Additionally, the study assesses residents' awareness of damage and the potential compensation channels. Thus, from the perspective of hillside residents, the research delves into the value of comprehensive ecosystems and solicits opinions on damage compensation resulting from inappropriate development, which can lead to resource degradation and potential loss of ecosystem services in the study areas.

It is true that the enterprise that extended this local further development is another resources user. The enterprise's stakeholder role in the LRW is another critical issue in the governance of ecosystem services, but not included in the present study. The enterprise stakeholder role in ecosystem governance would be another importance issue to be addressed in a future study.

2.2.3. Ecosystem Value for Hillside Residents

Enterprises continue to exploit local mineral resources; this resource utilization can degrade the land cover and the ecosystem services delivered by nature. Misgovernance under the circumstance of rising demands for development and exploitation at the fringe of nature and social systems would irreversibly hinder the protection objectives of the combination policy. The residents are one of the main stakeholders from the perspective of local community and local environmental governance. Their livelihoods and local connections hold particular significance. Hence, this research aimed to assess the comprehensive economic value of ecosystem services for an environmentally sensitive group of stakeholders, the hillside residents of three hillside townships. Healthy hillside forests provide a range of comprehensive ecosystem services, integrating provisioning, supporting, cultural, and regulatory functions. Conserving these forests significantly enhances ecosystem services, such as soil fertility, water quality, flood control, carbon sequestration, and habitat provision. This fosters resilient ecosystems and supports human livelihoods.

2.3. Estimation of the Comprehensive Ecosystem Services Based on a Survey of the Hillside Residents

The economic value of comprehensive ecosystem services in the LRW is evaluated in the present study, and the comprehensive ecosystem services are the integrating ecosystem services of the four categories classified and proposed by the World Bank's MEA (Millennium Ecosystem Assessment) [75], i.e., the composite services of provisioning, supporting, cultural, and regulatory services. The contingent valuation method is applied. Open-ended and close-ended questions are designed in the survey questionnaire, and corresponding logit model and Tobit regression techniques are applied in the evaluation.

The residents in the three townships, Sanshing, Yuanshan, and Dongshan Townships, dwell in the vicinity of the shallow hillside of the LRW, the location at the boundary of the tree-covered natural system and the human social system. Any misgovernance of the ecosystem would degrade the ecosystem services they receive, which might cause the loss of their livelihood, properties, or immediate disasters caused by flash floods and landslides.

Human beings live in the natural environment, and the natural environment provides diverse and extensive functions for them. These services can be checked from different perspectives, and corresponding values can be examined from multiple perspectives. To illustrate and address the eco-payment and compensation scheme for the intensive development along the nature–social fringe in the fragile watershed, the present research evaluates the residents' willingness to pay for the comprehensive ecosystem services provided by the forests.

2.4. Survey and Its Analysis

2.4.1. Questionnaire Design

A questionnaire survey is designed to understand the ecosystem services' benefits to the hillside residents and investigate the residents' awareness and opinions on damage compensation and compensation channels. The questionnaire is designed in three main parts.

The first part included the demographic characteristics of the respondents and the interaction history of the respondents with the local forests. The respondent's demographic characteristics include gender, age, education, and occupation type, family income, and family size. The forest ecosystem interaction history of the respondents includes length of residency (years), donation history to ecosystem conservation organizations, residential area (urban or rural), and hours per visit.

The second part was designed to collect information to evaluate a respondent's willingness to pay for comprehensive ecosystem services. The contingent valuation method is applied. The details are illustrated in the following subsection.

The third section is designed to survey the hillside residents for their opinions in three respects:

(1) *Resident Awareness of Forest Ecosystem Damage*, with three statements assessing public sentiment on Ecosystem Coexistence, Responsibility, and Primacy,
(2) *Resident Views on Developer Compensation*, with four statements evaluating views on Necessity of Compensation, Understanding Compensation, Potential for Supporting Forest Ecosystem through Compensation, and
(3) *Resident Views on Feasible Compensation Channels*, with five statements appraised potential compensation channels: Environmental Taxes, Cash Payments, Donations, Voluntary Labor, and Inclusion in Utility Bills.

Survey participants rated the questionnaire statements, using a 5-point Likert-type scale method [76–78], a measurement technique commonly used in rating the agreement magnitude of opinions and behaviors. The responses to the statements in the questionnaire were coded on a 5-point scale, with "strongly agree" coded as 5, "agree" as 4, "neutral" as 3, "disagree" as 2, and "strongly disagree" as 1.

2.4.2. Ecosystem Services Valuation by Two Eliciting Stages

Hillside residents were surveyed in two-stage of eliciting questions, i.e., close-ended and the following open-ended question in the second part of the questionnaire. The question in the first eliciting stage is as follows:

Are you willing to pay ___BID___ New Taiwan Dollars per year to protect the ecosystem in the LRW to ensure the comprehensive ecosystem services of provision, regulation, culture, and supporting?

☐ *Yes, I am willing.*
☐ *No, I am unwilling.*

The above variable "BID" in the close-ended question is the bidding value in the resident interview. The respondents were randomly asked about their willingness to pay New Taiwan Dollars (NTDs) 500, 1500, 2500, 3500, and 4500. The bidding value was designed based on a pilot survey. The 2022 average exchange rate was 1 USD = 29.78 NTD for the year in which the survey was conducted.

As previously mentioned, following the closed-ended question, an open-ended question is asked in the second stage of elicitation as follows:

What is the maximum value you are willing to pay per year?_____New Taiwan Dollars.

The bidding value in the questionnaire can offer the respondents a reference to be compared with their inner valuation when they are interviewed. Offering a bidding value can increase the compliance of the respondent in the interview survey. The open-question in the second stage after the first-stage close-ended question can facilitate a smooth elicitation of respondents' accurate expression of their perceived value during the empirical research questionnaire surveys. However, the anchored effect is suggested to be further explored in the future in both applied and theoretical research into contingent valuation within the field of behavioral economics.

2.4.3. Estimation Procedure of the Contingent Valuation Method

The contingent valuation method is extensively utilized for assessing non-market goods [79,80]. The elicited data from the aforementioned survey were analyzed with this contingent valuation method. The Logit model was applied to analyze the information from the close-ended questions in the first eliciting stage, according to a single bounded dichotomous contingent valuation method [79,80]. A Tobit model [81] was applied to analyze the open-ended question data in the second eliciting stage.

The contingent valuation method has proven to be a robust decision-making tool, as it is applied in a wide range of empirical studies [33,50,52,79,80,82–89] to estimate the willingness to pay for environmental goods [90–92], and in research on ecosystem services [33,50,52,93–98].

The single-bounded method, as outlined by Hanemann [99], was utilized to estimate the economic value in this study. The estimation involved fitting questionnaire data to the binary logit function,

$$\mathrm{P(Y)} = \left(1 + exp^{-(\beta_0+\beta_1 BID+XB)+e}\right)^{-1} \tag{1}$$

where the probability of a "yes" response ($\mathrm{P(Y)}$) is determined by the bidding value (BID) and a vector of independent variables (X) representing demographic characteristics, β_0, β_1, and B are parameters and e is the random error.

