Doctoral Thesis

Research on the relationship between pro-environmental behaviors and relocation based on surveys in China, Korea, and Japan

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Preface

This study focuses on Asian countries as the research subjects and aims to explore the interactive relationship between pro-environmental behaviors (attitudes, behaviors, and policy support) and individual relocation. It underscores the significance of investigating the interplay between life events (relocating) and pro-environmental behaviors at various scales. By utilizing official statistics from different countries, this study identifies the relationship between the experience or intention of relocation and individuals' environmental behavior and attitudes in countries with varying levels of development.

Importantly, this study not only examines the movement from rural to urban areas but also considers the movement from urban to rural areas or their inclination to relocate to rural areas. By adopting a broader perspective on population mobility and its connection to environmental protection behavior, this study contributes to policy development in this domain.

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Research on the Relationship between Pro-Environmental Behaviors and Relocation based on Surveys in China, Korea, and Japan

Abstract

We are currently living in an era of increased human mobility, with significant growth observed in immigration, urbanization, and tourism over the past few decades. These factors have contributed to the overall increase in mobility. However, the COVID-19 pandemic has temporarily disrupted human mobility. Previous research has primarily focused on the macro scale and explored the relationship between urbanization and carbon emissions. Studies have shown a positive correlation between urbanization and carbon emissions, examining the effects of urbanization scale and energy structures. On the micro scale, research has investigated the differences in carbon emissions, lifestyles, energy usage, and environmental awareness and behaviors between individuals in urban and rural areas. However, there has been limited research on the influence of mobility and its consequences on individuals' pro-environmental attitudes, behaviors, and policy support, particularly in different countries.

Therefore, this study aims to explore the connection between mobility, precise relocation, and pro-environmental behaviors. Specifically, the study seeks to examine the relationship between rural-to-urban or urban-to-rural relocation and individuals' willingness to pay for environmental initiatives or engage in pro-environmental behaviors like recycling or using eco-products. Additionally, the study aims to investigate individuals' attitudes and behaviors regarding the environment and analyze the impact of environmental policies on pro-environmental behavior and attitudes. By conducting comparative analyses across different countries, this research aims to identify both differences and commonalities, providing valuable insights for policymakers in developing effective environmental protection policies.

Chapter 1: Research Background and Purpose. The unique situation nowadays will be outlined to demonstrate the necessity and innovation of the thesis. This section will provide a context for understanding the importance of investigating the relationship between relocation and pro-environmental behaviors.

Chapter 2: Literature Review and Research Methodology. Chapter 2 will consist of a comprehensive literature review, focusing on topics such as behavioral change, population mobility, residential relocation, willingness to pay, and pro-environmental behavior. The Habit discontinuity hypothesis would be discussed in whether environment change or not due to relocation. The research methodology and data used in the study will be discussed, emphasizing the scientific rigor and feasibility of the chosen approach. The availability and suitability of the data sources will also be addressed.

Chapter 3: Preliminary study. In this chapter, the data and method are applied to check the willingness to pay for quality air and the urban living experience in China as a preliminary study.

Chapter 4: Case Study in China mainly discussing relocation experience and PEBs. Chapter 4 will delve into the special situation in China, utilizing insights from an article published in SCI journal. The primary focus will revolve around the analysis of specific factors and dynamics associated with relocation, particularly within the context of urban living experiences in China. The chapter will examine the relationship between urban living experience and environmental attitudes, specifically exploring individuals' willingness to pay for quality air and renewable energy in the

Chinese context. The aim of this section is to provide a comprehensive and detailed understanding of the Chinese context and its implications for pro-environmental behaviors. By shedding light on the interplay between relocation and environmental attitudes in China, this chapter will contribute valuable insights to the broader research on the topic.

Chapter 5: Case Study in Korea mainly discussing intention of change and PEBs. In Chapter 5, the focus will shift to exploring the relationship between the intention of relocation and environmental attitudes and behaviors in Korea over a period of nearly 10 years. Adopting a case study approach, this chapter will specifically investigate how individuals' willingness to return to rural areas and their preferences for return policies in South Korea influence their pro-environmental attitudes and behaviors, with a specific emphasis on recycling plastic bottles. By examining the unique context of South Korea, this section aims to contribute to a deeper understanding of the topic and provide valuable insights into the interplay between movement intention and pro-environmental behaviors in the South Korean context.

Chapter 6: Case Study in Japan mainly discussing relocation and settlement consciousness and PEBs. Chapter 6 of the study will focus on a case study conducted in Japan, exploring the relationship between relocation, settlement consciousness, and pro-environmental behaviors (PEBs), specifically looking at individuals' usage of eco-products in Japan. The chapter will adopt a case study approach to analyze how mobility patterns in Japan influence people's pro-environmental behaviors. By examining the unique context of Japan, the chapter aims to provide valuable insights into the connection between individual movement or settlement and pro-environmental behaviors in the Japanese context.

Chapter 7: Comparative Analysis. Chapter 7 will present a comparative analysis of Japan, Korea, and China. This section aims to verify whether various levels of development and different mobility systems impact individuals' pro-environmental behaviors and attitudes. By comparing the findings from the previous chapters, this section will shed light on the similarities and differences among the three countries.

Chapter 8: Conclusions. The main findings from the research will be summarized, and their implications will be discussed. Additionally, this chapter will highlight areas for future research and identify potential avenues for further investigation in the field of relocation and pro-environmental behaviors.

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Chapter 1   Background and Purpose of this Study

This research aimed to investigate the interaction between individuals' pro-environmental behaviors and mobility, bridging the gap in understanding the relationship between urbanization and environmental protection at the micro scale. To achieve this, the study focused on China, South Korea, and Japan, representing a developing country and two developed countries in Asia. The research extensively examined population mobility from rural to urban and urban to rural areas in these countries. Additionally, pro-environmental attitudes and behaviors were compared and analyzed across different contexts. By conducting this comparative analysis, the study aimed to provide valuable insights into the interplay between population mobility and pro-environmental behaviors in diverse settings.

In this chapter, the background of the research was described, emphasizing the significance of studying the interaction between mobility and pro-environmental behaviors.

1.1 Introduction

Human choice and behavior is one of the challenges for sustainability[1]. To achieve sustainable development, the whole world is applying for Pro-environmental behaviors(PEBs), which refer to actions and choices that have a positive impact on the environment.

In *The psychology of habit, 2018*, habit discontinuities as vehicles for behavior change[2].

In recent years, population mobility has become a prominent global phenomenon with significant social, economic, and environmental implications. The movement of individuals and communities from one location to another, whether within a country or across international borders, has been driven by several factors such as economic opportunities, education, conflict, and environmental changes. This population mobility presents a unique opportunity to examine its relationship with pro-environmental behavior.

Understanding the link between population mobility and pro-environmental behavior is crucial in addressing environmental challenges and promoting sustainability. As people move to new areas, they bring their attitudes, behaviors, and cultural practices with them, which can influence the environmental dynamics of both their places of origin and destination. Additionally, the process of migration often involves changes in lifestyle, access to resources, and exposure to different environmental contexts, all of which can shape individuals' attitudes and behaviors towards the environment.

Exploring how population mobility affects pro-environmental behavior can provide valuable insights for policymakers, urban planners, and environmental advocates. It can help identify the factors that influence individuals' environmental attitudes and behaviors during the process of migration, as well as shed light on the potential for promoting sustainable practices in both sending and receiving communities. By understanding these dynamics, targeted interventions and policies can be developed to foster pro-environmental behavior among mobile populations and promote sustainable development on a larger scale.

In the context described, this study aims to examine the relationship between population mobility and pro-environmental behaviors, specifically focusing on attitudes, behaviors, and policy support. By conducting a thorough analysis of case studies and considering political attitudes, this research aims to contribute to a better understanding of the intricate dynamics between population mobility and environmental sustainability.

The study will explore how population mobility affects individuals' environmental attitudes and behaviors. It will examine the changes in attitudes and behaviors that occur during the migration process, as well as the long-term effects on individuals' environmental practices. Furthermore, the study will consider the role of policy support in shaping pro-environmental behaviors among mobile populations.

By incorporating political attitudes into the analysis, the study seeks to understand how political factors influence individuals' environmental attitudes and actions. It will examine the impact of political ideologies, policies, and institutions on the pro-environmental behaviors of mobile populations. This comprehensive approach aims to provide a comprehensive understanding of the complex interplay between population mobility and environmental sustainability.

Ultimately, the findings of this study can contribute to the development of strategies and policies that promote environmental sustainability in the context of population mobility. By identifying the factors that shape individuals' environmental attitudes and behaviors during and after the migration process, this research can inform targeted interventions and initiatives to enhance pro-environmental behaviors among mobile populations.

