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Pollution Control and Well-Being in Rural Areas: A Study Based on Survey Data

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Abstract: Pollution control is of great value in order to achieve sustainable development and meet the needs of human development. This paper utilizes data from four rounds of longitudinal surveys conducted between 2012 and 2018 as part of the China Labor Force Dynamic Survey. Employing multiple linear regression methods, it empirically investigates the impact of pollution control on the well-being of rural residents. Empirical results show that even after accounting for individual, village, and family characteristics, pollution control significantly affects the happiness of rural residents. Notably, water pollution control emerges as having the most pronounced impact on rural residents' happiness. Furthermore, pollution control enhances the well-being of rural residents by improving the village environment, fostering family harmony, and enhancing the physical and mental health of individuals. A heterogeneity analysis indicates that pollution control exerts a stronger influence on the happiness of residents in the central and western region and ordinary villages, while its impact is somewhat weaker in the eastern region. Addressing the pollution issue remains imperative, along with stimulating the endogenous drivers of rural ecological revitalization, enhancing the effectiveness of grassroots governance in rural areas, and continually bolstering the sense of well-being and happiness among the populace.

Keywords: pollution control; rural residents; happiness; ecological civilization; heterogeneity

Citation: Zhou, Q.; Chen, J.; Liu, S.; Zhou, F.; Wen, H. Pollution Control and Well-Being in Rural Areas: A Study Based on Survey Data. *Sustainability* **2024**, *16*, 1334. https://doi.org/10.3390/su16031334

Academic Editor: Elena Cristina Rada

Received: 17 December 2023
Revised: 17 January 2024
Accepted: 26 January 2024
Published: 5 February 2024

1. Introduction

Existing research clearly reveals that a healthy ecological environment is fundamentally critical for human survival and well-being [1,2]. The state of the natural ecological environment is highly integral to people's health and happiness. Efforts toward pollution management aim to establish an environment conducive for production and living [3], thereby mitigating the tension between humanity and nature, protecting lives and health, and enhancing individual perceptions of happiness and security. Currently, addressing the pollution issues prevalent in agricultural and rural regions continues to be a challenging aspect [4,5] of ecological environmental protection, specifically in the comprehensive "three rural areas" initiatives, as anthropogenic pollutants persistently rise due to human activities. Extensive research and the implementation of water pollution control measures can make significant contributions to the improvement in ecological environment quality [6].

Agriculture and rural areas are the foundation of human civilization. They serve as a vital resource for enhancing societal evolution and greatly affect the sustainability of rural development. Rapid industrialization, urbanization, and globalization have exacerbated rural instability, marking sustainable development in these regions with significant challenges [7]. A series of ecological and environmental problems occur frequently, such as

rural resource and environmental degradation and soil and water pollution [8,9]. Globalization only accentuates these challenges as it leads to industrial sector elimination and the transfer of highly polluting industries, thereby intensifying environmental pollution and ecological damage in rural areas [7].

Given these issues, establishing robust rural environmental governance and promoting the creation of livable [10], functional, and aesthetically pleasing countryside is of utmost importance. This article attempts to explore whether pollution control in rural areas can enhance people's sense of happiness and sheds light on its internal mechanism. By considering individual, familial, and communal characteristics, this study investigates the underlying principles and universal patterns elucidating the influence of pollution control over rural residents' happiness. It aims to identify the inherent connection between pollution control and rural happiness, find new ways to promote sustainable development in rural areas, and encourage the government to formulate effective policies to support sustainable development in rural areas.

The expected contributions of this article are as follows: First, this study enriches the theoretical understanding of ecological governance and well-being. Specifically, it underscores the significant improvement in happiness levels resulting from effective pollution control measures. Second, the results provide empirical evidence on the way pollution is managed, asserting through an empirical analysis that improvements in individuals' physical and mental health, family harmony, and public village environment are strongly linked to enhancing happiness. Third, this paper provides a valuable reference for improving quality of life and overall happiness while contributing significantly to rural ecological revitalization. This, in turn, promotes the steady advancement of agricultural and rural modernization while moving toward the goal of establishing a beautiful China. This paper further elaborates on the varying impacts on eastern, central, western, affluent, and ordinary villages considered in this study, offering deeper theoretical support for improving rural ecological environmental governance, enhancing people's happiness, and providing critical insights for developing targeted rural pollution control policies by relevant government departments.

The remainder of this paper is organized as follows: Section 2 presents a literature review and theoretical analysis. Section 3 describes the design of the empirical study. Section 4 presents and analyzes the empirical results. Section 5 involves discussions. The Section 6 provides conclusions, recommendations, and potential future directions.

2. Literature Review and Theoretical Analysis

2.1. Literature Review on Pollution Control and Well-Being

Rural ecological environmental governance plays a crucial role in promoting ecological civilization and serves as a pragmatic necessity for comprehensive rural revitalization. Existing literature primarily focuses on the evaluation of pollution control efficiency and the factors and mechanisms affecting residents' happiness. Within the context of assessing pollution control effectiveness, studies have paid attention toward its influence on residents' trust in the government and their political participation. They have focused on evaluating the social security effects of pollution control [11], public perceptions [12,13], issues of concern, public participation [14,15], and environmental awareness. By utilizing data related to air pollution [16,17], land pollution [18,19], and water pollution [20,21], the study analyzes the effect of pollution control through a differential analysis, logistic regression, and index integration methods. Some studies have emphasized collaborative air pollution control, spatiotemporal evolution trends [22], influencing factors, and policy outcomes in water and haze pollution control [23,24]. Other studies have analyzed the effects of fluctuations in climate and aerosol types on the thermodynamic stability of the planetary boundary layer (PBL), aerosol vertical distribution, and aerosol–PBL interactions using in situ aircraft measurements, ground observations, and the Weather Research and Forecasting model coupled with Chemistry simulations. It helps with the identification of priority pollutants based on weather conditions and encourages more accurate air pollution control [25], thereby