Economic value (E(V)) was then estimated using the inverse of the coefficient of the bidding variable ($\hat{\beta_1}$), following logistic regression.

$$\mathbf{E}(\mathbf{V}) = -\frac{1}{\widehat{\boldsymbol{\beta}_1}} \tag{2}$$

Moreover, this study also uses the Tobit model [81] to estimate the residents' willingness to pay for the comprehensive ecosystem services by using the data collected by the open-ended question in the second eliciting stage in the questionnaire. The Tobit model was proposed by Tobin [81] to deal with the left-censored distribution problem, which is defined as a type of limited data. The data for this maximum willingness to pay are left-censored at 0, i.e., a value less than 0 is not possible. According to Tobin [81], the expected value of the maximum willingness to pay deals with the left-censored feature in the distribution. With a Tobit model, the willingness to pay is estimated by dealing with this left-censored feature. The point estimates of the individual maximum willingness to pay can be estimated with determinant variables, X, and the bidding value offered in the first stages, as shown in Equation (3), where subscript *i* represents the *i*th respondent.

$$\widehat{MAX}_i = f(BID_i,\ X_i). \quad (3)$$

Then, the willingness to pay for an average person can be expressed as an expected value of the point estimation.

$$WTP = E\left(\widehat{MAX}_i\right). \quad (4)$$

2.5. Sampling, Sample Size and In-Person Interview Design

To ensure a sampling error lower than 5% [100], a minimum of 384 samples was required. However, considering the possibility of invalid questionnaires, this study set the number of distributed questionnaires at 450. The questionnaires were allocated to the residents in the three villages based on the proportionate population in 2021 as outlined in Table 1.

Table 1. Sample allocation in the study area.

Township	Population in 2021	Distributed	Completed
Sanshing	21,219	90	89
Yuanshan	32,189	136	129
Dongshan	52,999	224	215
Total	106,407	450	433

Questionnaire surveys were conducted through face-to-face interviews by four trained interviewers at local bus and railway stations, as well as farmers' association offices in Sanshing, Yuanshan, and Dongshan Townships. Demographic information in the questionnaire included in the first part helped screen out participants not residing in these areas. The interviewers had been trained in advance for this screening mechanism.

The survey was conducted in August 2022. Systematic sampling, based on population proportion, was employed to select respondents every 30 min during survey days. Of the 450 distributed questionnaires, 433 valid responses were collected, resulting in an effective response rate of 96.2%, which is statistically acceptable.

Basic demographic data for the respondents is reported in Table 2. Only residents older than 18 years of age were interviewed. The number of male interviewees slightly exceeds that of females. The majority of interviewees are middle-aged, predominantly engaged in industry, commerce, and service sectors. The residents are highly educated, with a significant portion having completed high school and university education.

Table 2. Demographic characteristics of the respondents.

	Number of Respondents	(%)
Gender		
Male	182	42.0
Female	251	58.0
Age (years)		
18–30	96	22.2
31–45	144	33.3
46–60	113	26.1
>60	80	18.5
Education		
Elementary and Junior High School	70	16.2
Senior High School	147	33.9
University and College	207	47.8
Graduate School	9	2.1

Table 2. *Cont.*

	Number of Respondents	(%)
Occupation		
Agriculture, Forestry, Fishing, and Ranching	32	7.4
Industry, Commerce, and Services	179	41.3
Military and Public Services	35	8.1
Free lancer	11	2.5
Student	31	7.2
Housewife	53	12.2
Other	92	21.2
Family income (NTD 10,000/year)		
<30	63	14.5
30–49	105	24.2
50–100	185	42.7
>100	80	18.5
family size (headcount)		
1–2	39	9.0
3	66	15.2
4	121	27.9
5	82	18.9
>5	125	28.9

2.6. Variable Definitions for Empirical Regressions

The definitions of the variables used in the regression models are listed in Table 3. The specifications of the empirical regressions to fit Logit and Tobit models are determined with interpolative and extrapolative techniques. The statistical significance of the variable in the regression models is determined at 0.1 significance level. The gender, occupation, and age of the respondents did not show statistical significance in the regression models, and they were therefore not included in the list of defined variables in Table 3.

Table 3. Definition for the variable used in the empirical regression model.

Variable	Definition
Y	Binary variable, elicited from first-stage question in the second part of the survey =1 if the response is "yes", he/she is willing to pay the bidding amount. =0 otherwise.
MAX	Maximum annual willingness to pay (NTD/year), elicited from second-stage question in the second part of the survey
BID	Bidding values enquired about. A hypothetical individual annual payment amount distributed to the interviewees according to the order of sampling: NTD 500, 1500, 2500, 3500, and 4500.
EDU_{YR}	formal schooling years.
DON	donation dummy variable, =1, donation history to forest ecosystem conservation organizations. =0, otherwise.
$EDU_{YR} \times DON$	$EDU_{YR} \times DON$: cross-multiplication variable for the above two variables.
INC_{10T}	Family income (NTD 10,000).
$FAMILY$	family size.
$RURAL$	Whether residing in rural areas, =1 for yes. =0 for no.
$FAMILY \times RURAL$	the cross-multiplication variable for the above two variables.
$STAY_{HR}$	Stay duration (hours) of each visit to nearby hillside forests.

3. Results

3.1. Statistical Analysis for Survey Results

3.1.1. Ecosystem Interaction History of the Hillside Respondents

Based on the survey results, the forest ecosystem interaction history of the respondents is presented in Table 4. Accordingly, the respondents have resided in the hillside townships for a considerable period. Based on their length of residency, 80.4% of the respondents have lived locally for more than 15 years, and 39.4% have resided there for more than 30 years. The majority of them reside in urban areas. Despite relatively low incomes, as shown in Table 2, there is evidence of a donation history for some respondents. They also have a significant history of interaction with the nearby forest ecosystem, as indicated by their prolonged stays during visits.

Table 4. Ecosystem interaction history of the respondents.

	Number of Respondents	(%)
Length of residency (years)		
0–15	85	19.6
16–30	177	40.9
31–45	65	15.0
46–60	71	16.4
>60	35	8.1
Ever donated to forest ecosystem conservation organizations		
No	375	86.6
Yes	58	13.4
Residential area		
Urban	280	64.7
Rural	153	35.3
Stay duration (hours per visit to the forests) (continuous variable with a mean 1.68 and standard deviation 1.06).	-	-

Note: the notation "-" denotes irrelevance to applying any data.

3.1.2. Distribution Data of the Questions for Economic Valuation

The distribution data for the information collected from close-ended and open-ended questions for economic valuing in the questionnaires are depicted in Tables 5 and 6.

Table 5. Response distribution statistics for different bidding amounts.

Bid (NTD/Year)	Number of Respondents	Number Consented	Number Dissented
500	87	69	18
1500	86	31	55
2500	87	15	72
3500	86	17	69
4500	87	12	75
Total	433	144	289

In the closed-ended survey questions, respondents indicated their willingness to pay designated annual payments, with bidding amounts ranging from NTD 500 to 4500. The allocation of respondents agreeing to pay for each bidding amount was evenly distributed. A decline in willingness to pay at higher bidding prices is illustrated, from 144 consenting individuals overall to decreasing numbers at each price point.

Following the closed-ended questionnaire, respondents were asked an open-ended question about the maximum annual amount they were willing to pay for comprehensive ecosystem services. Table 6 displays the statistics for responses, revealing a right-skewed distribution with fewer respondents indicating high payment amounts and more indicating lower amounts. Notably, 160 respondents specified a maximum payment of zero dollars. The largest amount proposed by a respondent is 10,000 NTD, as reported in the second eliciting question of the survey.

Table 6. Distribution of maximum annual willingness to pay.