The relationship between humans and the environment is mutually influential, as shown in Figure 1-1, changes in population and household characteristics may have a more significant impact on energy emissions than technological changes. Especially in developing countries, the variation is

greater, as shown in Figure 1-2. Occupants' differences can explain 50% of the difference in energy consumption of buildings, and the impact of human differences in energy-efficient buildings is even more significant.
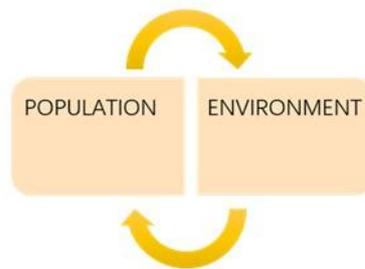
Figure 1-1 Connection between Human and Environment
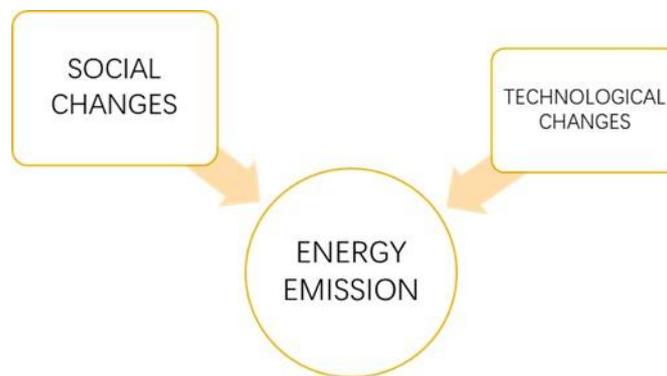
Figure 1-2 Different Ways of Shorten Energy Emission.

According to the World Environment Situation Room (WESR), the main carbon emission areas are in the eastern United States, eastern China, Japan, Korea, India, Southeast Asia and Europe[1]. Due to convenience of data and surveys, over representation of high income, white samples[3]. So, in this study the main research focus on China, Korea, and Japan, in three Asian countries to enlarge our understanding of the domain.

There are some similarities between the views of nature in China, Japan and Korea. They are all influenced by Confucianism[4].

Concepts of Harmonious in China, Japan, and Korea: Traditional Chinese culture has a profound concept of harmony between humans and nature. This is reflected in Taoism and Confucianism, which emphasize the harmonious relationship between man and nature. The Japanese view of nature has a strong sense of harmony. Shintoism and Zen Buddhism in traditional Japanese culture have a profound influence on the idea of nature worshipping and respecting nature, emphasizing the interdependence and harmonious coexistence of man and nature. The Korean view of nature also emphasizes the harmony between man and nature. Confucianism and Buddhism have had a profound influence on traditional Korean culture, where respect for nature and protection of the environment are seen as important values.

Environmental protection and sustainable development in China, Japan, and Korea: China has begun to emphasize environmental protection and sustainable development in recent years. The

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[1] https://wesr.unepgrid.ch/static.html?language=en&views=MX-43BHF-LEPC9-L9L19&zoomToViews=true&p=0&b=0&z=1.475&lat=14.865&lng=-13.248&t3d=false&sat=false&theme=classic_light

government has implemented a series of environmental protection policies and advocated green development, but still faces challenges such as industrial pollution and resource depletion. Japan has been a leader in environmental protection and sustainable development. The Japanese are generally aware of the limitations of natural resources and the seriousness of environmental problems, and have taken active measures such as energy conservation, renewable energy utilization and waste recycling. Korea has also gradually emphasized environmental protection and sustainable development. The government has taken a series of measures, such as promoting renewable energy, reducing air and water pollution, and promoting waste recycling, to address environmental challenges.

Although China, Japan and South Korea share some commonalities in their concepts of nature, there may be some differences in their specific approaches to nature and environmental issues due to differences in history, culture, and policies.

1.2 Research Background

1.2.1 Pro-Environmental Behavior

Pro-environmental behavior refers to actions and choices made by individuals or groups that have a positive impact on the environment. It includes the conscious adoption of behaviors aimed at reducing harm to the natural environment, conserving resources and promoting sustainable development. Pro-environmental behavior takes many forms, including:

1. Resource conservation: This includes practices such as reducing energy and water consumption, using public transportation or carpooling, minimizing waste generation, and recycling.

2. Sustainable consumption: choosing environmentally friendly and sustainable products, supporting local and organic food production, reducing the use of plastics, and choosing renewable energy sources.

3. Environmental awareness: Participate in environmental activities, support environmental organizations, and promote awareness and education on environmental issues.

4. Nature Conservation: Participate in activities to protect and preserve natural habitats, volunteer for environmental restoration projects, and support initiatives to protect biodiversity.

5. Sustainable Lifestyle Choices: Adopt a more sustainable lifestyle in general, including practices such as composting, gardening, reducing carbon footprints, etc., and adopt environmentally friendly habits in your daily life.

Pro-environmental behaviors are essential for addressing environmental challenges, mitigating climate change and contributing to the long-term well-being of the planet. It requires concerted efforts at the individual, community and societal levels to create a more sustainable future. Table 1-1 shows a brief literature review of willingness to pay for the environment.

Table 1-1 Literature Review of Willingness to Pay

Sources	WTP for	Socio-economic characteristics and respondents' characteristics	Attitude, knowledge, prior experience, socials norms
Zografakis et al., 2010 [5]	Renewable Energy Sources	Education, income, staying in large houses	Environment awareness, experience, specific knowledge
Bigerna and Polinori, 2014[6]	Green Electricity	Gender, age, income, education, professional status, municipality size,	Environment awareness, specific knowledge, green

Sources	WTP for	Socio-economic characteristics and respondents' characteristics	Attitude, knowledge, prior experience, socials norms
		household size	energy conviction
Lee et al., 2018[7]	Increasing Photovoltaic Power Generation	Education, income	Specific knowledge
Shao et al., 2018 [8]	Environmental Protection	Income, education	Pollution, environment awareness
Zhang et al., 2020 [9]	Environmental Protection	Income, happy, smart phone	environment awareness, air pollution, government act
Ayodele et al., 2021[10]	Green Electricity	Age, income, marital status	environment awareness
Korzhenevych and Owusu, 2021[11]	Renewable Mini grid Electrification in Off-Grid Rural	Education, household size, income, marital status	Usage
Halkos et al., 2022[12]	Urban Parks	age, income, education, professional status	Experience, motivation, cost
Malik et al., 2022[13]	Better Air Quality	Health	political trust, environment awareness, economic cost
Rafique et al., 2022[14]	Pollution Prevention	Education, marital status, children, income, health	environment awareness, air pollution
Li et al., 2020[15]	Ecological Consumption	Education, income	environment awareness, environmental cognitive attitude
Bai and Lin, 2022[16]	Garbage Recycling	Education, household size, income, marital status	Local, specific knowledge

People's acceptance of environmental policies is influenced by many factors, such as:

1. Education attainment: People with higher education are more likely to support environmental policies because they are more likely to understand environmental issues and the impact of policies.

2. Political stance: Political ideology and party affiliation may influence people's attitudes towards environmental policies. For example, liberals may be more inclined to support environmental policies, while conservatives may be more inclined to oppose environmental policies.

3. Economic interests: People may worry that environmental policies will have a negative impact on their own economic interests, such as unemployment or reduced income. This may lead them to

oppose these policies.

4. Personal experience: An individual's environmental experience may influence their perception of environmental policies. For example, living in a polluted city may lead to greater support for environmental policies because they are directly aware of the impact of environmental issues.

5. Social pressures: Social and cultural factors may influence attitudes towards environmental policies. For example, some communities may be more environmentally conscious, so people may be more likely to support environmental policies when they live in those communities.

In conclusion, people's acceptance of environmental policies is a complex issue, influenced by a variety of factors, including personal experience, political and economic factors, social and cultural factors.

1.2.2 Population Mobility

Population mobility refers to the movement of individuals or groups of people from one location to another. It can involve migration within a country (internal migration) or across national borders (international migration). Population mobility can occur for several reasons, such as seeking better economic opportunities, pursuing education, escaping conflict or persecution, or following family and social networks. It can have significant social, economic, and cultural implications for both the areas of origin and destination, affecting factors such as demographics, labor markets, infrastructure, and social integration. Population mobility is a complex phenomenon that is influenced by a combination of individual choices, socioeconomic factors, government policies, and global trends. Table 1-2 briefly reviews the literature on the experience of living in cities, short for urban living experience.

Table 1-2 Literature Review of Urban Living Experience

Sources	Key Points	Conclusion
Sansone et al., 2004[17]	Lewin's Behavior Equation, $B = f(P, E)$, tells that the behavior (B) is a function of personal characteristics (P) and environmental characteristics (E).	Behavior is environmental decided, although people tend to stick to past patterns, residential relocation or considering relocation offer an opportunity to reform their behavior.
Verplanken et al., 2008[18]	Environmental change could activate people to think about sustainable behavior.	
Fatmi and Habib, 2017[19]	People tend to stick to past patterns of behavior.	
Curl et al., 2018[20]	Residential relocators are more promoted an increasing in walking than those just experiencing renewal living in same place.	
Ralph and Brown, 2019[21]	It is just as effective for people who are preparing to move as they are for just moving, because people are in a period of reflection on their habits of thinking and behaving.	
Shen et al., 2017[22]	Change in energy consumption due to migration	Changes have been found that migration impact on energy consumption, transportation, and prosocial activities.
Ding et al., 2018[23]	Migration impact on changes in transportation patterns.	
Le and Nakagawa, 2021[24]	The migration experience makes returnees more prosocial, rather than prosocial people choosing to migrate.	