paving the way for sustainable economic and high-quality environmental development. In addition, some studies have focused on port pollution control, believing that ports play a crucial role in the economic, environmental, and social sustainability of cities and urban areas. The most important solution to address port decarbonization barriers is embedded in policies and management tools. Countries and ports need to develop decarbonization strategies with appropriate packages of policies, and when required, introduce grants, subsidies, investments, performance standards, and tasks along with adequate communication and educational activities, as well as carbon taxes [26]. At the same time, these studies call for a re-evaluation of port sustainability in alignment with the United Nations Sustainable Development Goals; this could provide port practitioners and policy makers with valuable references for reliable decision making, serving the wider goal of global sustainable development [27].

In terms of research concerning the factors that affect residents' happiness, most research has explored the relationship between residents' income and happiness [28]. These studies have concluded that income disparities and unequal opportunities significantly diminish residents' happiness [29–31]. Other research has investigated trends in national happiness, assessed the influence of government quality on residents' happiness [32], and analyzed the effect of fintech development on rural family happiness [33,34]. When looking at the mechanisms through which environmental governance influences residents' happiness, some studies have argued that farmers' subjective perceptions, physical and mental health, interpersonal relationships, and farming activities mediate their happiness [35]. Scholars have suggested that environmental pollution harms residents' health and diminishes their subjective well-being. Furthermore, some studies have stated that building an ecological civilization enhances residents' happiness by fostering a favorable ecological environment, creating diverse cultural industries, and nurturing a harmonious social environment [36]. Other studies have discussed the effect of rural pollution control on residents' happiness through the lens of traditional village culture integration [37], believing that the diversity of social culture effectively enhances people's sense of happiness. These studies provide valuable insight into enhancing rural ecological environmental governance, advancing the creation of habitable, functional, and aesthetically pleasing rural communities, and further enriching the theory and practice of ecological environmental governance.

Surprisingly, few existing studies have examined the influence and mechanism of ecological civilization construction on rural residents' happiness. Most studies have concentrated on the effects of environmental governance [38], ecological environment quality [39], green development [32,40], and residents' happiness, often focusing on specific regions or particular pollutant mitigation measures. Such studies may not entirely capture the breadth, depth, and scope of rural residents' perceptions of the ecological environment. Thus, they may not fully reflect the extent to which rural residents absorb and utilize ecological resources, making it challenging to reveal the intricate connection between pollution control and residents' happiness. As a significant component of rural ecological civilization establishment, rural pollution control plays a critical external role in people's physical and mental health, happiness, sense of achievement, and sense of security. Taking rural pollution control as the starting point for research can more accurately depict how the level of rural ecological environment governance can improve people's sense of happiness.

By exploring the effect of pollution control on the happiness of rural residents, this research aims to depict residents' awareness of ecological environment management, evaluate current pollution control outcomes, and map out directions for future improvements more accurately. Moreover, it explores the efficacy of grassroots social governance. Accordingly, this paper sheds light on the ways rural pollution control influences and effectively enhances rural residents' happiness. It employs a more comprehensive set of indicators for assessing rural pollution control and examines the pathways through which pollution control affects happiness, including individual health, family harmony, and village environment. By analyzing the heterogeneity present in eastern, central, western, ordinary, and affluent villages, this study aims to gain a deeper understanding of the effect of pollution

control in different regions on people's well-being. This is conducive to conducting a comprehensive evaluation of the effectiveness of rural pollution control and could provide innovative policy insights for grassroots community governance.

2.2. Theoretical Analysis of Pollution Control and Well-Being

"Happiness" represents a state of life that manifests as a subjective sentiment within individual life experiences and is a personal perception subject to observation and evaluation [33]. As a subjective feeling, happiness involves value judgments made by individuals based on objective facts and their own evaluation criteria. These evaluations are influenced by value concepts, individual characteristics, and environmental factors [41]. For rural residents, happiness represents their perception and judgment of their living environment, along with satisfaction derived from it. Amid economic and societal development, the ecological environment has emerged as a crucial factor affecting residents' happiness.

Pollution control, rooted in the restoration of an ecological environment, aims to provide people with an aesthetically pleasing production and living environment [42]. It fosters the adoption of ecologically friendly ways of living and working [3,16], enhancing the spiritual outlook of rural areas, fostering community and family cohesion, and enabling residents to coexist harmoniously within their environment, ultimately boosting their happiness.

In terms of the effect of pollution control, regions with more effective pollution control measures tend to experience higher levels of happiness among residents. Furthermore, different forms of pollution control, such as soil, water, air, and noise pollution control, have varying degrees of influence on residents' happiness. Notably, the criteria for experiencing and judging happiness are subjective, and the extent to which pollution control affects residents' happiness is closely related to the internal and external conditions and characteristics of villages, individuals, and families. Based on these observations, the following hypothesis is proposed:

Hypothesis 1. *Pollution control significantly affects the happiness of rural residents. Particularly, the control of soil, water, air, and noise pollution can significantly improve the happiness of rural residents.*

Amid rapidly accelerating urbanization and industrialization, environmental pollution has garnered significant attention due to its adverse effects on ecological environments and public health. This necessitates an urgent requirement for precise and scientific environmental pollution control measures [43]. On a macro scale, pollution control can enhance the village environment, creating a conducive space for production and living, alleviating tensions among various groups, and promoting harmonious coexistence between humanity and nature. At the same time, a favorable ecological environment fosters positive interpersonal relationships, enhances family harmony, and contributes to residents' overall happiness [4].