Range of Maximum WTP (NTD/Year)	Number of Respondents	(%)
0	160	37%
1–500	101	23%
501–1500	87	20%
1501–2500	48	11%
2501–3500	23	5%
3501–4500	11	3%
>4500	3	1%
Total	433	100%

3.2. *Assessing Economic Value for Comprehensive Ecosystem Services*

Applying data collected from a survey of hillside residents, this study employs both the logit regression model and the Tobit regression model to estimate the economic value of the comprehensive ecosystem services they receive. Table 3 illustrates the definitions of the variables used in both models, and the means and standard deviations are shown in Table 7.

Table 7. Statistics of variables.

Variable	Mean	SD
Y	0.38	0.49
MAX	-	-
BID	2488.76	1426.17
EDU_{YR}	13.01	4.04
DON	0.20	0.40
$EDU_{YR} \times DON$	2.67	5.66
INC_{10T}	74.83	52.73
$FAMILY$	5.03	2.21
$RURAL$	0.27	0.47
$FAMILY \times RURAL$	1.39	2,55
$STAY_{HR}$	1.68	1.06

3.2.1. Logistic Regression Model

The data collected from the closed-ended questionnaire were analyzed using the logit regression model. The variable Y in the logit regression model represents the binary choice made by the respondents for consenting to pay for the random bidding price; agreement to pay is coded as 1, while disagreement is coded as 0. The dependent variable $P(Y)$ is the percentage of the binary response of a resident in the single bounded contingent valuation method. The dependent variables include the bidding value, personal demographic features, and ecosystem interaction history of the respondents. With interpolation and extrapolation applied to choose the feasible specification, the logistic regression is as follows:

$$P(Y_i) = f(BID_i,\ EDU_{YRi} \times DON_i,\ FAMILY_i \times RURAL_i,\ STAY_{HRi},\ INC_{10Ti}) + e_i \quad (5)$$

where e is the residual and subscript i represents the ith respondent, and the variables adopted in the model to explain the tendency of the willingness to pay variable Y include the bidding variables, BID, the interaction term between the number of years of education and donation experience ($EDU_{YR} \times DON$), the interaction term between family size and rural residence ($FAMILY \times RURAL$), and the stay duration (hours) per visit to the hillside forest ecological area ($STAY_{HR}$). However, the income variable (INC_{10T}) does not significantly affect the willingness to pay.

The estimated results of the logit regression model are presented in Table 8. The analysis of the logit regression model reveals the following patterns in the decrease in the offering bidding values and the willingness to pay. An inverse relationship is observed between willingness to pay and the bidding value. Among those with donation experience, individuals with higher education exhibit higher willingness to pay the offered bidding price. Respondents residing in rural areas with larger family sizes show a higher willingness to pay. Respondents who have longer stay durations in their visit to the hillside areas demonstrate a significantly higher willingness to pay.

Table 8. Regression results of the logit model.

Dependent Variable: *P*(*Y*)					
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**	
BID	−0.00065	0.00008	−8.47	<0.0001	***
$EDU_{YR} \times DON$	0.08864	0.02474	3.58	0.0003	***
$FAMILY \times RURAL$	0.08489	0.04165	2.04	0.0415	**
$STAY_{HR}$	0.77788	0.47360	1.64	0.1000	*
INC_{10T}	−0.01277	0.01006	−1.27	0.2043	
S.E. of regression	0.416422	Akaike information criterion		1.074814	
Sum squared resid.	74.21819	Schwarz criterion		1.121820	
Log likelihood	−227.6972	Hannan–Quinn criterion		1.093370	
Deviance	455.3944	Restr. Deviance		550.7580	
Avg. log likelihood	−0.525860				
Obs with Dep = 0	289	Total obs	433		
Obs with Dep = 1	144				

Note: *** represents significance at the 0.01 level; ** represents significance at the 0.05 level; * represents significance at the 0.1 level.

Evidenced from the results presented by the above logit model, people who live in rural areas with a larger family size and stay in the shallow mountain forest ecosystem zone for a longer period of time may recognize higher risks of natural environmental disasters and have higher awareness about the degradation of ecological services. Therefore, their willingness to pay the bidding price for comprehensive ecosystem services is also higher. People with higher education and more experience in donating are also more likely to bid more highly because they are more educated, understand the vulnerability of the watershed, and have experience in donating.

The point estimate for the economic value is calculated based on the parameter estimation of the logit model and the formula proposed by Cameron [79,80] as in Equation (2),

$$E(V) = -\frac{1}{\widehat{\beta_{BID}}}.$$

where $E(V)$ is the point estimate of the economic value and $\hat{\beta_{BID}}$ is the estimated coefficient of the inquiry BID variable. Since the estimated coefficient of the inquiry BID is −0.000653 (see Table 8), accordingly, the point estimate for the economic value is NTD 1531.39.

3.2.2. Tobit Model

The specifications of the Tobit model in this study are as follows:

$$\widehat{MAX_i} = f(BID_i,\ EDU_{YRi} \times DON_i,\ INC_{10Ti},\ FAMILY_i). \quad (6)$$

where subscript i represents the ith respondent. The variables adopted in the model to explain the maximum willingness to pay, variable MAX, include the bidding variables, BID, the interaction term between education and donation experience ($EDU_{YR} \times DON$), income variable INC_{10T}, and family size ($FAMILY$).

The estimation results of the Tobit model [81] as shown in Table 9 present several important findings. It is demonstrated that the maximum amount the respondents are willing to pay is affected by the level of inquiry (BID) offered in the previous close-ended question. This inquiry amount is reference information for the maximum price the respondent is willing to pay. The higher the formal education level of those with donation experience, the higher their willingness to pay. Moreover, this study also found that family income and family size are inversely related to the amount of payment. Ecosystem services reliance, and consequently the maximum payment for conservation, is higher in low-income and small-sized families.

Table 9. Regression results of the Tobit model.

Dependent Variable: MAX					
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**	
BID	0.77433	0.09167	8.44664	<0.0001	***
$EDU_{YR} \times DON$	53.52993	25.50035	2.09918	0.0358	**
INC_{10T}	−6.59287	2.78650	−2.36600	0.0180	**
$FAMILY$	−172.72170	64.18714	−2.69091	0.0071	***
Mean dependent var.	933.4988	S.D. dependent var.		1241.858	
Akaike info criterion	17.05897	Schwarz criterion		17.11538	
Log likelihood	−3687.267	Hannan–Quinn criterion		17.08124	
Avg. log likelihood	−8.515629				

Note: *** represents significance at the 0.01 level; ** represents significance at the 0.05 level.

According to the results of the Tobit regression model reported in Table 9, the willingness to pay for an average person can be represented by an expected value of the point estimates. The point estimates are forecast by using estimation results of the Tobit model with specification, shown by Equation (6). The expected value of the point estimates is 1645.76 NTD. Therefore, the average hillside resident would be inclined to contribute this annual amount towards the comprehensive ecosystem services. The largest amount proposed by the respondent is 10,000 NTD in the second eliciting question in the survey. This calculated value of the point estimates can inform decision-making processes for local environmental policies. The preservation of the ecosystem and its services holds significant value as indicated by the point estimates for these residents.

3.3. Awareness, Compensation, and Channels for Ecosystem Damage

3.3.1. Resident Awareness of Damages

Based on the questionnaire results presented in Table 10, residents demonstrate a high level of awareness regarding forest ecosystem degradation, particularly for two items: statement 3: the ecological environment in the sensitive area is more important than the economy; and statement 2: all citizens should be responsible for ecological protection. The mode for both of these items is 5, indicating a strong consensus and agreement among the majority of respondents regarding these viewpoints.