Sources	Key Points	Conclusion
Soon and Ahmad, 2015[25]	For2015, the average expenditure was $7.16 per month, and metropolitan residents and North American households were more willing to pay than rural and Asian households.	Carbon emission is higher in cities than rural area and showed regional differences, along with the willingness to pay for protecting the environment.
Li et al., 2015[26]	As urbanization increases in China, both direct and indirect household carbon emissions increase.	
Poom and Ahas, 2016[27]	Different spatial distribution of people has different energy consumption patterns, because people's lifestyles determine where they live.	
Wiedenhofer et al., 2017[28]	Urban households have high carbon emissions, wealthy and middle-class carbon emissions are high	
Fan et al., 2019[29]	Carbon emissions are higher in cities than in rural areas, and households emit carbon emissions directly.	
Li et al., 2020[15]	In distinct parts of China, residents' willingness to pay is influenced by environmental perceptions and other factors, showing regional differences.	

Definition of urban and rural:

There is no globally agreed definition of urban and rural. The description of urban-rural differences in this article is based on the definitions of each country. The basic consensus is that rural areas are sparsely populated, industries are mainly agricultural, and urban areas have a larger and denser population, engaged in secondary or tertiary industry activities. In South Korea, the distinction between urban and rural areas is based on administrative groupings based on geographical areas. The size of the rural population is limited to 50,000 people. Together with the size of the population, the proportion of the agricultural population and the structure of the agricultural economy, it is rural.

In a comprehensive social survey conducted by China, Japan and South Korea, the size of residential areas was divided into five types: large cities, suburbs of large cities, small and medium-sized cities, towns/villages, and sparse farmhouses. This study defines the first three as urban areas and the latter two as rural areas.

Difference between urban and rural

Research on urban-rural differences primarily focuses on six areas: socioeconomic inequality, livelihood, migration, consumption and poverty, biodiversity conservation, and connectivity and integration [30]. In addition to these, the following studies have revealed differences between urban and rural areas in other aspects.

Psychological differences between urban and rural areas have been discussed in the literature review by Marsella (1998). It was found that in 1990, rural men in South Korea had higher rates of alcoholism. The development of high-rise residential buildings in urban areas of China in 1990 had both positive and negative impacts on mental health. High-density urban living in Japan in 1991 was associated with significant psychological and physical harm [31]. A survey conducted in Gwangju, South Korea, in 2002 found no difference in the prevalence of depression between urban and rural areas, but different factors were found to trigger depression in different regions [32]. A study in 2016 indicated that there were no urban-rural differences in depression among middle-aged individuals in

Japan [33]. Research in China in 2015 revealed that socioeconomic status was the primary factor contributing to the urban-rural disparity in depression [34].

Residential mobility can lead to anxiety, which in turn compels individuals to seek familiarity. The degree of residential mobility and community stability are associated with various cognitive, emotional, and behavioral outcomes [35]. Japanese individuals exhibit lower mobility compared to Americans and are less likely to express themselves to strangers and have lower levels of trust in strangers. Jokela's study in Finland revealed that extraverted young individuals living in rural areas were more likely to move to larger cities compared to introverted young individuals living in rural areas [36]. A study in Japan in 2005 found that urban residents had higher scores in the sense of coherence (SOC) compared to rural residents, indicating a greater feeling of consistency. This could be attributed to higher levels of social support, self-efficacy, and socioeconomic status among urban residents [37].

There exist disparities in health conditions between urban and rural areas. Research indicates that urban residents and rural residents differ significantly in certain health indicators. In 2022, a study conducted in Peru revealed a significant disparity in the prevalence of childhood anemia between urban and rural areas [38]. Some studies have found that urban residents are more susceptible to the impacts of air pollution and noise pollution, which may increase the risk of respiratory issues and cardiovascular diseases. Additionally, urban residents often face more stress, work pressure, and unhealthy lifestyles, which can affect their mental health and increase the risk of chronic diseases.

On the other hand, rural residents may face different health challenges. Limited access to healthcare resources and inconvenience in healthcare services can lead to healthcare inequality in rural areas. Moreover, rural residents often engage in agricultural and manual labor, exposing them to occupational diseases and the risk of work-related injuries.

Overall, the health disparities between urban and rural areas are complex and influenced by multiple factors, including environmental factors, lifestyle choices, socioeconomic factors, and the availability of healthcare resources. Further research is needed to gain a deeper understanding of the causes and potential solutions for urban-rural health disparities.

About urbanization and deurbanization:

The impact of urban size on individuals can be both positive and negative, as indicated by research [39]. It is a double-edged sword. On one hand, larger and more tolerant cities can accommodate diverse cultures, which is beneficial for people's mindset and personal development. However, on the other hand, as urban size increases, there is a potential for an increase in crime rates, posing risks to people's lives and property.

The measurement of population concentration in the United States from 1950 to 2015, using the density distribution index, reveals that most major cities in the U.S. stopped dispersing after 1990 [40]. Research on the density distribution index has also found that population concentration in U.S. cities has not remained consistently stable but has experienced several fluctuations. For instance, in the 1960s and 1970s, some U.S. cities witnessed a wave of "white flight," resulting in population loss and urban impoverishment. However, since the 1990s, due to the increased economic and cultural attractiveness of cities, many people have started returning to urban areas, leading to a re-concentration of population in cities.

1.2.3 Interactive Effects between Mobility and Pro-Environmental Behavior

Literature review of population migration and residential relocation:

Lewin's Behavior Equation, B = f (P, E), tells that the behavior (B) is a function of personal characteristics (P) and environmental characteristics (E)[17].

The impact of migration has been studied in four fundamental areas.

a. Studies mainly have focused on the changes in transportation patterns[23,41–43]. The general

conclusion is that relocating to the suburbs increases the use of private cars and reduces public transport, walking, or cycling. The increase in the use of private cars is either due to increased commuting or social needs. The impact on the elderly and young is similar.

b. Studies have focused on change in energy consumption due to migration[22]. For example, urbanization caused by migration significantly impacts the direct good of urban households. Total urban carbon emissions have also increased, but this increase will be offset by increased carbon efficiency due to technological improvements. Occupancy changes increase the chance of changing heating system from coal, oil or peat to gas[44].

c. Studies have focused on the impact of migration on the work of returnees[24]. Some urban migrant workers will succeed in starting a business. Some say that they are more suitable for wage-paying jobs, and some say that they have minor impact on work and the difference is relatively large. Another study noted that returnees were more prosocial than those with no urban living experience.

d. Studies have focused on the relationship between migration and health[45]. People from rural China who work in the cities return to the countryside after their health deteriorates, exacerbating the deterioration of health due to the difference between China's urban and rural medical care.

Also, there are some more research argued about life course transitions may not have the moments of change due to habits are more complex and not priority in the change of life course[46].

Changed individual and structural conditions when mobility happened may have a bigger influence of their travel behaviors[47].

The motivation for migration is mainly demographic sociological characteristics[48], such as gender and occupation, but the differences in this area are narrowing. The choice of destination is also influenced by family characteristics, urban-rural linkages, and urban integration. Housing prices and commuting distance from work and school will also affect the location of people's homes.

Classical assimilation theory states that over time there will be convergence at the economic, social, and cultural levels[49]. In Mai's article, it is pointed out that the length of residence does not eliminate the difference in economic imbalances, nor does it offset the obstacles to the mobility of urban social classes[50]. The article points out that new urban people who migrate to cities to obtain hukou have the same energy consumption level as urban people, while rural migrants without urban hukou have different energy structures[24]. The article also pointed out that old city people before 1980, new urban people who obtained urban hukou after 1980, and people who did not have hukou in cities. In terms of energy consumption, the energy consumption of old city people and new urban people will be the same due to welfare benefits and other reasons, while those who do not have hukou in the city lack energy such as firewood compared with those in rural areas[24].

Cheng used CGSS2013 data to compare the differences in environmental protection behavior of urban and rural residents and analyze the influencing factors[51]. Cheng pointed out that the practice level of urban and rural residents' environmental protection behavior is low, and the personal environmental protection behavior and public environmental protection behavior of urban residents are higher than those of rural residents. The positive impact of environmental awareness on the personal environmental protection behavior of urban residents is greater than that of rural residents, and the positive impact on public environmental protection behavior of rural residents is greater than that of urban residents. Environmental knowledge can help urban and rural residents to adopt personal environmental protection behaviors but has a negative impact on urban residents' public environmental protection behaviors. Environmental protection job satisfaction is conducive to the implementation of environmental protection behaviors by urban and rural residents, but the impact effect on urban and rural residents' personal environmental protection behaviors and public environmental protection behaviors is different.

Immigration experiences may also influence attitudes towards environmental policy. Specifically, the following are some of the possible influences:

1. Cultural background. Migrants may have different cultural backgrounds and environmental perceptions, which may influence their views on environmental policies. For example, migrants may be more concerned about protecting land and resources because they come from resource-poor countries or regions.

2. Economic conditions. Migrants may face different economic conditions and challenges, which may influence their attitudes towards environmental policies. For example, migrants may focus more on economic growth and employment opportunities because they need more opportunities to improve their standard of living.

3. Political stance: Immigrants may have different political stances and views, which may also affect their attitudes towards environmental policies.

4. Immigrant background: Immigrant background may also influence people's views on environmental policy. For example, some immigrants may have moved to countries or regions with poor environments, which may make them more concerned about environmental issues.

Overall, immigration experience may influence people's views on environmental policy, but this influence may be multifaceted and depend on individual experiences and perspectives.