At the individual level, pollution control can enhance people's aesthetic sensibilities by providing a beautiful ecological environment. It also helps alleviate individual stress and tension, promoting a relaxed and contented state of mind while contributing to individuals' physical and mental well-being. While enjoying the gifts of a beautiful ecological environment, people are more inclined to actively participate in rural pollution control, consciously protect the environment, and create a living space that aligns with their personal growth and development. In this mutual interaction, rural ecological environments continuously improve, the quality of life and physical and mental health of residents are comprehensively enhanced [10], and overall happiness is increased. On the basis of the above analysis, the following hypothesis is proposed:

Hypothesis 2. *Pollution control enhances the happiness of rural residents by improving the village environment, promoting family harmony, and improving individuals' physical and mental health.*

Rural pollution control plays a pivotal role in ecosystem improvement, the promotion of sustainable development, and ultimately, the enhancement of individual health and well-being [44]. Current rural areas face the intertwined and escalating issues of three major pollutants [5]: domestic, agricultural, and industrial pollution [45]. The overproduction of pollution not only inflicts severe damage on the rural ecological environment but also significantly impedes rural residents' quest for improved living conditions. Harnessing the collective enthusiasm of all stakeholders and enhancing pollution control efficiency through diversified cooperation have become crucial tasks [46].

Given the vast geography of China, there exist pronounced disparities in economic development across its regions. Pollution control has a more pronounced effect on cities with a higher concentration of heavily polluting industries and larger populations, particularly in the central regions [47]. When viewed from the perspective of the development levels of villages across various regions, those with higher collective economic and residents' incomes tend to allocate more funds to pollution control efforts, resulting in positive outcomes. However, residents' understanding may still be limited. Conversely, the effect of pollution control in ordinary villages is slightly improved, and residents' happiness is significantly enhanced [48,49]. Hence, the efficiency of pollution control has a stronger effect on the well-being of rural residents in the central region and ordinary villages. Thus, the following hypothesis is proposed:

Hypothesis 3. *Pollution control has a stronger effect on the well-being of residents in central regions and ordinary villages.*

On the basis of the above analysis, the analytical framework of this paper is shown in Figure 1.

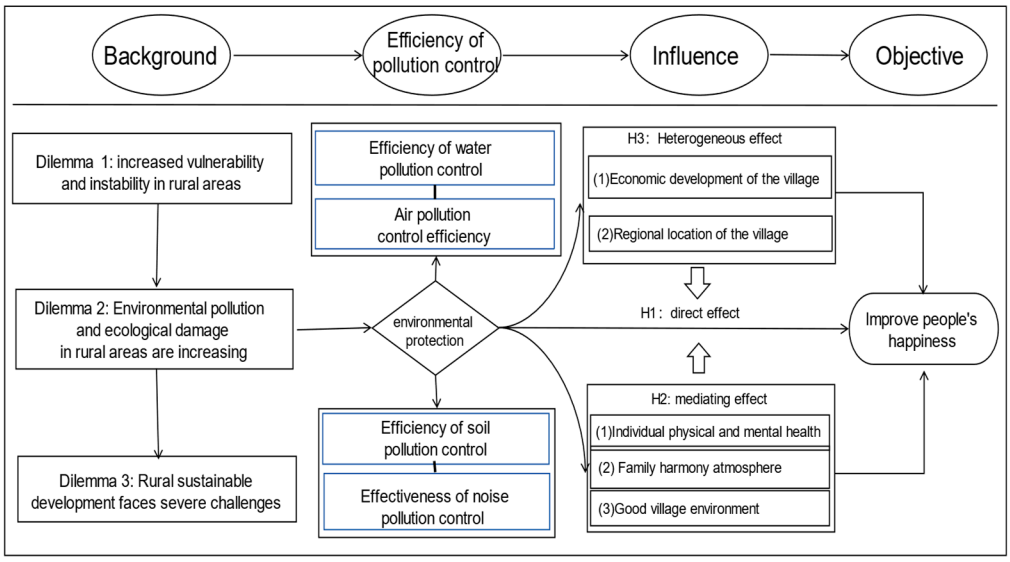

Figure 1. Analytical framework.

3. Methodology and Data

3.1. Sample and Data

The data utilized in this study are sourced from the China Labor Force Dynamics Survey (CLDS), conducted by the Social Science Survey Center of Sun Yat-sen University. The survey adopted a multistage, stratified, and proportional probability sampling approach, aiming to collect data from individuals aged 15 and above. This extensive dataset covers a wide range of information related to individual demographic characteristics, socioeconomic attributes, family profiles, and village-specific characteristics. The sample size reflects the distribution of the labor force in different demographics and serves as a comprehensive national social tracking survey. These data represent the first implementation of the rotating

sample tracking method, which is better suited to the rapidly changing environment in China and provides reliable data for this study.