Additionally, residents generally agree with statement 1: people should harmoniously coexist with nature (the mode is 4). These results reflect residents' concerns and their emphasis on the issue of forest ecosystem degradation, as well as their support for the values of ecological conservation and harmonious coexistence between humans and nature.

Table 10. Resident awareness of forest ecosystem damage.

Awareness of Forest Ecosystem Damage	5	4	3	2	1	Mode
#1: Humans should harmoniously coexist with nature.	194 45%	214 49%	24 6%	1 0%	0 0%	4
#2: The responsibility for ecological protection should be implemented by all citizens.	203 47%	201 46%	28 6%	1 0%	0 0%	5
#3: Forest ecosystem is more important than the economy.	158 36%	155 36%	108 25%	12 3%	0 0%	5

Note: The coding of the Likert scale is arranged as follows: strongly agree = 5, agree = 4, average = 3, disagree = 2, strongly disagree = 1.

3.3.2. Damage Compensation and Payment

Based on the questionnaire results presented in Table 11, while a significant number of respondents have a high level of understanding of ecological compensation payments, there are also a substantial number of respondents with only a moderate or limited understanding. Since most of the local land is regulated by land zoning policy, the large number of respondents (169 in Table 11) reacted neutrally to this statement: there is a high level of understanding of ecosystem compensation payments, reflecting their reservations about this market tool and their unfamiliarity with the market tool that never existed.

Table 11. Resident views on developer compensation.

Opinions on Developer Compensation	5	4	3	2	1	Mode
#1: Destruction of ecosystem services should require corresponding compensation.	182 42%	204 47%	47 11%	0 0%	0 0%	4
#2: You have a high level of understanding of ecosystem compensation payments.	76 18%	168 39%	169 39%	15 3%	5 1%	3
#3: The establishment of an ecosystem compensation system can lay the foundation for sustaining forest ecosystem.	134 31%	199 46%	98 23%	2 0%	0 0%	4
#4: You support the establishment of an ecosystem compensation system.	135 31%	185 43%	110 25%	3 1%	0 0%	4

Note: The coding of the Likert scale is arranged as follows: strongly agree = 5, agree = 4, average = 3, disagree = 2, strongly disagree = 1.

Moreover, opinions on forest ecosystem damage compensation payment are shown in Table 11. The residents demonstrate general agreement for statements 1, 3, and 4 (the mode is 4). However, there are a significant number of respondents who demonstrate reservations toward the idea that damage compensation can lay the foundation for sustaining forest ecosystem (statement 3) and toward supporting the establishment of an ecological compensation payment system (statement 4). The response "3, neutral" was recorded for these statements by 98 and 110 respondents, respectively. Additionally, there were opposing views, with two and three respondents, respectively, rating them as "2, disagree", indicating disagreement with the establishment of an ecological compensation payment system.

3.3.3. Channels to Be Compensated

As the questionnaire results presented in Table 12 show, residents were asked about their agreement level regarding the statements on the five channels for compensating forest ecological damage. There was general agreement with the five payment channels offered in the survey. However, there were still a considerable number of respondents who rated these channels as "3, neutral." Furthermore, a significant proportion of respondents also expressed disagreement, with some respondents answering "2, disagree" and even

"1, strongly disagree" when asked their opinion on whether these channels constitute viable options.

Table 12. Resident views on feasible compensation channels.

Feasible Compensation Channel	5	4	3	2	1	Mode
#1: Paying environmental taxes	104 24%	179 41%	98 23%	46 11%	6 1%	4
#2: Providing cash payments to affected communities	126 29%	207 48%	84 19%	13 3%	3 1%	4
#3: Donate to social welfare activities	121 28%	213 49%	85 20%	10 2%	4 1%	4
#4: Offering voluntary labor services	108 25%	206 48%	93 21%	20 5%	6 1%	4
#5: Including in water and electricity bills	75 17%	132 30%	124 29%	89 21%	13 3%	4

Note: The coding of the Likert scale is arranged as follows: strongly agree = 5, agree = 4, average = 3, disagree = 2, strongly disagree = 1.

4. Discussion

4.1. Sustainability in a "Full World"

The challenges encountered by our current "full world" addressed in the field of Ecological Economics [1–7] require policies that foster healthier relationships between society and nature. This study investigates the fragile Lanyang River Watershed (LRW) where human development has reached its natural carrying capacity. The assessment of comprehensive ecosystem services in the LRW measured in monetary terms highlights the welfare to local society provided by forest ecosystems, and the importance of protecting comprehensive ecosystem services. As these services benefit local residents, any misgovernance of the forest ecosystems would forfeit these benefits. The value indicates the sociological warning regarding loss in case of disasters. This indicative warning signal is crucial for curbing land conversion, sustaining water resources, preserving natural habitats, safeguarding biodiversity, mitigating climate change, and protecting essential ecosystem services.

Under the high pressure of additional LRW development, this economic indicator could effectively help maintain ecosystem services as our planet reaches the proposed geological Anthropocene era [10–12].

4.2. Land Zoning Policy and the Hillside Residents' High Awareness of Damage

Land use affects human well-being [22–24]. Improper land use could cause catastrophes. This is particularly evident in the LRW, where strong winds and heavy rainfall in typhoon seasons occur on steep slopes with geological fragmentation, posing a dangerous vertical drop [15]. The literature has illustrated the significant effects of land zoning and watershed management, along with soil and water conservation, in Taiwan, as well as in the LRW [16–19]. Accordingly, the comprehensive ecosystem services provided by the forests in LRW is protected by a land zoning policy that is legally enforced [34].

This effect of the zoning policy is evident in the LRW according to the aforementioned literature, even though the respondents were not evaluating the function of land zoning in the present study. The ecosystem offers significant value through comprehensive ecosystem services to the hillside residents.

However, policy exceptions or exemptions are provided for by law and allow developers to carry out additional development on government-owned mountains and hillside lands based on application specifications [34]. Allowance of these applications for additional development for mining and farming would put pressure on nature and on the sensitive hillside residents. Hence, current key issues are reconciling the confrontation between development and conservation, rather than merely relying on the policy of local land zoning.

The current study focuses on public opinions. However, considering the public attitudes outlined in the literature [46,49] and local vulnerabilities [15–19], it would be interesting to explore how individuals assess the zoning policy in a future investigation. Examining public perceptions of land zoning could be a key aspect of future research.

Residents are key stakeholders, as their lives and property are locally reliant. Their high awareness of forest ecosystem damage evidenced in the present study has affirmed local support for ecosystem protection. Regarding the dilemma between the economy and conservation that is often encountered in watershed management and ecosystem governance, the residents strongly agree that the forest ecosystem is more important than the economy. Residents are aware that humans should harmoniously coexist with nature. They strongly agree that the responsibility for ecological protection should be carried by all citizens and that humans should harmoniously coexist with nature. The priorities of the local community as presented in Table 10 could be adopted as important arguments for maintaining the policy based on historical land zoning decisions. Based upon the evidence in the study of the highly alert attitudes and the significant value of comprehensive ecosystem services, as seen in the surveyed opinions of the residents, the continuity of land zoning and upland protection is still a feasible policy. The results suggest that there is little place left in the uplands of the LRW for mining in the mountains and cabbage growing in the uphill valleys.

As a viable solution for addressing and confronting problems of development and conservation, land zoning should ensure that scientifically based policy objectives are met over an extended period, particularly in the context of the Anthropocene.

However, LRW miners and farmers also play a role as stakeholders who need to reduce land use in the vulnerable LRW.