The experience of migration within a country may also influence attitudes towards environmental policy. The following are some of the possible influences:

1. Geographic Factors: The geographic location of migration may influence attitudes toward environmental policy. For example, people living in areas that are environmentally poor or prone to natural disasters may be more concerned about environmental issues and policies.

2. Socio-economic background: Migration may expose people to different social and economic backgrounds, which may affect their attitudes towards environmental policies. For example, people who move from rural to urban areas may be more concerned with urban environmental issues, while people who move from urban to rural areas may be more concerned with land use and natural resource conservation.

3. Cultural context: Migration may expose people to different cultures and perceptions, which may also affect their views on environmental policy. For example, people who move to areas with a stronger environmental culture may be more supportive of environmental policies.

4. Political stance: Migration may also expose people to different political environments and perspectives, which may influence their attitudes towards environmental policy.

Overall, the experience of migration within a country may influence people's views on environmental policy, but this influence is also multifaceted and depends on individual experiences and perspectives.

Rural-urban migration and urban-rural migration may have different impacts on attitudes towards environmental policy.

For urban-rural migration:

Concern for environmental protection: Urban residents may be more concerned about environmental protection, especially air and noise pollution. In rural areas, where the natural environment is more pristine, urban dwellers are likely to value and protect these resources more.

Perceptions of land use: Urban dwellers may be more exposed to modern and ecological agriculture, which may affect their perceptions of land use and the argic environment. They may be more supportive of organic farming and land conservation policies.

Concerns about resource use: Urban residents may be more concerned about the use and waste of resources. In rural areas, where natural resources are relatively more abundant, wasteful and irrational use of resources may be a concern.

Applies to rural-urban migration:

Relocation from rural to urban area, seeking for better income and more opportunities like better education, health care and so on.

Concerns about Urban Environmental Issues: Rural residents in cities may be more concerned about urban environmental issues, especially air pollution and urban waste disposal. They may be more supportive of urban environmental policies and resource recycling.

Land Awareness: Rural urban dwellers are likely to be more aware of land scarcity and land use issues. They may be more supportive of urban land planning and conservation policies.

Concern for Resource Utilization and Conservation: Since rural residents come from resource-poor areas, they are likely to be more concerned about resource utilization and conservation. They may be more supportive of resource conservation and eco-friendly lifestyles.

In general, both rural-to-rural and rural-to-urban migration may have an impact on attitudes towards environmental policy. Such influences are multifaceted and depend on individual experiences and perspectives.

A survey jointly completed by the University of Chinese Academy of Sciences, Tsinghua University and other institutions found that urban residents are generally more concerned about environmental issues, especially air pollution, noise pollution and water pollution, while rural residents are more concerned about agricultural environment and land resource use. The findings suggest that urban-rural migration may influence the level of attention paid to environmental and resource use issues.

A survey released by the Center for Urban and Competitiveness Research of the Chinese Academy of Social Sciences shows that urban residents pay more attention to urban environmental issues, including urban transportation, garbage disposal and environmental pollution, while rural residents pay more attention to the protection and utilization of natural resources. This also supports the view that urban-to-rural and rural-to-urban migration may influence attitudes towards environmental policy.

A study funded by the National Science Foundation found that immigrants' attitudes toward environmental policies are influenced by their cultural and economic backgrounds. This suggests that the experience of migration may have an impact on people's attitudes towards environmental policies.

Overall, the above research suggests that rural-to-rural and rural-to-urban migration, as well as migration experiences, may have an impact on attitudes towards environmental policy.

The question is: To what extent does the experience or intention of relocation within a country affect people's environmental attitudes and behaviors? If there is an effect, what are the typical effects observed?

The internal population mobility within a country can indeed have an influence on people's environmental attitudes and behaviors. The effects of this influence can generally be seen in the following ways:

Awareness and consciousness: Population mobility may expose individuals to diverse environmental conditions and challenges in different regions. This exposure can increase their awareness of environmental issues and the need for sustainable practices.

Cultural exchange and knowledge sharing: When people migrate or move within a country, they bring their unique perspectives and experiences with them. This cultural exchange and knowledge sharing can lead to the dissemination of environmental awareness and best practices, influencing others to adopt more sustainable behaviors.

Local environmental impact: The influx or outflow of population in specific areas can have direct consequences for the local environment. Increased population density may result in greater resource

consumption and waste generation, putting pressure on local ecosystems. Conversely, depopulation can lead to abandoned lands and potential environmental degradation.

Policy and infrastructure development: Population mobility often necessitates the development or improvement of infrastructure, such as transportation, housing, and utilities. These developments present opportunities to integrate environmental considerations and promote sustainable practices in urban planning and resource management.

Community engagement and activism: Population mobility can facilitate the formation of diverse communities and networks. These communities may collectively engage in environmental initiatives, such as local clean-up campaigns, conservation projects, or advocacy for sustainable policies.

Overall, the influence of internal population mobility on people's environmental attitudes and behaviors is multifaceted. It can contribute to raising awareness, fostering knowledge exchange, shaping local environmental conditions, influencing policy and infrastructure development, and fostering community engagement in environmental initiatives.

1.3 Purpose

There are many comparisons of urban-rural disparities, but what impact does the lack of comparative mobility experiences have? This is the gap that this article aims to study.

China has significant differences between rural and urban areas, leading to uneven development. How about countries like Japan or South Korea? Do they also have significant urban-rural disparities? In their cases, what are the differences in environmental behaviors between urban and rural residents?

Some literature suggests that Chinese and Indian people show significantly higher climate change anxiety compared to Japanese and American people [52]. Overall, there may be differences based on varying levels of development and urban-rural regions. If so, will the environmental behaviors of urban and rural residents in developed countries change as they move?

Alternatively, what differences might exist in environmental attitudes?

There are three main research gaps in this article:

Under urban-rural disparities, does mobility between urban and rural areas affect people's environmental attitudes/behaviors?

In situations where urban-rural disparities are minimal, how does mobility between urban and rural areas impact individuals?

In what aspects are environmental attitudes and behaviors influenced by mobility?

The influence of environmental policies on pro-environmental behavior and attitudes.

The study of immigration has a wide range and divisions. The earliest research on immigration can be traced back to 1885, and international migration studies originated in 1927 ([53]P10). The flourishing development of immigration research can be intricately linked to urbanization and the Great Depression (P10). One of the reasons for migration is environmental factors. Environmental factors are often studied in conjunction with the economy, given the relationship between economic opportunities, climate change, and natural disasters (P60). Moreover, the impact of the natural environment is often more evident in rural areas, leading to internal migration. However, considering the poorer economic conditions in rural areas, environmental motives are secondary to economic motives. Even in places with natural disasters, environmental factors are usually secondary and temporary motivations (P69).

This study research provides another perspective for current studies, examining whether immigration, prior to or with the intention to migrate, influences people's views on the environment and the economy.

The combination of politico-institutional drivers with environmental drivers is seldom examined,

with more emphasis placed on security-related drivers (P60). This study research seeks to bridge this gap by exploring the interplay between political attitudes and people's environmental attitudes, recognizing their interconnectedness.

The purpose of this article is to address the following research questions and gaps in understanding:

1. Investigate the impact of mobility between urban and rural areas on people's environmental attitudes and behaviors, particularly in the context of urban-rural disparities.

2. Examine the differences in environmental behaviors between urban and rural residents in countries like China, Japan, and South Korea.

3. Explore the potential influence of mobility on the environmental attitudes and behaviors of urban and rural residents in developed countries.

4. Investigate the various aspects in which mobility influences environmental attitudes and behaviors.

5. Explore the influence of environmental policies on pro-environmental behavior and attitudes.

6. Provide a perspective on the influence of immigration, whether as a precursor to or with the intention to migrate, on people's views regarding the environment and the economy.

7. Bridge the gap in understanding by examining the interplay between political attitudes and people's environmental attitudes, recognizing their interconnectedness.

By addressing these research questions and gaps, the study aims to contribute to the existing knowledge on the relationship between mobility, environmental attitudes, and behaviors, and shed light on the interplay between political and environmental factors.

1.4 Research Structure

This thesis is divided into six parts, as shown in Figure 1-3. The first three parts provide the background and theoretical basis for the study, discussing the relationship between population mobility, urban-rural disparities, and pro-environmental behavior or intentions. Introduction: Introduce the research background and motivation, clearly state the research objectives and questions, and provide an overview of the research methodology and paper structure. Literature Review: Review relevant literature, discuss the relationship between population mobility and pro-environmental behavior, and introduce the relevant theoretical frameworks and major findings from previous research.

The fourth part consist of case analyses based on general social surveys from China, South Korea, and Japan, respectively. These analyses examine the factors related to pro-environmental behavior or intentions in each country. Theoretical Framework and Model: Establish the theoretical framework of the study, propose research hypotheses, and develop a corresponding research model to explain the impact of population mobility on pro-environmental behavior. Methods: Describe the methods of data collection and sample selection, define variables, and select appropriate data analysis methods and models to test the research hypotheses. Results and Discussion: Present research findings, including descriptive statistical analysis and main results, interpret and discuss the results, compare them with previous research, and provide insights and explanations.

The fifth part presents a comparative study that incorporates political attitudes into the analysis, leading to the conclusions drawn from the research. Additional Analysis and Sensitivity Testing: Conduct further data analysis and subset analysis, perform sensitivity testing to validate the robustness of the results. Policy and Practical Implications: Based on the research results, propose policy recommendations and practical implications to promote sustainable development in relation to population mobility and pro-environmental behavior. Last part is conclusion: summarize the main findings, discuss the limitations of the study, and suggest future research directions and

recommendations.