This article focuses on data from four rounds of longitudinal surveys conducted by CLDS in 2012, 2014, 2016, and 2018. The samples are distributed across more than 400 villages (communities) throughout 29 Chinese provinces, and the survey questionnaire is basically consistent in terms of question setting, providing a relatively suitable data support for the research topic. In accordance with the research requirements, missing values and outliers are eliminated. This paper employs mixed cross-sectional data from the four rounds of longitudinal surveys between 2012 and 2018 to empirically examine the effect of pollution control on the well-being of rural residents. In comparison with cross-sectional data, mixed cross-sectional data can increase the sample size, expand sample representativeness, achieve more precise estimators, and produce more effective test statistics. By analyzing the interaction term between annual dummy variables and explanatory variables, mixed cross-sectional data can be used to examine the trend of changes in the effects of these explanatory variables over a certain period of time, which is in line with the research expectations.

3.2. Model Setting

On the basis of existing research [50,51], this paper constructs an econometric model, as shown in Equation (1), to test the effect of pollution control on the well-being of rural residents.

$$\text{Happiness}_{it} = a_0 + a_1 pollution\_control_{it} + \gamma X_{it} + \varepsilon_{i,t} \quad (1)$$

The explained variable in this model is the happiness of rural residents, which is a numerical variable. Consequently, this study employs a multiple linear regression model to examine the effect of pollution control on rural residents' happiness. The variable being explained, Happiness_{it}, indicates the happiness of rural residents. The core explanatory variable, $pollutioncontrol_{it}$, is the different pollution control efficiencies (specifically, the levels of water pollution, noise pollution, soil pollution, and air pollution); γ is the coefficient; x_{it} is the control variable such as individual, family, and village characteristics; and ε stands for the random disturbance term.

3.3. Variable Definition and Description

The explained variable in this study is the happiness of rural residents, determined with their responses to the question "Overall, do you think your life is happy?" The respondents were provided with five response options, "very happy = 5", "relatively happy = 4", "average = 3", "unhappy = 2", and "very unhappy = 1," with values assigned based on their corresponding answers. People's lives are closely related to elements such as water, air, soil, and tranquility. Air, water, soil, and noise are the most obvious and basic types of pollution. This article selects the efficiency of pollution control as the core explanatory variable. The CLDS assessed the types of pollution in the respondents' villages (e.g., air, water, soil, and noise pollution). These variables are rated on a scale of 1 to 4, ranging from severe pollution to no pollution. Higher scores indicate a lower degree of pollution and a more effective pollution control effort. Although this index does not encompass all types of pollution, it serves as a reasonable measure of rural residents' involvement in pollution control.

In terms of instrumental variable selection, this article refers to the methodologies adopted in these studies and employs data from four rounds of tracking data from the 2012–2018 CLDS for discussion [52,53]. In the selection of control variables, three primary aspects are considered: individual, family, and village characteristics. Individual characteristics encompass variables such as age, gender, education level, marital status, and health status. Marital status is categorized into two groups: unmarried and married. Health status is assessed on a scale from unhealthy to very healthy, with higher scores indicating better health. Education level is rated on a scale from 1 to 11, with higher scores indicating higher levels of education. Family characteristics include factors such as noise levels around the

house, air quality within the house, and family relationship status. The noise pollution level around the house ranges from 1 to 10, with higher scores indicating less noise pollution around the house. The air quality assessment inside the house ranges from 1 to 10, with higher values indicating better air quality inside the house. The score for family relationship status ranges from 2 to 5, with higher scores indicating better relationships among family members and a more harmonious and friendly family. Village characteristics primarily encompass the cleanliness appearance of the village. Values range from 1 to 10, with higher scores indicating better environmental conditions in the village. The specifics of these variables are presented in Table 1. The screening of these variables is shown in Figure 2.

Table 1. Variable definition and descriptive statistics.

Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
Happiness	very happy = 5, unhappy = 1	70,186	3.791	0.934	1	5
Gender	male = 1, female = 2	70,370	1.522	0.5	1	2
Age	unit: years	70,150	45.003	14.575	15	115
Education	primary school = 1, PhD = 11	66,659	3.396	2.256	1	11
Health status	very healthy = 5, unhealthy = 1	70,307	3.622	0.999	1	5
Marital status	married = 1, unmarried = 0	70,329	0.831	0.375	0	1
Air condition inside the house	very good = 10, poor = 1	70,293	6.589	1.712	1	10
Noise around the house	very good = 10, bad = 1	70,288	6.441	2.037	1	10
Degree of air pollution	severe = 1, no = 4	59,731	3.084	0.829	1	4
Degree of water pollution	severe = 1, no = 4	59,697	3.14	0.801	1	4
Degree of noise pollution	severe = 1, no = 4	59,714	3.156	0.835	1	4
Degree of soil pollution	severe = 1, no = 4	59,390	3.307	0.71	1	4
Cleanliness of village appearance	very good = 10, poor = 1	64,740	7.25	1.726	1	10
Evaluation of family relationships	very good = 5, poor = 2	48,840	4.01	0.676	2	5