4.3. Neither Damage Compensation nor Payment for Ecosystem Services

The present study addressed the relevant issues of payment for ecosystem services (PES) to demonstrate how difficult life will be once the natural ecosystem is greatly degraded and destroyed. In the LRW, where ecosystem services are already well-protected and continuously provided to the public, PES is not a feasible scheme.

PES is a scheme via which the public pay to purchase ecosystem services, and PES is used to incentivize land developers to adopt sustainable practices, ensuring sustainable resource use and ecosystem service provisions. PES operates under the Coase theorem, aiming to efficiently allocate natural resources through negotiation, but its effectiveness is constrained by transaction costs and wealth effects [59,62]. The practical application of PES encounters challenges from the complexity of nature and society. Design failures, such as high transaction costs and inaccurate targeting, hinder the success of PES. Legal enforcement and compliance are crucial for its viability. It requires a composite policy politically to sustain or enhance its effectiveness. High-threat areas may be more feasible PES sites compared to areas with strong ecological health.

Given the current additional development in the LRW and high awareness among hillside residents, conservation of the upland area is prudent. It is in the public interest to protect the ecosystem before its degradation leads to loss of ecosystem services, rather than resorting to compensation after degradation occurs.

Neither damage compensation nor payment for ecosystem services are straightforward solutions in the context of the LRW. Especially, damage compensation acts as both a sanction for developers and an incentive for ecosystem services recipients to accept additional development. However, in the LRW, where there is high awareness of environmental damage and less emphasis on economic development, compensation for environmental degradation may not be acceptable. Payment for ecosystem services (PES) aims to address declining ecosystem services by incentivizing their provision, but its practical application has limitations, despite its potential.

The assessed value of comprehensive ecosystem services in this study reflects residents' perceptions about the value in a hypothesis market. The LRW's stringent land zoning policy currently ensures quality of services, making actual payment unnecessary.

The survey indicates that hillside residents have limited understanding and support for damage compensation and PES, likely due to the LRW's protected status and the familiarity with natural disasters. Corresponding compensation for degraded ecosystem services might be more acceptable in this context as a sanction for existing damage. They show an equal level of concern about the payment channels, as surveyed in this study.

It is important to consider adopting an information campaign to make residents more aware of market solutions. However, market solutions are widely addressed in academic research and practical applications [58–66]. This knowledge and understanding can lead to further relevant applications in locally feasible ecosystem governance policies.

The studies investigated by Chen et al. [50,52], conducted by the same research team as the present study, assess the non-market economic value of a range of categories of ecosystem services in the same fragile watershed forest ecosystem. The assessed ecosystem services included provisioning, regulating, cultural, and supporting ecosystem services [50], as well as ecosystem services to adapt to climate change [52]. The estimated willingness to pay in these studies represents the economic benefit that nature brings to humans, and assessment studies demonstrate that protecting forest ecosystems effectively will yield multiple services to society. It is feasible that forest ecosystems can be locally protected. The present study evidenced that protection is preferred so that human society and forest ecosystems can coexistence in harmony.

4.4. Advancing Understanding: Forest Services Valuation and Theoretical Context

Since the contingent valuation method is used to survey the respondents' stated value based on a hypothesis market for non-market goods, with some protest responses and uncertain responses in the survey [101], it is reasonable, via the basic theoretical methodology of the contingent valuation method, that not all respondents would agree to pay the bidding amount to conserve the comprehensive services, even though all of the hillside residents receive the forest ecosystem services. The disagreement rate to pay the bid in the survey, shown in Table 5, does not indicate that residents experience no pressure and are not threatened by local additional development. The study focuses on safeguarding forest ecosystems, validating this through addressing theoretical aspects of valuation techniques, and affirming its credibility.

The value estimated in the present study is on the basis of stated value in a hypothesis market. The stated behavior might be bounded by respondent psychological perceptions. The relevant theoretical context in the contingent valuation method has not been clarified and requires further advanced research. It can be further addressed in a future study by examining the prospect theory of Kahneman and Tversky in 1979 [102], and the study of Behavioral Economics [102,103].

5. Conclusions

In the pursuit of sustainability, it is vital to find policies that ensure human activities are in harmony with the Earth's finite capacities. The Lanyang River Watershed (LRW) is a fragile ecosystem. Effective management practices, including historical land zoning and forest protection, are relied upon to safeguard water and soil, as well as the lives and property of residents. Additionally, these practices help preserve the ecosystem services offered by healthy forest systems.

The present study evidenced that the hillside residents in the LRW highly value the comprehensive ecosystem services protected by long-term land use planning aimed at forest protection and water and soil conservation. The hillside residents have high public awareness of the damage caused by ecosystem degradation, but they pay little attention to damage compensation, which would be a sanction to the developers and an incentive to the recipients. They show general agreement on the feasibility of the payment channels for forest ecosystem damage, according to the survey results. In light of the opinions of local communities on the frontline of nature and society, and considering current land classification and enforced zoning policies, residents prioritize conservation over further development.

Despite pressure for local resource exploitation, further development in the LRW risks diminishing these vital ecosystem services. Hillside residents, who benefit directly from these services, prioritize conservation over additional development. While they value ecosystem services, they show limited interest in damage compensation, focusing instead on preserving the existing ecosystem.

This study underscores the importance of balancing human needs with environmental conservation, especially in regions like the LRW. By highlighting the perspectives of local stakeholders, it emphasizes the interconnectedness of social and ecological systems.

Author Contributions: Conceptualization, methodology, investigation, software, validation, and formal analysis, writing, and editing: W.-J.C.; organization of the research project, survey design, paper review, and paper submission: S.-C.L.; research project administration, W.-J.C., J.-F.J., C.-H.C. and S.-C.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the National Science and Technological Council, Taiwan, grant number NSTC 112-2321-B-004-001.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: We gratefully acknowledge the five reviewers for their helpful comments and suggestions. The interviewers for this in-person survey were W.J. Chen, W.R. Chen, C.C. Cheng, I.J. Huang, Y.S. Hua, and W.M. Hsieh.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Van Den Bergh, J. Herman Daly's Economics for a Full World: His Life and Ideas by Peter Victor. *Ethics Environ.* **2023**, *28*, 117–125. [CrossRef]
2. Victor, P.A. *Herman Daly's Economics for a Full World: His Life and Ideas*; Routledge: Toronto, ON, Canada, 2021.
3. Daly, H.E. Economics in a full world. *Sci. Am.* **2005**, *293*, 100–107. [CrossRef] [PubMed]
4. Daly, H. A new economics for our full world. In *Handbook on Growth and Sustainability*; Edward Elgar Publishing: London, UK, 2017; pp. 85–106.
5. Solomon, B.D. Full world. In *Dictionary of Ecological Economics*; Edward Elgar Publishing: London, UK, 2023; pp. 237–238.
6. Costanza, R. Stewardship for a "full" world. *Curr. Hist.* **2008**, *107*, 30–35. [CrossRef]
7. Costanza, R. A new development model for a 'Full' world. *Development* **2009**, *52*, 369–376. [CrossRef]
8. Robinson, N.A. Beyond sustainability: Environmental management for the Anthropocene epoch. *J. Public Aff.* **2012**, *12*, 181–194. [CrossRef]
9. Hoffman, A.J.; Jennings, P.D. *Re-Engaging with Sustainability in the Anthropocene Era: An Institutional Approach*; Cambridge University Press: London, UK, 2018.
10. Dalby, S. *Anthropocene Geopolitics: Globalization, Security, Sustainability*; University of Ottawa Press: Ottawa, ON, Canada, 2020.
11. Merchant, C. *The Anthropocene and the Humanities: From Climate Change to a New Age of Sustainability*; Yale University Press: New Haven, CT, USA, 2020.
12. Knight, J. Anthropocene futures: People, resources and sustainability. *Anthr. Rev.* **2015**, *2*, 152–158. [CrossRef]
13. Scown, M.W.; Craig, R.K.; Allen, C.R.; Gunderson, L.; Angeler, D.G.; Garcia, J.H.; Garmestani, A. Towards a global sustainable development agenda built on social–ecological resilience. *Glob. Sustain.* **2023**, *6*, e8. [CrossRef] [PubMed]
14. Leach, M.; Reyers, B.; Bai, X.; Brondizio, E.S.; Cook, C.; Díaz, S.; Espindola, G.; Scobie, M.; Stafford-Smith, M.; Subramanian, S.M. Equity and sustainability in the Anthropocene: A social–ecological systems perspective on their intertwined futures. *Glob. Sustain.* **2018**, *1*, e13. [CrossRef]
15. Yilan County Government, Taiwan. Characteristics of Townships in Yilan County. 2024. Available online: https://www.e-land.gov.tw/cp.aspx?n=9E1BEC13B38E00CE (accessed on 10 March 2024).
16. FRMB, First River Management Branch, Water Resources Agency, Ministry of Economic Affairs, Taiwan. Beautiful Yi-lan, the Lanyang River. 2024. Available online: https://www.twrr.ndc.gov.tw/index (accessed on 18 April 2024).