Introduction	**Chapter One** Research Background and Purpose of the Study
Data & Material Procession	**Chapter Two** Literature Review and Methodology
Preliminary Study	**Chapter Three** *(AIUE)* Willingness to Pay for Quality Air and Urban living Experience in China
Case Studies *(Core Parts)*	**Chapter Four** *(Energies)* Comparison of Willingness to Pay for Quality Air and Renewable Energy considering Relocated in Urban in China

	Chapter Five Pro-environmental Behaviors and Relocation Intention in Korea	**Chapter Six** PEBs and Settlement Consciousness in Japan

Comparative Study	**Chapter Seven** Comparative Study in China, Korea, and Japan
Conclusion	**Chapter Eight** Conclusions and Prospects

Figure 1-3 Outline of Thesis

Chapter 2   Literature Review and Methodology

The research methodology and data used in the study will be discussed, emphasizing the scientific rigor and feasibility of the chosen approach. The availability and suitability of the data sources will also be addressed.

The existing works and initiatives in the field were reviewed, and logistic regression was identified as the primary method used to uncover the connections between dependent variables and other factors in each case.

2.1 Interactive Relationship and Research Methodology

Interdependent metatheory assumes that human action is continually created, reinforced, or eroded by experiences and other factors[54]. Lewin's Equation points out that behavior is environmental decided[17], although people tend to stick to their past patterns[19], such as the saving behaviors of the past will be carried over to the new environment[55], residential relocation or considering relocation offer an opportunity to reform their behavior[18,20,21,56], according to habit discontinuity theory. There is a complex relationship between attitudes, habits, and behavior change. According to the planned behavior theory, attitudes are an important starting point for habit change[57]. The above studies illustrate that human behavioral intentions are influenced by environmental changes.

Changes have been found that migration impact on energy consumption[22], transportation[23], and prosocial activities[24]. Population mobility is related to carbon emissions.

At the same time, carbon emissions are typically higher in urban areas compared to rural areas[26,28,29] and regional disparities exist[15,25,27]. Urban residents display a greater willingness to contribute financially towards environmental protection compared to rural villagers[15,25]. Pro-environmental behavior has been found differences between individuals living in urban and rural areas. Urbanization have a positive role in personal pro-environmental behavior[58].

So, the problem is how would relocation be connected with human pro-environmental behavior?

in two aspects, human mobility from rural to urban areas for economic reasons, in this how would their behavior change when they relocated in urban area?

On the other hand, people move to rural areas from urban areas after retirement, we suggest that these people are economically rich, they should be more likely to protect the environment. And some people move to rural areas from urban areas due to seeking for better natural environment, based on cognitive consistence theories[59], we suggest they have more likely to protect the environment as well.

Factors connected to PEBs include demographic factors: age, gender, income, occupation(social status/ socio-economic status), education, religion and ethnicity, family structure(family life cycle/ marital/ family size), and geographic location(area of residence).

In South Korea, urban-rural migrants were motived by lifestyle change which is not prioritized job-related[60]. We hold the guess that due to this pro-nature motivation; those people may hold a more pro-environmental intention and have more PEB.

High level of mobility would decrease private PEB[61]. The impact of relocation on pro-environmental behavior (PEB) remains inconclusive, making it a primary objective of this study.

2.2 Concepts

2.2.1 Migration

The interaction process between immigration and the destination society can be divided into five dimensions, showed in Figure 2-1, based on the framework of transnational migration integration: structural (such as participation in labor and housing markets, education and healthcare systems), social (including social interactions, relationships, and networks), cultural (involving changes in values, attitudes, behaviors, and lifestyles), civic and political (involving community life and democratic processes), and identity (involving the development of a shared identity and sense of belonging with the place, country, community, and people) [62]. These dimensions are considered to influence the integration process between immigrants and the destination society.

However, when studying domestic migration, the situation may be different. Within the same country, the degree of cultural change, such as values, attitudes, behaviors, and lifestyles, may be

lower compared to transnational migration.

The question of whether it is necessary to study the impact of domestic migration experiences exists and requires further research. Domestic migration experiences can bring about a range of effects, including changes in lifestyle, attitudes, and values. Research in this area helps understand the impact of diverse types of migration and mobility on individuals and society.

Furthermore, the focus of migration research is gradually shifting from the national level to specific cities. Different cities may present varying forms and integration patterns of migration. This can be considered as a future research direction to further explore the influence and interactions of migration in different cities.
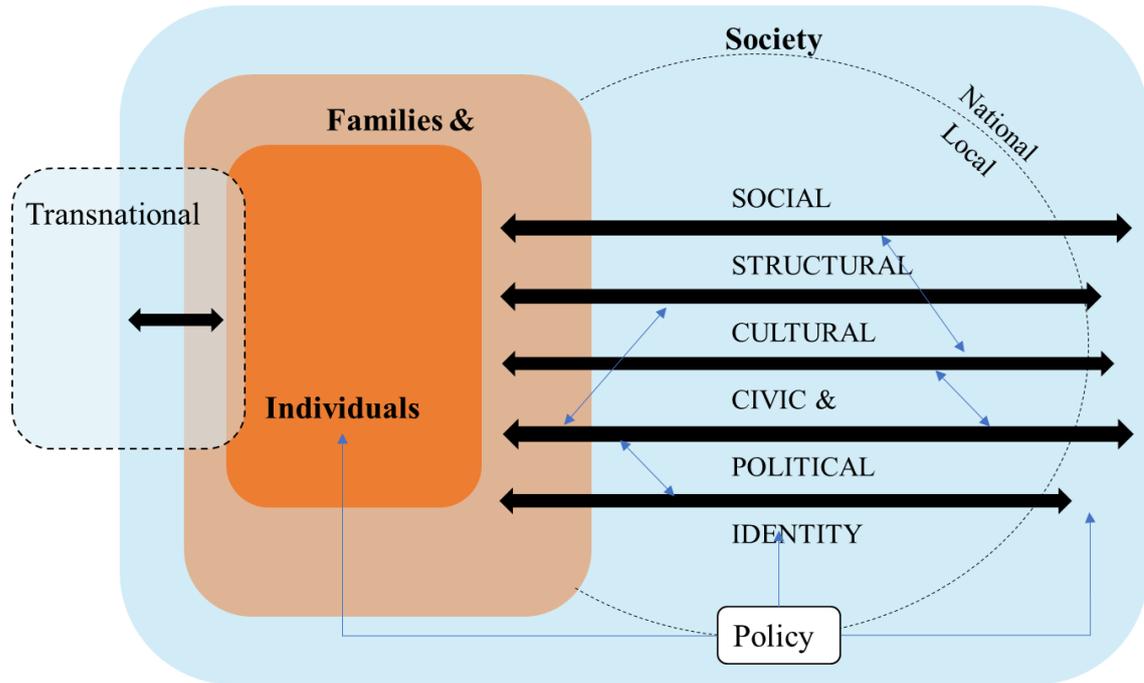
Figure 2-1 Heuristic Model of Integration Processes and Effectors

(source: Spencer and Charsley[62], author simplified)

There are differences among China, Japan, and South Korea in terms of their foreign immigration policies and attitudes, which may have implications for domestic population mobility.

Differences in Foreign Immigration Policies: China, Japan, and South Korea have variations in their foreign immigration policies. South Korea ranks higher in terms of immigrant integration and adopts a relatively open and inclusive policy, providing more equal rights, opportunities, and guarantees, and demonstrating a more favorable attitude towards foreign immigrants. In comparison, Japan and China have relatively conservative immigration policies with limited acceptance and integration of foreign immigrants.

Population Mobility Relations: The differences in foreign immigration policies among China, Japan, and South Korea may impact domestic population mobility. With South Korea being more open in terms of immigrant integration, it attracts a certain number of foreign immigrants to settle, which may influence domestic population mobility in South Korea. On the other hand, Japan and China have a smaller number of foreign immigrants, and domestic population mobility is primarily driven by factors such as internal migration and urbanization.

Factors of Influence: The presence of foreign immigrants may have certain effects on domestic population mobility. Firstly, foreign immigrants may impact the labor market, including changes in employment opportunities, wage levels, and industrial structure, which could trigger population

mobility within the country. Secondly, the introduction of foreign immigrants' culture, social customs, and lifestyles may affect domestic society, leading to internal population migration and adjustments. Additionally, foreign immigrants may also influence domestic social and cultural identities, potentially resulting in some degree of population mobility.

In conclusion, there are differences in the attitudes and policies towards foreign immigrants among China, Japan, and South Korea, which may have implications for domestic population mobility. The scale, characteristics, and impact of foreign immigrants on the labor market and social culture can all be factors influencing domestic population mobility. However, specific effects would require further analysis and investigation based on the circumstances and specific research of each country.

In the early 21st century, King proposed that Europe had various forms of migration and that new information and communication technologies blurred the distinction between migration and mobility [63].

In this paper, a more ambiguous approach was also adopted, without differentiating types of migration, but rather focusing on the experiences of people's movements. It even blurred the timeline of migration experiences, although this study acknowledges that the timing of migration is likely a crucial factor. However, considering that it may not have a significant impact on the overall understanding or that it warrants further in-depth research, this condition was overlooked in the current preliminary study.