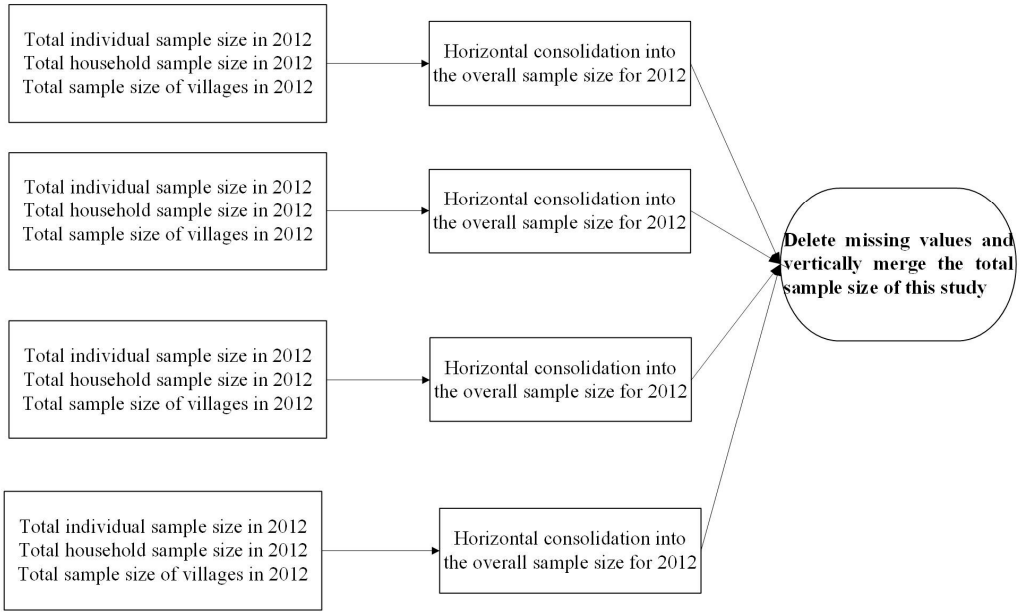

Figure 2. Variable screening situation.

4. Empirical Results and Analysis

4.1. Correlation Test of Independent Variables

In this paper, the autocorrelation of tool variables is tested to ensure that they meet the requirements. From a statistical standpoint, the correlation coefficient r ranges from −1 to 1. Variables are considered highly correlated when $|r| \geq 0.8$ and moderately correlated when $0.5 \leq |r| < 0.8$ and exhibit a low correlation at $0.3 \leq |r| < 0.5$. When $|r| < 0.3$, the correlation between variables is extremely low, and it is generally assumed that no correlation exists between them. As shown in Table 2, the correlation between the variables is extremely weak. The correlation coefficients are 0.011, 0.034, 0.003, and 0.031, all of which are less than 0.3 and significant at the 1% level. This suggests that the selection and setting of independent variables meet the requirements, and collinearity issues are avoided during regression modeling.

Table 2. Correlation test of independent variables.

Variables	Happiness	Degree of Air Pollution	Degree of Water Pollution	Degree of Noise Pollution	Degree of Soil Pollution
Happiness	1.000				
Degree of air pollution	0.011 ***	1.000			
Degree of water pollution	0.034 ***	0.595 ***	1.000		
Degree of noise pollution	0.003	0.575 ***	0.438 ***	1.000	
Degree of soil pollution	0.031 ***	0.549 ***	0.588 ***	0.500 ***	1.000

Note: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively.

4.2. Pollution Control Affects the Happiness of Rural Residents Due to Its Efficiency

In the process of promoting rural ecological revitalization, increasing pollution control measures is paramount in improving people's happiness [54,55]. This paper utilizes multiple linear regression methods to empirically test the influence of the type and severity of environmental pollution on people's happiness. The results showed a positive relationship between people's happiness and the efficiency of environmental governance. Controls over soil, water, air, and noise pollution could significantly improve people's happiness, with water and soil pollution controls playing a significant part. Furthermore, water pollution control had a greater influence on people's happiness. These results validate Hypothesis 1.

Specifically, as shown in Table 3, without controlling villages, individuals, and households, the treatment effects of water and soil pollution are relatively significant. For every 1-unit increase in water pollution control, the happiness of residents can be significantly improved by 3.6%, and for the same increase in soil pollution control, the improvement is 3.7%. When controlling only for individuals, the treatment effects of water and soil pollution control grow modestly by 1.7% and 2.5%, respectively. With control at the village level, the effectiveness of water and soil pollution control remains significant, increasing by 4.1% and 3.1%, respectively. In the case of controlling only households, the effectiveness of air and soil pollution control is more significant at 2.4% and 3.1%, respectively.

Subsequently, after controlling individual and village conditions, the effectiveness of water and soil pollution control was more significant, increasing by 2.2% and 1.9%, respectively. After controlling individual and household conditions, the effectiveness of water and soil pollution control was still substantial, increasing by 1.9%. After controlling household and village conditions, the effectiveness of water and soil pollution control was still more significant, increasing by 3.7% and 2.4%, respectively. After controlling the situation of households, villages, and individuals, the pollution control effect is more significant. Increasing water pollution control by one unit can significantly increase residents' happiness by 2.6%. Most farmers attach great importance to improving water quality through water pollution control, which is of great significance for improving ecosystems, promoting sustainable development, and ultimately promoting personal health and well-being [44].

Table 3. Empirical results of pollution control affecting the happiness of rural residents.