17. SWCB, Soil and Water Conservation Bureau. *The 60th Anniversary Storybook of the Bureau of Soil and Water Conservation—About Those Things on the Hillside*; Council of Agriculture Executive Yuan: Taipei, Taiwan, 2023.
18. Lee, S.W. On the issues of watershed governance in Taiwan. *J. Chin. Soil Water Conserv.* **1981**, *12*, 119–140.
19. Leung, K.W.; Tseng, Y.I.; Cheng, C.C.; Wang, S.T.; Chu, H.M.; Huang, W.L.; Lin, T.H.; Lai, C.Y. Land Use Capability Survey of Some Areas Along East-West Cross Island Highway of Taiwan Part 1. Grand Report. Report of Taiwan Agricultural Experimental Institute, No 19. Nantou County, Taiwan. 1959. Available online: https://scholars.tari.gov.tw/handle/123456789/10891 (accessed on 3 March 2024).
20. Tsai, C.S.; Chiang, Y.H. A ruler for hillside farming-A check. *Agric. Policy Rev.* **2013**, 252. Available online: https://www.moa.gov.tw/ws.php?id=2447709 (accessed on 3 March 2024).
21. Geneletti, D. Assessing the impact of alternative land-use zoning policies on future ecosystem services. *Environ. Impact Assess. Rev.* **2013**, *40*, 25–35. [CrossRef]
22. Rozas-Vásquez, D.; Fürst, C.; Geneletti, D.; Almendra, O. Integration of ecosystem services in strategic environmental assessment across spatial planning scales. *Land Use Policy* **2018**, *71*, 303–310. [CrossRef]
23. Bragagnolo, C.; Geneletti, D. Dealing with land use decisions in uncertain contexts: A method to support strategic environmental assessment of spatial plans. *J. Environ. Plan. Manag.* **2014**, *57*, 50–77. [CrossRef]
24. Geneletti, D.; Bagli, S.; Napolitano, P.; Pistocchi, A. Spatial decision support for strategic environmental assessment of land use plans. A case study in southern Italy. *Environ. Impact Assess. Rev.* **2007**, *27*, 408–423. [CrossRef]
25. Birch, J.C.; Newton, A.C.; Aquino, C.A.; Cantarello, E.; Echeverría, C.; Kitzberger, T.; Schiappacasse, I.; Garavito, N.T. Cost-effectiveness of dryland forest restoration evaluated by spatial analysis of ecosystem services. *Proc. Natl. Acad. Sci. USA* **2010**, *107*, 21925–21930. [CrossRef] [PubMed]
26. Nelson, E.; Sander, H.; Hawthorne, P.; Conte, M.; Ennaanay, D.; Wolny, S.; Manson, S.; Polasky, S. Projecting global land-use change and its effect on ecosystem service provision and biodiversity with simple models. *PLoS ONE* **2010**, *5*, e14327. [CrossRef]
27. Polasky, S.; Nelson, E.; Pennington, D.; Johnson, K.A. The impact of land-use change on ecosystem services, biodiversity and returns to landowners: A case study in the state of Minnesota. *Environ. Resour. Econ.* **2011**, *48*, 219–242. [CrossRef]
28. Geneletti, D. Reasons and options for integrating ecosystem services in strategic environmental assessment of spatial planning. *Int. J. Biodivers Sci. Ecosyst. Serv. Manag.* **2011**, *7*, 143–149. [CrossRef]
29. Geneletti, D. Environmental assessment of spatial plan policies through land use scenarios. A study in a fast-developing town in rural Mozambique. *Env. Impact Assess Rev* **2012**, *32*, 1–10. [CrossRef]
30. Lin, C.T.; Li, C.F.; Zelený, D.; Chytrý, M.; Nakamura, Y.; Chen, M.Y.; Chen, T.Y.; Hsia, Y.J.; Hsieh, C.F.; Liu, H.Y.; et al. Classification of the high-mountain coniferous forests in Taiwan. *Folia Geobot.* **2012**, *47*, 373–401. [CrossRef]
31. Li, C.F.; Chytrý, M.; Zelený, D.; Chen, M.Y.; Chen, T.Y.; Chiou, C.R.; Hsia, Y.J.; Liu, H.Y.; Yang, S.Z.; Yeh, C.L.; et al. Classification of Taiwan forest vegetation. *Appl. Veg. Sci.* **2013**, *16*, 698–719. [CrossRef]
32. Bebi, P.; Kienast, F.; Schönenberger, W. Assessing structures in mountain forests as a basis for investigating the forests' dynamics and protective function. *For. Ecol. Manag.* **2001**, *145*, 3–14. [CrossRef]
33. Lin, J.C.; Chiou, C.R.; Chan, W.H.; Wu, M.S. Valuation of Forest Ecosystem Services in Taiwan. *Forests* **2021**, *12*, 1694. [CrossRef]
34. LRD_MJ_T (Laws and Regulations Database, Ministry of Justice, Taiwan). 2024. Available online: https://law.moj.gov.tw/ (accessed on 3 March 2024).
35. Tu, H.M.; Chen, H.M. From deforestation to afforestation: Effect of slopeland use policies on land use/cover change in Taiwan. *Land Use Policy* **2020**, *99*, 105038. [CrossRef]
36. Lin, J.C.; Chiou, C.R.; Chan, W.H.; Wu, M.S. Public perception of forest ecosystem services in Taiwan. *J. For. Res.* **2021**, *26*, 344–350. [CrossRef]
37. Liu, W.Y.; Lee, D.R.; Wang, S.Y.S.; Yu, H.W. Assessing the ecological loss of mining areas in Taiwan. *Environ. Monit. Assess.* **2023**, *195*, 288. [CrossRef] [PubMed]
38. Abdulmana, S.; Lim, A.; Wongsai, S.; Wongsai, N. Land surface temperature and vegetation cover changes and their relationships in Taiwan from 2000 to 2020. *Remote Sens. Appl. Soc. Environ.* **2021**, *24*, 100636. [CrossRef]
39. Wang, Y.P.; Chen, C.T.; Tsai, Y.C.; Shen, Y. A sentinel-2 image-based irrigation advisory service: Cases for tea plantations. *Water* **2021**, *13*, 1305. [CrossRef]
40. Ostrom, E. A diagnostic approach for going beyond panaceas. *Proc. Natl. Acad. Sci. USA* **2007**, *104*, 15181–15187. [CrossRef]
41. Ostrom, E. A general framework for analyzing sustainability of social-ecological systems. *Science* **2009**, *325*, 419–422. [CrossRef]
42. Coase, R.H. The problem of social cost. *J. Law Econ.* **1960**, *3*, 1–44. [CrossRef]
43. Lesbirel, S.H. *NIMBY Politics in Japan: Energy Siting and the Management of Environmental Conflict*; Cornell University Press: New York, NY, USA, 1998.
44. Frey, B.S.; Oberholzer-Gee, F. The cost of price incentives: An empirical analysis of motivation crowding-out. *Am. Econ. Rev.* **1997**, *87*, 746–755.
45. Frey, B.S.; Oberholzer-Gee, F.; Eichenberger, R. The old lady visits your backyard: A tale of morals and markets. *J. Political Econ.* **1996**, *104*, 1297–1313. [CrossRef]
46. Lin, J.Y.; Lin, Y.J. Mining on Mountains Endangers Zhonghua Village's Future and Yilan's Water Source. Residents: No Compensation Is Worth Our Children's Future. A Web News Plateform: News and Market. 2019. Available online: https://www.newsmarket.com.tw/blog/125588/ (accessed on 3 March 2024).