Lifestyle migration refers to a form of immigration where aesthetic qualities, including the quality of life, take precedence over economic factors such as career advancement and income [64]（P11）. It encompasses various types of privileged migration, such as amenity migration, international retirement migration, residential tourism, second homes, and international counter urbanization [65]. The primary motivation behind lifestyle migration is the pursuit of a better quality of life, rather than job opportunities or political rights [66].

In Japan, there is a trend known as "urban escape" where people leave busy cities and move to suburban or rural areas in pursuit of a more relaxed lifestyle and a more beautiful natural environment. This trend is particularly prominent in certain regions, such as the rural areas surrounding Tokyo.

In South Korea, a similar trend is also developing, with people shifting their focus to suburban or rural areas in search of a more livable environment and a more leisurely way of life. This phenomenon is particularly pronounced in the outskirts of Seoul, where people seek to escape the hustle and bustle of the city and its associated pressures.

In China, there is indeed an increasing number of people shifting their focus to remote suburban areas or places with beautiful natural environments outside of developed regions. They engage in activities such as residential tourism or pursue a more peaceful and comfortable lifestyle. These places may include rural areas, mountainous regions, or coastal areas. They offer a more serene, comfortable, and closer connection with nature. Some areas may be favored for their unique natural scenery, fresh air, and environmental quality.

Migration types such as temporary and seasonal migration are closely related to environmental attitudes and behaviors. The relatively short duration of these migrations means that they have lower expectations of the environmental economics of future investments and returns. As a result, they may be less inclined to invest in long-term projects that take time to generate returns, such as housing renovations or the adoption of low-carbon, energy-efficient electric vehicles. This aspect has been examined in the field of environmental economics, with research articles exploring the reluctance of temporary and seasonal migrants to engage in such long-term investments with delayed returns.

In addition to temporary and seasonal migration, there are two main categories of migration: internal migration and international migration. Internal migration refers to movement within a country, while international migration involves crossing national borders. The drivers of migration

are often used to distinguish between two sub-groups: those who are forced to move, such as individuals displaced by natural disasters or conflicts, and those who migrate voluntarily for several reasons such as employment or family reunification. Understanding the motivations behind diverse types of migration is crucial for addressing the unique challenges and opportunities they present.

When categorizing migrants, they can be grouped into various types, including labor migrants who move in search of employment opportunities, family-based migrants who relocate to join family members, humanitarian migrants who seek refuge or protection, lifestyle migrants who move for a desired lifestyle or environmental conditions, student mobility for educational purposes, and irregular migrants who migrate outside of legal frameworks[53](P114). Each type of migration has its own dynamics and implications, which require careful examination and analysis.

2.2.2 Urbanization

Urbanization increases ecological pressure, but the consumption of renewable energy reduces ecological footprint[67].

The Environmental Kuznets Curve may not apply to all pollutants; it only reveals the possibility of simultaneous improvement in environmental quality and economic development. Improving the environment does not always imply a decrease in income.

The differentiation between urban and rural areas has various characteristics, yet people are mobile, and society is constantly changing. This study focuses on the impact of human mobility on fixed urban-rural disparities. Considering people's environmental awareness, environmental behaviors, or attitudes, this article systematically analyzes the situations in three different development countries, China, Japan, and South Korea, to illustrate the associations and differences among them.

2.2.3 Warm Glow

Warm glow refers to the positive emotional feeling or satisfaction that individuals experience when they engage in pro-social or pro-environmental behavior. It is a concept commonly used in behavioral economics and psychology to describe the intrinsic motivation that drives individuals to act in ways that benefit others or the environment.

When people engage in pro-environmental actions, such as recycling, conserving energy, or volunteering for environmental causes, they often experience a warm glow, a sense of personal fulfillment, and happiness. This warm glow is derived from the belief that their actions are contributing to a greater good and making a positive impact on the world around them.

The warm glow effect is believed to stem from a combination of psychological and social factors. From a psychological standpoint, engaging in pro-environmental behavior aligns with an individual's values and promotes a sense of self-identity and integrity. It can also boost self-esteem and provide a sense of meaning and purpose in life.

From a social perspective, pro-environmental actions often receive positive recognition and social approval from others. This social reinforcement further enhances the warm glow experience, as individuals feel valued and appreciated for their contributions.

The warm glow effect plays a significant role in motivating individuals to continue engaging in pro-environmental behavior. By understanding and harnessing this positive emotional response, policymakers, organizations, and educators can design interventions and initiatives that foster a sense of warm glow and encourage sustainable actions among individuals and communities.

2.2.4 Related Theories of Behavior Study

Human behaviors have been studied for many years, below listed common agreements about behavior, such as people are more touched by things near and specific.

Identifiable victim effect

One theory that explains why people are more touched by things that are near and specific is the "identifiable victim effect." This theory suggests that individuals are more emotionally moved and motivated to help when they can relate to or have a personal connection with a specific individual or a small group of individuals who are in need.

According to this theory, people tend to respond more strongly to concrete, identifiable victims than to abstract statistics or larger-scale problems. When a person is presented with a specific case or story that depicts the suffering or needs of an individual or a small group, it elicits a greater emotional response and empathy. This emotional connection can lead to a stronger desire to help and act.

The identifiable victim effect is thought to occur due to several psychological mechanisms. First, when faced with a concrete and specific situation, people find it easier to imagine themselves in the same situation, which enhances their emotional response. Second, personalizing the situation humanizes the victim and creates a sense of individual responsibility to help. Finally, when a problem is presented on a smaller, more personal scale, it becomes more manageable and less overwhelming, leading to a greater likelihood of action.

This theory has been supported by assorted studies and has important implications for communication and persuasion strategies. By highlighting individual stories, personalizing the impact of problems, and connecting people to specific victims, organizations and advocates can effectively evoke empathy and motivate individuals to act and support causes.

Proximity effect

Another theory that explains why people are more touched by things that are near and specific is the "proximity effect" or "geographical proximity effect." This theory suggests that individuals feel a stronger emotional connection and are more affected by events or issues that occur near their own location or community.

The proximity effect is based on the idea that individuals have a stronger emotional attachment to their immediate environment and the people within it. When something happens nearby, it is more likely to have a direct impact on their lives or the lives of people they know, which triggers a heightened emotional response.

This theory can be explained by the concept of in-group bias and social identity. People tend to feel a stronger sense of connection and empathy towards those who are part of their own community or social group. When events or issues occur in proximity, they are perceived as more relevant and personally significant, evoking a stronger emotional response.

Additionally, the proximity effect can be influenced by the availability of information. When people are exposed to news or information about events happening nearby, it is more salient and readily accessible in their daily lives. This continuous exposure can intensify the emotional impact and increase the sense of personal relevance.

The proximity effect has implications for public opinion, decision-making, and social activism. It suggests that individuals may be more motivated to act and support causes that directly affect their immediate surroundings. By understanding this effect, organizations and policymakers can tailor their messaging and interventions to highlight the local impact of issues and engage individuals in their own communities.

Concreteness effect

Another theory related to why people are more touched by things near and specific is the "concreteness effect" or "concrete mindset theory." This theory suggests that individuals are more emotionally affected by information or stimuli that are concrete, vivid, and tangible compared to abstract or general information.

According to this theory, when information is presented in a concrete and specific manner, it is

easier for individuals to mentally process and visualize, leading to a stronger emotional response. Concrete information engages the sensory and perceptual systems, making it more vivid and memorable. On the other hand, abstract or general information can be more difficult to grasp and may not elicit the same level of emotional impact.

The concrete effect is linked to cognitive and emotional processing. Concrete information is believed to activate the sensory and emotional areas of the brain, enhancing the personal relevance and emotional salience of the stimuli. This emotional engagement can increase empathy and generate a stronger emotional response.

In the context of being touched by near and specific things, the concreteness effect suggests that when individuals are presented with tangible and detailed stories or situations that are close to their own experiences or surroundings, they are more likely to be emotionally moved. The specific details and vividness of the situation make it more relatable and real, intensifying the emotional impact.

Understanding the concreteness effect can help in designing persuasive messages, storytelling, and communication strategies that effectively evoke emotions and engage individuals. By using concrete and specific examples, visuals, and narratives, organizations and communicators can create a more impactful and emotionally resonant connection with their target audience.

The identifiable victim effect theory can be applied to explain why individuals may be more willing to pay for quality air. When the negative consequences of poor air quality are presented in a specific and personal manner, such as highlighting the health issues faced by individuals or communities due to air pollution, people are more likely to feel a personal connection and empathy towards those affected. This emotional response can increase their willingness to pay to improve air quality, as they perceive it as directly benefiting themselves and their immediate environment.

On the other hand, the proximity effect theory can help explain the difference in willingness to pay for renewable energy. If individuals perceive that renewable energy sources, such as solar or wind power, are directly available and accessible within their local community or region, they may feel a stronger emotional connection and sense of ownership towards supporting renewable energy initiatives. This proximity to renewable energy options can make it more salient and personally relevant, leading to a greater willingness to pay for renewable energy sources.

Additionally, the concreteness effect theory can also be applied to both scenarios. When the benefits of quality air or renewable energy are presented in a concrete and tangible manner, such as highlighting the specific improvements in health, well-being, and environmental sustainability, individuals can better visualize and understand the positive outcomes. This concreteness makes the benefits more relatable and increases the perceived value, which can influence their willingness to pay for these goods and services.