Variable	Happiness							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Degree of air pollution	−0.016 ** (0.006)	0.003 (0.006)	−0.009 (0.007)	−0.024 *** (0.008)	−0.023 *** (0.008)	−0.015 * (0.008)	0.007 (0.006)	−0.014 * (0.008)
Degree of water pollution	0.036 *** (0.006)	0.017 *** (0.006)	0.041 *** (0.006)	0.03 *** (0.008)	0.037 *** (0.008)	0.019 *** (0.007)	0.022 *** (0.006)	0.026 *** (0.008)
Degree of noise pollution	−0.019 *** (0.006)	0.011 * (0.005)	−0.017 *** (0.006)	−0.01 (0.008)	−0.004 (0.008)	0.01 (0.008)	0.01 * (0.006)	0.015 * (0.008)
Degree of soil pollution	0.037 *** (0.007)	0.025 *** (0.007)	0.031 *** (0.007)	0.031 *** (0.009)	0.024 *** (0.008)	0.019 ** (0.008)	0.019 *** (0.007)	0.012 (0.009)
Individual characteristics	No	Yes	No	No	No	Yes	Yes	Yes
The appearance of the village	No	No	Yes	No	Yes	No	Yes	Yes
Family characteristics	No	No	No	Yes	Yes	Yes	No	Yes
R-squared	0.002	0.080	0.007	0.029	0.029	0.091	0.080	0.091
observations	59,266	58,984	53,825	38,122	34,549	37,934	53,574	34,377

Note: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively.

Currently, nitrates used in farming are the most common chemical pollutant in groundwater aquifers, and the treatment of rural domestic wastewater has led to the increased pollution of freshwater and soil [56]. Studying the views and attitudes of farmers toward water pollution issues can help in understanding their sustainable water resource management and welfare [57]. The results indicate that water and soil pollution control significantly affects people's well-being, playing a critical role in ecological improvement, sustainability, and promoting human health and well-being. As water is the crux of survival and the foundation of civilization, ensuring water safety is a basic requisite for survival. Improving the water ecological environment can promote high-quality development, create high-quality life, and enhance people's awareness of the ecological environment. Pollution control allows people to breathe fresh air, drink clean water, eat safe food, see the mountains and bodies of water, foster wholesome memories of their home surroundings and work, and live in superior conditions, all of which assure a consistent sense of happiness.

4.3. Robustness Test of Pollution Control Affecting the Happiness of Rural Residents

In order to validate the reliability of the research findings, a robustness test was conducted by modifying the regression model. A logit model was constructed to analyze the influence of pollution treatment on rural residents' well-being. The research results are shown in Table 4. Column (1) represents the results of adding the control variable group, and Column (2) portrays the control group. Even without controlling for households, individuals, and villages, pollution control significantly affects the happiness of rural residents. Among all factors, water pollution control has the most significant effect on improving residents' happiness. With each unit increase in water pollution control, residents' happiness notably increases by 7.5%. Likewise, each unit increase in soil pollution control significantly increases residents' happiness by 8%. After controlling for households, individuals, and villages, water pollution control continues to have the most significant effect on rural residents' happiness (with a coefficient of 0.054 and significant at the 1% level). Every unit increase in water pollution control can significantly enhance residents' happiness by 5.4%. These results are largely consistent with the prior conclusions, confirming the robustness of the research results presented in this paper.

Table 4. Influence of pollution control on rural residents' happiness, and the robustness test of the results.

Variable	Happiness	
	(1)	(2)
Degree of air pollution	−0.039 ** (0.018)	−0.037 *** (0.013)
Degree of water pollution	0.054 *** (0.017)	0.075 *** (0.013)
Degree of noise pollution	0.036 ** (0.017)	−0.036 *** (0.012)
Degree of soil pollution	0.028 (0.019)	0.08 *** (0.014)
Individual characteristics	Yes	No
The appearance of the village	Yes	No
Family characteristics	Yes	No
Pseudo r-squared	0.036	0.001
Observations	34,377	59,266

Note: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively.

4.4. Pollution Control Heterogeneity Test

Pollution control enhances people's happiness through mechanisms that improve the village environment, promote family harmony, and enhance individuals' physical and mental health. In addition, whether the effect of pollution control on people's well-being differs across regions warrants further investigation. Therefore, this paper introduces various categorical variables to examine the heterogeneity of the effects of pollution prevention and control on people's well-being. On the basis of the average collective financial income level in villages, those with incomes higher than the sample mean are labeled as affluent villages, whereas those with incomes below it are designated as ordinary villages. According to the Statistical Data Management Center of the National Bureau of Statistics' demarcation into eastern, central, and western regions, the villagers' locations are categorized accordingly into eastern, central, and western villages. The research results are shown in Table 5.

Table 5. Empirical results of heterogeneity in pollution prevention and control.

Variable	Happiness				
	Eastern Village	Central Village	Western Village	Rich Village	Ordinary Village
Degree of air pollution	−0.001 (0.012)	−0.078 *** (0.017)	0.032 * (0.016)	−0.005 (0.011)	−0.025 ** (0.012)
Degree of water pollution	0.01 (0.011)	0.049 *** (0.015)	0.029 ** (0.014)	0.013 (0.01)	0.04 *** (0.011)
Degree of noise pollution	0.017 (0.011)	0.033 ** (0.016)	−0.013 (0.016)	0.027 ** (0.011)	0.001 (0.012)
Degree of soil pollution	0.009 (0.013)	0.004 (0.018)	0.029 * (0.017)	0.01 (0.012)	0.014 (0.013)
Individual characteristics	Yes	Yes	Yes	Yes	Yes
Village appearance	Yes	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes	Yes
R-squared	0.105	0.091	0.077	0.092	0.089
Observations	15,155	7992	11,230	19,677	14,700

Note: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively.