47. Chen, H.; Shu, C.F. Engineering properties of the china clay and its slope stability in the I-lan area. *Min. Metall. Bull. Chin. Inst. Min. Metall. Eng.* **1992**, *36*, 9–17.
48. Wu, Y.P.; Chang, C.T.; Lan, W.L.; Chen, Y.M.; Lin, J.H.; Lin, J.I.; By, S.Y. The Characteristics of Fugitive Dust in Limestone Extraction Area in Ilan. *J. Natl. Ilan Inst. Technol.* **1999**, *2*, 65–74. Available online: https://lic.niu.edu.tw/var/file/10/1010/img/6/880608.pdf (accessed on 3 March 2024).
49. Chen, B.L. Spatial Production and Resistance: The Enclavization and Localization of Yilan after 1980s. Ph.D. Thesis, Chung Yuan Christian University, Taoyuan City, Taiwan, 2015. [CrossRef]
50. Chen, W.J.; Jan, J.F.; Chung, C.H.; Liaw, S.C. Resident Willingness to Pay for Ecosystem Services in Hillside Forests. *Int. J. Environ. Res. Public Health* **2022**, *19*, 6193. [CrossRef]
51. Chen, W.J.; Jan, J.F.; Chung, C.H.; Liaw, S.C. Agriculture Risks and Opportunities in a Climate-Vulnerable Watershed in Northeastern Taiwan—The Opinions of Leisure Agriculture Operators. *Sustainability* **2023**, *15*, 15025. [CrossRef]
52. Chen, W.J.; Jan, J.F.; Chung, C.H.; Liaw, S.C. Do Eco-Based Adaptation Measures Enhance Ecosystem Adaptation Services? Economic Evidence from a Study of Hillside Forests in a Fragile Watershed in Northeastern Taiwan. *Sustainability* **2023**, *15*, 9685. [CrossRef]
53. Brink, E.; Aalders, T.; Ádám, D.; Feller, R.; Henselek, Y.; Hoffmann, A.; Ibe, K.; Matthey-Doret, A.; Meyer, M.; Negrut, N.L.; et al. Cascades of green: A review of ecosystem-based adaptation in urban areas. *Glob. Environ. Change* **2016**, *36*, 111–123. [CrossRef]
54. Simatele, D.; Katanha, A. Natural hazard mitigation strategies review: Actor–network theory and the eco-based approach understanding in Zimbabwe. *Jàmbá: J. Disaster Risk Stud.* **2019**, *11*, 1–9.
55. Yang, S.Y.; Chan, M.H.; Chang, C.H.; Chang, L.F. The damage assessment of flood risk transfer effect on surrounding areas arising from the land development in Tainan, Taiwan. *Water* **2018**, *10*, 473. [CrossRef]
56. Doughan, Y.A.R. Ecosystem-Based Management: An Illustrative Approach. *Zero Hunger* **2020**, 262–274. [CrossRef]
57. Oduoye, M.O.; Karim, K.A.; Kareem, M.O.; Shehu, A.; Oyeleke, U.A.; Zafar, H.; Muhsin Umar, M.; Raja, H.A.A.; Adegoke, A.A. Flooding in Libya amid an economic crisis: What went wrong? *IJS Glob. Health* **2024**, *7*, e0401. [CrossRef]
58. Tietenberg, T.; Lewis, L. *Environmental and Natural Resource Economics*; Routledge: New York, NY, USA, 2018.
59. Coase, R.H. *The Firm, the Market, and the Law*; University of Chicago Press: Chicago, IL, USA, 2012.
60. Alix-Garcia, J.; Wolff, H. Payment for ecosystem services from forests. *Annu. Rev. Resour. Econ.* **2014**, *6*, 361–380. [CrossRef]
61. Salzman, J.; Bennett, G.; Carroll, N.; Goldstein, A.; Jenkins, M. The global status and trends of Payments for Ecosystem Services. *Nat. Sustain.* **2018**, *1*, 136–144. [CrossRef]
62. Wunder, S.; Börner, J.; Ezzine-de-Blas, D.; Feder, S.; Pagiola, S. Payments for environmental services: Past performance and pending potentials. *Annu. Rev. Resour. Econ.* **2020**, *12*, 209–234. [CrossRef]
63. Kane, M.; Erickson, J.D. Urban metabolism and payment for ecosystem services: History and policy analysis of the New York City water supply. In *Ecological Economics of Sustainable Watershed Management*; Emerald Group Publishing Limited: Leeds, UK, 2007; pp. 307–328.
64. Greenwalt, T.; McGrath, D. Protecting the city's water: Designing a payment for ecosystem services program. *Nat. Resour. Env't* **2009**, *24*, 9.
65. Grolleau, G.; McCann, L.M. Designing watershed programs to pay farmers for water quality services: Case studies of Munich and New York City. *Ecol. Econ.* **2012**, *76*, 87–94. [CrossRef]
66. Swain, M.; McKinney, E.; Susskind, L. Water shutoffs in older American cities: Causes, extent, and remedies. *J. Plan. Educ. Res.* **2023**, *43*, 758–765. [CrossRef]
67. Ma, C.C.; Chang, C.Y.; Liu, Y.Y. Time-Space Allocation of High Mountain Vegetable in Nan-Shan Tribe. *Bull. Geogr. Soc. China* **2006**, *37*, 45–67.
68. Gual, M.A.; Norgaard, R.B. Bridging ecological and social systems coevolution: A review and proposal. *Ecol. Econ.* **2010**, *69*, 707–717. [CrossRef]
69. Chan, W.H.; Cheng, K.F.; Lin, J.C.; Chiou, C.R. Using Invest to Simulate the Impact of Land-Use Change on Ecosystem Services Benefits: A Case Study of Lianhuachi Area. *Q. J. Chin. For.* **2020**, *53*, 1–17.
70. Gössling, S.; Balas, M.; Mayer, M.; Sun, Y.Y. A review of tourism and climate change mitigation: The scales, scopes, stakeholders and strategies of carbon management. *Tour. Manag.* **2023**, *95*, 104681. [CrossRef]
71. Biggs, D.; Hicks, C.C.; Cinner, J.E.; Hall, C.M. Marine tourism in the face of global change: The resilience of enterprises to crises in Thailand and Australia. *Ocean Coast. Manag.* **2015**, *105*, 65–74. [CrossRef]
72. Loehr, J.; Becken, S. The tourism climate change knowledge system. *Ann. Tour. Res.* **2021**, *86*, 103073. [CrossRef]
73. Hopkins, D. Applying a comprehensive contextual climate change vulnerability framework to New Zealand's tourism industry. *Ambio* **2015**, *44*, 110–120. [CrossRef] [PubMed]
74. Nitivattananon, V.; Srinonil, S. Enhancing coastal areas governance for sustainable tourism in the context of urbanization and climate change in eastern Thailand. *Adv. Clim. Change Res.* **2019**, *10*, 47–58. [CrossRef]
75. MEA, Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being—Synthesis: A Report of the Millennium Ecosystem Assessment*; Island Press: Washington, DC, USA, 2005; Available online: https://www.millenniumassessment.org/documents/document.356.aspx.pdf (accessed on 10 March 2024).
76. Jebb, A.T.; Ng, V.; Tay, L. A review of key Likert scale development advances: 1995–2019. *Front. Psychol.* **2021**, *12*, 637547. [CrossRef] [PubMed]