All of the above behavior-related studies have revealed that the relationship between people and their environment is a necessary element to consider when conducting pro-environmental behavioral research. Although this paper is not a specialized study in psychology or sociology, it is important to take into account the results of research in other disciplines when designing the influencing factors and to be as comprehensive as possible.

2.3 Conceptual Framework and Model
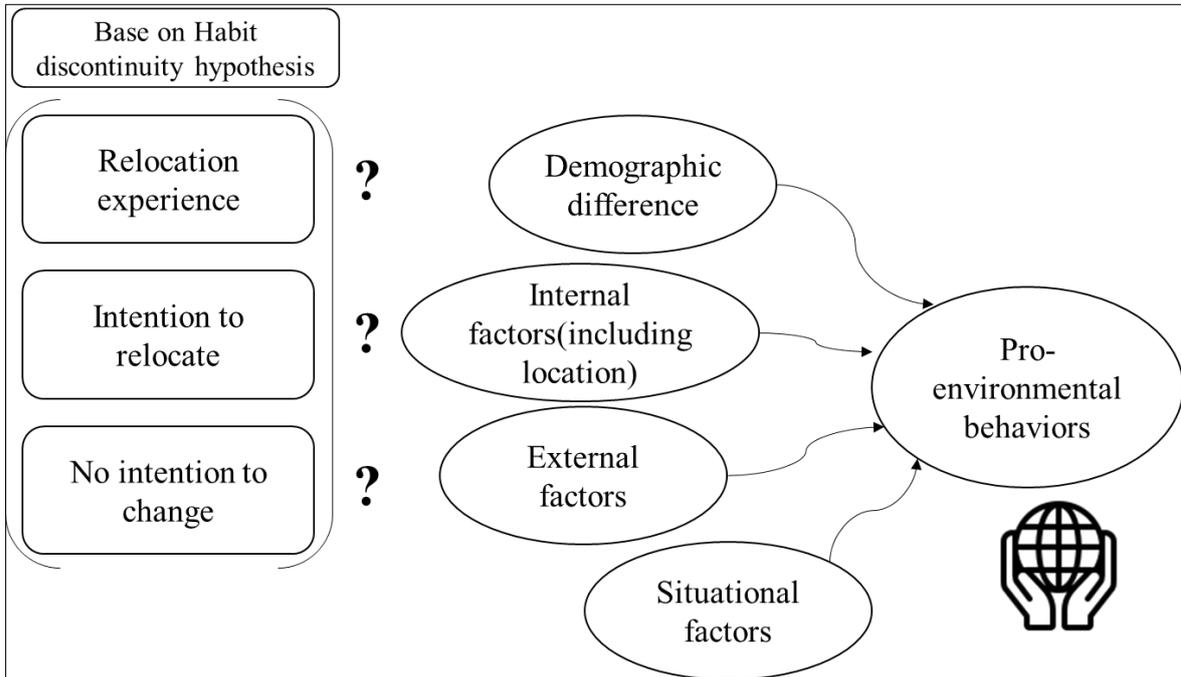
Figure 2-2 Conceptual Framework for PEBs and Relocation

In this study, we hypothesis that the experience or the intention of relocation would have an influence on PEBs. In detail, there are three sub hypotheses:

Research Hypothesis 1: Relocated in urban area would increase PEBs, particularly in the context of urban-rural disparities and relocation to the urban area for economic reasons.

Research Hypothesis 2: Intention to relocate in rural area increase PEBs, particularly the intention to relocate in rural area for lifestyle change or enjoying the nature.

Research Hypothesis 3: Settlement consciousness decreases PEBs, since there is no circumstance change.

Research Hypothesis 4: Environmental policies have a significant influence on pro-environmental behavior and attitudes, indicating that the implementation and effectiveness of such policies directly affect individuals' environmental consciousness and actions.

2.3.1 Workflow

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┌─────────────────────────────────────────────────────┐
│   Research problem – dependent variable and          │
│              independent variables                   │
└─────────────────────────────────────────────────────┘
    ┌─────────────────────────────────────────────────────┐
    │   Data selection and clean, Description statistics   │
    └─────────────────────────────────────────────────────┘
        ┌─────────────────────────────────────────────────────┐
        │     Correlation analysis and decision tree model     │
        └─────────────────────────────────────────────────────┘
            ┌─────────────────────────────────────────────────────┐
            │   Logistic regression- binary logistic regression or │
            │              multi-logistic regression               │
            └─────────────────────────────────────────────────────┘
                ┌─────────────────────────────────────────────────────┐
                │            Discussion and conclusion                 │
                └─────────────────────────────────────────────────────┘
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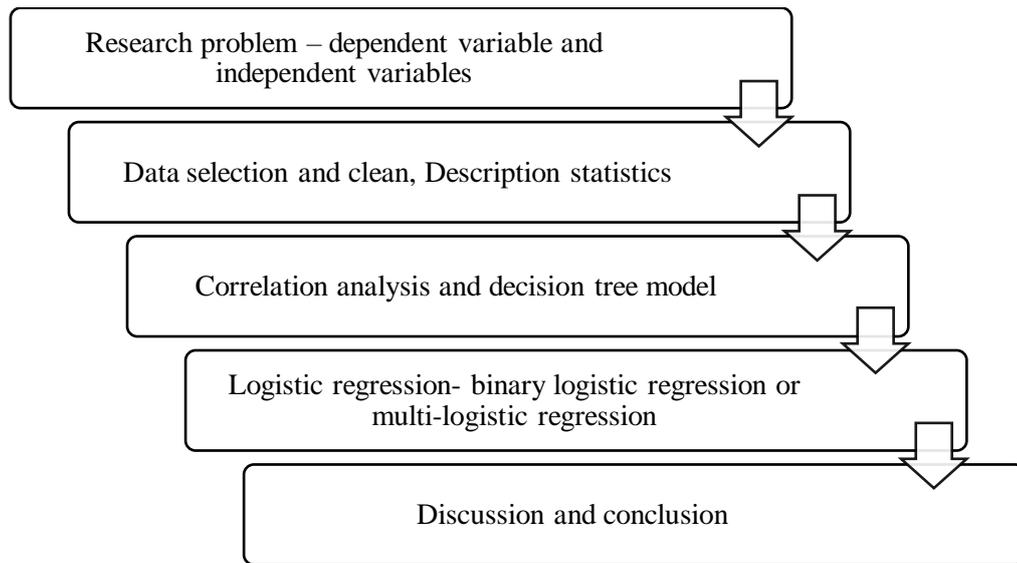
Figure 2-3 Steps of Each Case Study

2.3.2 Empirical Model

The empirical model is based on existing research[50,68] and incorporates urban living experiences. Many influencing factors affect residents' willingness to pay for clean energy and quality air, including personal characteristics, social characteristics, and policy factors. The model is as follows:

$$Y_i = \alpha + \sum_{n=1}^{n} \beta_n x_{ni}$$

Where Y_i, the dependent variable represents the choice of whether to be willing to pay for clean air. $\beta 1, \beta 2, \beta 3..., \beta n$ are the parameters to be estimated, α is a constant term, and x is the influencing factor that affects the consistency of the adoption willingness.

Factors such as the impact of migration on human behavior, environmental change, and the built environment need to be considered to see whether they directly affect or have a mediating role.

Furthermore, since per capita disposable income is an important influencing factor, it is a controlling variable. Of course, there is no denying a mutual relationship between these. There is also a correlation between migration and disposable income. For example, migration is for better economic development or only for economic development.

Dependent variables: willingness to pay, recycling, frequency of saving energy, use of eco-products. The dependent variables varied in different surveys, but they are all related to PEB.

Combined with other studies[69], this study divided the independent variables into four components. Namely, relocation, demographic factors, internal factors, external factors, and situational factors.

Independent variables: from the main concern of this study, i.e., relocation experience or intention of relocate. The experience of moving during teenage period is also considered. And other studied factors in three to four groups.

Demographic factors: age, gender, income (the natural logarithm of household disposable income), occupation (non-agricultural, agricultural, unemployed-temporary, or permanent) (social status/ socio-economic status), education, religion and ethnicity, family structure (family life cycle/

marriage/ family size), number of children, and geographic location (area of residence).

Internal factors are psychological factors including values, beliefs, attitudes, emotions (happy, depress), interpersonal relationships, social interaction, life satisfaction, social capital (social trust, institutional trust, social networks, adherence to social norms), and environmental awareness. According to previous research[70], the question "frequency of social entertainment activities with friends" measures social interaction.

External factors: formal regulation, social norms, cultural taboos, environmental knowledge, and perception of environmental pollution.

Situational factors: building age, floor area, strata title(ownership), and health status.

Due to the large number of correlating factors, this study used the stepwise likelihood method for regression testing. The stepwise method was used to accurately test the factors even with a limited number.

Reliability tests were first conducted to ensure that the data for the study was available. Then a diagnosis of covariance between factors was performed to eliminate factors with high covariance and reduce independent variables. Correlation analysis was then performed to determine which factors were correlated with the dependent variable so that the correlated factors could be placed in the logistic regression model in the next step. In addition, a forward stepwise selection method that takes into account the likelihood ratio is used to ensure that influential independent variables are included in the calculations. Then, interactions between relocation and other independent variables were put into the regression model to check whether each interaction term had an effect on the regression model. Finally, a robustness test was performed to demonstrate that the model was reliable.