The results show the significant effect of water pollution control on the happiness of ordinary villagers, with each unit of water pollution control leading to a 4% rise in people's happiness. This result can be attributed to ordinary villages primarily relying on agriculture, given their lagging industrial development, which yields an obvious effect of water pollution control. In wealthier villages, noise pollution control significantly increases people's happiness by 2.7% for every unit of improvement. This result can possibly be due to a solid industrial foundation, better transportation, higher income levels, heightened environmental protection awareness, and a greater effect of noise pollution, resulting in people valuing emotional value more.

In addition, the effect of water pollution control is notably robust on the happiness of people living in central and western villages. Every unit of water pollution control can improve central villagers' happiness by 4.9% and western villagers by 2.9%. Air pollution control also significantly influences the happiness of western villagers, with every unit increase in air pollution control leading to a 3.2% rise in happiness. Possibly due to acceptable environmental conditions of central villages, residents are insensitive to governance effects. Given that the central region accepts industrial transfers from the east, this inevitably leads to increased environmental pollution, diluting the treatment effect. Conversely, the western villages confront worse environmental conditions, but pollution control can effectively and swiftly boost residents' happiness. Hence, pollution control in central and western villages must be strengthened. The above heterogeneity analysis results verify Hypothesis 3.

4.5. Pollution Control Enhances the Happiness of Rural Residents by Improving the Village Environment, Promoting Family Harmony, and Enhancing Individuals' Physical and Mental Health

This paper delves into the mechanism of pollution control affecting people's happiness in old revolutionary areas by considering three mediating variables, village appearance, family harmony, and individuals' physical and mental health, with main explanatory variables of the degree of a good village environment, the degree of harmonious interpersonal relationships, and the degree of individuals' physical health, respectively. Table 6 shows that pollution control not only guides value orientation and behaviors, creating a pleasant external environment, but also improves family harmony, thereby fostering a pleasant village and family atmosphere, promoting individuals' physical and mental health, and increasing happiness in old revolutionary areas. These findings support Hypothesis 2.

Table 6. Results of pollution control effectiveness.

Variable	Happiness		
	Individual Health Status	**Family Harmony**	**Village Environment**
Degree of air pollution	−0.004 (0.009)	−0.003 (0.006)	−0.019 (0.015)
Degree of water pollution	0.059 *** (0.008)	−0.013 ** (0.006)	0.033 ** (0.014)
Degree of noise pollution	−0.053 *** (0.009)	0.038 *** (0.006)	−0.114 *** (0.015)
Degree of soil pollution	0.04 *** (0.01)	0.023 *** (0.007)	0.011 (0.017)
Individual characteristics	Yes	Yes	Yes
The appearance of the village	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes
R-squared	0.133	0.028	0.031
Observations	34,382	34,382	34,382

Note: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively.

The estimation results indicate that the effect of water and soil pollution control on individual health is significant. Every unit rise in water pollution control can significantly boost physical health by 5.9%, whereas each unit of soil pollution control can similarly improve individuals' physical health by 4%. Water is fundamental to survival and prosperity, with water security being an essential survival issue. High-quality water safeguards people's physical and mental health. Soil pollution accumulates through various sources, paths, and environmental processes, as well as other pollutant inputs, such as leaching, seepage, leakage, and diffusion, which considerably affect human health and warrant careful attention [58]. As the foundation of life, soil ecological environmental protection is related to the safety of primary needs such as food and water. By controlling water and soil pollution, individuals can live and eat securely, ensuring the quality and sustainability of happiness.

Substantial mechanistic evidence suggests that noise affects the human body, especially the cardiovascular system. Two primary routes link acute noise exposure to adverse health effects: direct and indirect pathways. The direct pathway influences the autonomic nervous system and endocrine system, whereas the indirect pathway affects these systems by causing distress or disrupting sleep [59]. The findings suggest that the effect of noise and soil pollution control on the familial atmosphere is significant. Every unit of noise pollution control can significantly enhance a pleasant family atmosphere by 3.8%, whereas each unit of soil pollution control can uplift a pleasant family atmosphere by 2.3%. The safety of soil pollution control and noise pollution control contributes to a harmonious family atmosphere, emotional support, and comfort, stabilizing emotions, enhancing cognitive abilities, increasing positive emotions, reducing stress and irritability, and leading to happiness.

Industrial wastewater, domestic sewage, and urban residents' agricultural runoff enter the water cycle, leading to severe water pollution, which in turn endangers aquatic organisms, human health, and the quality and sustainability of water sources [60]. The results indicate that water pollution control considerably affects the village environment. Every unit of water pollution control can significantly improve villages' environmental quality by 3.3%. Clean and orderly environments underpin people's healthy life, elevating people's quality of life and health; allowing people to live in a pleasant ecological environment, leading a healthier, happier, high-quality life; and fostering a more fulfilling sense of happiness.

5. Discussion

As the world rapidly evolves in unprecedented ways, pollution control has yielded some results, yet the trend of ecological environmental deterioration has not entirely or effectively been reversed. Relying solely on government initiatives or individual measures to control pollution is unsustainable. A modern environmental governance system led by the government must be established, with active participation from businesses, social organizations, and the public. This effort is essential to improve the quality of the ecological environment. Although existing studies have delved into controlling various types of pollution, fewer empirical studies have specifically explored how pollution control affects the happiness of rural residents. The present study is based on a large sample survey, and it uses mixed cross-sectional data from the CLDS (2012–2018) to investigate the effect of pollution control on rural residents' happiness. It examines the effect of water, soil, air, and noise pollution while also exploring the influence mechanism of pollution control on rural residents' happiness based on individual, family, and village characteristics, conducting a heterogeneity analysis. Being a developing country with the highest population of farmers globally, the research results have strong practical significance for China.