77. Willits, F.K.; Theodori, G.L.; Luloff, A.E. Another look at Likert scales. *J. Rural Soc. Sci.* **2016**, *31*, 6.
78. Albaum, G. The Likert scale revisited. *Int. J. Mark. Res.* **1997**, *39*, 1–21. [CrossRef]
79. Cameron, T.A. A new paradigm for valuing non-market goods using referendum data: Maximum likelihood estimation by censored logistic regression. *J. Environ. Econ. Manag.* **1988**, *25*, 355–379. [CrossRef]
80. Cameron, T.A. Interval estimates of non-market resource values from referendum contingent valuation surveys. *Land Econ.* **1991**, *67*, 413–421. [CrossRef]
81. Tobin, J. Estimation of relationships for limited dependent variables. *Econom. J. Econom. Soc.* **1958**, *26*, 24–36. [CrossRef]
82. Keyhkhaysalar, Z.; Hosseini, S.M.; Dadrasmoghadam, A. Factors affecting the willingness to pay for organic honey using Heckman's two-stage Tobit model (Case study: Zahedan city). *Honeybee Sci. J.* **2024**, *14*, 23–35.
83. Jahanabadi, E.A.; Mousavi, S.N.; Moosavihaghighi, M.H.; Eslami, M.R. Consumers' willingness to pay for antibiotic-free chicken meat: Application of contingent valuation method. *Environ. Dev. Sustain.* **2023**, 1–22. [CrossRef]
84. Abebe, A. Farmers' willingness to pay for mobile phone-based agricultural extension service in northern Ethiopia. *Cogent Food Agric.* **2023**, *9*, 2260605. [CrossRef]
85. Zhu, W.; Paudel, K.P.; Luo, B. The influence of land titling on the disparity between willingness to accept and willingness to pay values. *J. Environ. Plan. Manag.* **2021**, *64*, 930–953. [CrossRef]
86. Carlsson, F.; Martinsson, P. Willingness to pay among Swedish households to avoid power outages: A random parameter Tobit model approach. *Energy J.* **2007**, *28*, 75–90. [CrossRef]
87. Haddak, M.M.; Lefèvre, M.; Havet, N. Willingness-to-pay for road safety improvement. *Transp. Res. Part A Policy Pract.* **2016**, *87*, 1–10. [CrossRef]
88. Owusu, V.; Owusu Anifori, M. Consumer willingness to pay a premium for organic fruit and vegetable in Ghana. *Int. Food Agribus. Manag. Rev.* **2013**, *16*, 67–86.
89. Zhang, Q.; Ren, D.; Chang, X.; Sun, C.; Liu, R.; Wang, J.; Zhang, N. Willingness to pay for packaging cancer screening of Chinese rural residents. *Cancer Med.* **2023**, *12*, 3532–3542. [CrossRef] [PubMed]
90. Xu, D.; He, J.; Qing, C.; Zhang, F. Impact of perceived environmental regulation on rural residents' willingness to pay for domestic waste management. *J. Clean. Prod.* **2023**, *412*, 137390. [CrossRef]
91. Pham, T.T.; Lam, T.P.M.; Le Dang, H.; Pham, N.T. Consumers' willingness to pay an environmental fee for e-waste recycling in Vietnam: Integrating the theory of planned behaviour and the norm activation model. *J. Mater. Cycles Waste Manag.* **2023**, *25*, 2900–2914. [CrossRef]
92. Carlsson, F.; Johansson-Stenman, O. Willingness to pay for improved air quality in Sweden. *Appl. Econ.* **2000**, *32*, 661–669. [CrossRef]
93. Halstead, J.M.; Lindsay, B.E.; Brown, C.M. Use of the Tobit model in contingent valuation: Experimental evidence from the Pemigewasset Wilderness Area. *J. Environ. Manag.* **1991**, *33*, 79–89. [CrossRef]
94. Sethy, M.K.; Senapati, A.K. Perceptions towards ecotourism practice and the willingness to pay: Evidence from Chilika coastal wetland ecosystem, Odisha. *Int. J. Geoheritage Parks* **2023**, *11*, 497–513. [CrossRef]
95. Korle, K. Drivers of willingness to pay for reforestation of urban ecosystems in Ghana. *Int. J. Soc. Econ.* **2023**, *50*, 1688–1701. [CrossRef]
96. Zhang, G.; Zhang, Q.; Yang, X.; Fang, R.; Wu, H.; Li, S. Living environment shaped residents' willingness to pay for ecosystem services in Yangtze River Middle Reaches Megalopolis, China. *Geogr. Sustain.* **2023**, *4*, 213–221. [CrossRef]
97. Jiang, Y.; Liu, X.; Yang, L.; Hu, T.; Pan, H.; Luo, H.; Han, W.; Xiao, W. Moving towards sustainable development in China's rural counties: Ecological efficiency evaluation based on DEA-Malmquist-Tobit model. *J. Clean. Prod.* **2024**, 141093. [CrossRef]
98. Xu, Z.; Xu, J.; Li, S.; Wang, C. The influencing factors of residents' willingness to pay in marine ecological restoration: The integration of the theory of planned behavior and social capital theory. *Mar. Policy* **2024**, *161*, 106031. [CrossRef]
99. Hanemann, W.M. Welfare evaluations in contingent valuation experiments with discrete responses. *Am. J. Agric. Econ.* **1984**, *66*, 332–341. [CrossRef]
100. Lin, H.L.; Chen, J.C. *Statistics: Methods and Applications*, 5th ed.; Yeh Yeh Book Gallery: Taipei, Taiwan, 2021.
101. Wu, P.I.; Lin, C.Y.; Su, M.T. The characteristics of protest responses and responses with "Uncertain": The impacts of these responses on WTP estimation. *Surv. Res. Method Appl.* **2005**, *17*, 65–110. [CrossRef]
102. Kahneman, D.; Tversky, A. Prospect theory: An analysis of decision under risk. *Econometrica* **1979**, *47*, 263–291. [CrossRef]
103. Thaler, R.H. Mental Accounting Matters. *J. Behav. Decis. Mak.* **1999**, *12*, 183–206. [CrossRef]