The findings reveal a significantly positive effect of effective pollution control on rural residents' happiness. This result is consistent with that of Mu et al. [44], who reported that most farmers' water quality promotes sustainable development, personal health, and eventually happiness. The results of the present study are also aligned with those

of He et al. [35], who found that the subjective perception, physical and mental health, and agricultural activities of farmers mediate their sense of happiness. However, this study found the effect of air pollution control on happiness to be relatively weak, possibly because China has long-established air pollution control measures, and most rural areas lack industrial enterprises, resulting in better air quality compared to urban areas. In addition, research indicates that the effect of pollution control on affluent villages' happiness is less prominent than in ordinary villages. This finding can be due to the fact that affluent villages have started the "Ten Million Project" for environmental remediation earlier, suggesting that enhancing pollution control efforts in ordinary villages should be the subsequent step.

6. Conclusions and Implications

6.1. Research Results

A good ecological environment is vital to people's well-being and constitutes the most inclusive aspect of their livelihoods. In the industrial society, various favorable and unfavorable factors present enormous pressure and challenges to ecological environmental protection [61]. An in-depth analysis of how pollution control can enhance people's happiness and provide policy recommendations for the government to implement specific pollution prevention measures is of great importance. These analyses can help alleviate the conflicts between China's current economic development and environmental protection while promoting harmony between humans and nature. This paper uses mixed cross-sectional data from the China Labor Force Dynamic Survey (2012–2018) and employs a multiple linear regression model to investigate how pollution control affects rural residents' happiness, analyzing heterogeneity and testing influence mechanisms. The following conclusions are drawn from this study:

First, different types of pollution have varying effects on rural residents' happiness, with water pollution control having the most significant effect. In central and western regions and ordinary villages, the effect of water pollution control on happiness is significant at 4.9%, 2.8%, and 4%, respectively. Water pollution control further enhances rural residents' happiness by improving their physical and mental health and the village environment. Second, through a diverse and coordinated approach to pollution control, water and soil pollution control helps create a suitable production and living environment for people. Such approaches improve rural ecological infrastructure, enhance harmony among neighbors and families, promote residents' physical and mental health, and enhance their sense of ecological fairness and justice, ultimately leading to increased happiness. Third, from the perspective of village characteristics, pollution control has a significantly positive effect in ordinary villages. Moreover, regarding regional characteristics, pollution control greatly benefits residents' happiness in western and eastern regions. Particularly water and noise pollution control, providing a comfortable and pleasant living environment, remarkably boosts people's satisfaction, sense of gain, and happiness.

6.2. Research Inspiration

This research offers valuable insights for future environmental pollution control efforts. First, during pollution control, unique models that align with local conditions must be established, considering factors such as population changes, resource availability, energy structure, environmental capacity, and ecological conditions. This approach emphasizes the principle that "green mountains and clear waters are as valuable as gold and silver," implying that natural resources hold as much value as monetary wealth. Moreover, institutional mechanisms should be developed to alleviate governance problems innovatively. Second, the leadership roles of national and local governments at all levels should be fully utilized, encouraging active participation from farmers and village collectives, guiding different social organizations and market capital to actively cooperate, and implementing the characteristics of rural ecological governance into practical applications. This integration of ecology with modernization can provide safer and healthier living spaces for people, meeting their basic survival needs. It also fosters an atmosphere of friendliness among

neighbors, thus contributing to the harmonious and stable development of rural society. Lastly, there should exist a concerted effort to raise awareness. Special attention should be given to remote rural areas that have weak foundations and those with severe pollution from heavy industry in the central region. The support of modern science and technology must be utilized, pollution prevention must be ensured to align with local economic and social development, the efficiency of grassroots governance must be improved, and the pace of creating beautiful villages should be accelerated. These will meet people's needs for a better environment and enhance the rural population's sense of achievement and satisfaction. However, due to limitations in accessing public data-related variables, this paper cannot analyze the effect of rural residents' participation in pollution control on their well-being. This limitation presents an opportunity for future investigation.

6.3. Insufficient Research and Future Research Directions

This article theoretically analyzes and quantitatively evaluates how pollution control can enhance people's happiness, providing useful references for the better implementation of pollution prevention and control efforts and policy optimization in the future. Despite this, this article primarily focuses on the effects of controlling four main types of pollution, namely, water, air, noise, and soil pollution, and their effects on happiness, leaving other forms such as industrial, port, marine, and cross pollution unaddressed. Moreover, this study did not examine one key aspect during an analysis of the influence mechanism, namely, the effect of rural residents' participation in pollution control on their happiness. Therefore, future research should focus on assessing the influence of new pollutants and the effectiveness of rural residents' participation in pollution control on their happiness. This remains an essential area for future investigation.

Author Contributions: Conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, Q.Z. and J.C.; writing—review and editing, visualization, supervision, project administration, funding acquisition, S.L., F.Z. and H.W. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by National Social Sciences Foundation of China (22BKS158); the Open Fund from Key Research Institute of Humanities and Social Sciences in Hubei Province-Research Center of University Student Development and Innovation Education (DXS2022003).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data in this paper can be found at the Center for Social Science Investigation of Sun Yat-sen University.

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

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