2.4 Data

In this study, main data source is from general social surveys in China, South Korea, and Japan. Also, some data comes from statistic center of the government or world professional statistic agencies such as the world bank, united nations.

In specific, CGSS-China general social survey, from: National Survey Research Center (NSRC) at Renmin University of China. KGSS-Korea general social survey, from: Survey Research Center of Sungkyunkwan University. JGSS-Japan general social survey, from the JGSS Research Center at Osaka University of Commerce.

Other materials used for discussion in this study are from national materials and international materials. Materials from Korea are reports of "Living in rural areas" from Ministry of Agriculture, Food and Rural Affairs, Return to farming program, and Korean statistical information service. Materials from Japan are Japan Regional Revitalization, database RESAS: regional economy society analyzing system, and Japan government Cabinet office. Materials from international are Migrant integration policy index 2020, The world bank, United nation environment program, emission gap report 2022, and Pew research center.

Table 2-1 General Social Survey in China, Korea, and Japan

	China	South Korea	Japan
Sample Population	Men& women Aged 18 or more	Men& women Aged 18 or more	Men& women Aged 20-89
Sampling method	Three-stage stratified random sampling	Three-stage stratified random sampling	Two-stage stratified random sampling
Fieldwork methods	Face-to-face interview	Face-to-face interview	Both face-to-face interview and placement
Frequency of original survey	Every year since 2003	Every year since 2003	Almost every year since 2000; every two years

			since 2006; two different questionnaires for placement
Investigator	National Survey Research Center (NSRC) at Renmin University of China	Survey Research Center of Sungkyunkwan University	JGSS Research Center at Osaka University of Commerce
Sample size	12,000-15,000	1,000-2,000	2,000-3,000

Chapter 3 Willingness to Pay for Quality Air and Circled Migration in China

Studies have demonstrated the positive impact of urbanization on reducing environmental pressure from the perspective of urbanization affecting pro-environmental behavior. Urban residents have a higher awareness of environmental protection than rural residents. People living in a city have less agreement with the air quality. This study is mainly a discussion of the willingness to pay for clean air, varying from having an urban living experience or not. This study discusses a particular context in China because farmers do not leave their hometowns and go to the cities but do not have urban Hukou benefits. To identify the differences in the willingness to pay for clean air among people with urban living experiences. This study conducts empirical tests based on the Chinese General Social Survey (CGSS) data. The resulting logistic model is statistically significant, city living experience is related to the willingness to pay for clean air, and people with city living experience are 1.2 times more willing to pay for clean air than people without urban living experience.

3.1 Introduction

The relationship between population and the environment is mutually influential, and demographic and household characteristics changes may have a more significant impact on energy emissions than technological changes. Especially in developing countries, where there is more change[68]. Occupants differences can explain 50% of the difference in energy consumption of buildings, and the impact of human differences in energy-efficient buildings is even more significant[71].

Studying the impact of migration on energy consumption in urbanization in developing countries is necessary.

Urban households have high carbon emissions, wealthy and middle-class carbon emissions are high[28], and cities can reach them because of the existence of multi-functional consumption spaces for various types of consumption. Some places engage in a broader range of activities. The availability of consumer space and the visual culture convince people to spend more money[27]. Live in the county center and small towns or cities are the most resource-intensive because these residents need less excitement than those living in the rural area. Transport can reach daily destinations. The car ownership of people living in the wilderness of the urban core, as the result of suburbanization, and the decline in public transportation outside the city limits their accessibility to excitements. The total transport carbon load is also high in capital regions and regional multi-purpose centers. Due to the long distance between the inner city and the edge. Residential choices are linked to lifestyle preferences, which can explain some of the gaps in consumption patterns—the differences and the carbon emissions that come with them.

Extensive research demonstrates that cities are highly carbon-emitting relative to rural areas and point to the ability of migration from rural to urban areas to promote environmentally friendly behavior.

In China, most of the migration or residential relocation occurs as people move from rural areas to urban areas. The presence or absence of urban living experience is more reflective than a change in Hukou or committee type.

In the context of China, it is worth mentioning significant instances of both passive and active migration throughout history. For example, the large-scale migration known as "filling Sichuan with people from Hubei and Hunan" aimed to populate and develop the Sichuan region. Another notable example is the population displacement caused by the construction of the Three Gorges Dam, which led to the relocation of millions of people. Furthermore, post-earthquake reconstruction efforts in regions like Sichuan involved extensive migration and resettlement initiatives. These historical migrations have shaped the demographic and socioeconomic landscapes of China.

This chapter primarily focuses on internal migration within China, examining the patterns, drivers, and impacts of population movements within the country. However, it is essential to consider the broader context of international migration and its interconnectedness with internal migration, as both types of migration contribute to the social, economic, and environmental dynamics of a region or country.

The relation migration brings about an increase in carbon emissions [5], the impact on carbon emission efficiency shows different effects, macro population urbanization, and carbon emissions there is a threshold effect and decoupling phenomenon. At the household level, whether the length of migration time shows a phased impact on carbon emissions. There is much discussion about migration and development. The relationship between migration duration and environmental awareness and behavior has not yet been studied regarding domestic migration and social development. This article is here to make up for this. Compared with the historical panel data of the China Comprehensive Social Survey, the general law is discussed, and the migration time has an impact on environmental awareness and behavior, and this influence has weakened or increased with the development process. An essential regulatory or mediating role played by educational attainment was observed. It cannot be denied that it is difficult to tell what happens first, the educational level,

and migration duration, but they are all related to environmental awareness and environmental behavior.

Contained the residential relocation situation and information on household energy consumption, CGSS[72] data was chosen to prove this.

From Figure 3-1 shows the difference between whether people have an urban living experience (UL) or not.
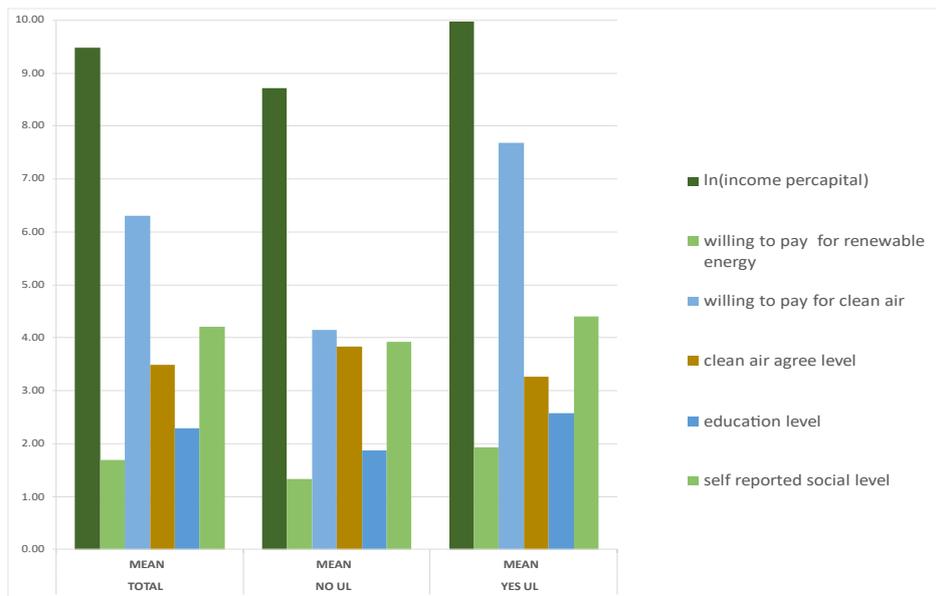
Figure 3-1 Descriptive Statistics

3.2 Urban-Rural Difference in China

The urban-rural disparity has had various impacts on China, including in terms of household energy consumption, carbon emissions, life satisfaction, and health conditions.

In terms of household energy consumption, there are notable differences between urban and rural areas[73]. Studies have found variations in residential energy consumption across different stages of urbanization[74], where a 1% increase in urbanization is associated with a 2.9% and 1.1% increase in direct and indirect household carbon emissions, respectively[26]. This suggests that increasing urbanization levels may lead to higher energy consumption and carbon emissions by urban households[29]. Additionally, there are differences in energy-saving behaviors between urban and rural residents, influenced by various factors[75].

Research indicates that carbon emissions are generally higher in urban areas compared to rural areas[76]. Within the process of urbanization, carbon emissions increase at a faster rate within urban regions. Moreover, China has a relatively low per capita carbon footprint, but the fastest growth is observed among the affluent upper-middle class in urban areas[28]. This highlights the impact of urbanization on carbon emissions[77].

Furthermore, internal migration has been a significant factor influencing carbon emissions. Studies have shown that the positive impact of internal migration on carbon emissions can outweigh the effects of net population growth[78]. This implies that population migration from rural to urban areas can contribute to reducing carbon emissions to some extent.

Regarding health conditions, there is some inconsistency in research findings. Some studies suggest that individuals who have experienced migration in China tend to have poorer health conditions[79], although this may be attributed to sample limitations or other factors. However,

another study has found the opposite conclusion, associating migration to cities or the transition from rural to urban household registration with lower levels of depression among older adults[80].

In conclusion, the urban-rural disparity affects household energy consumption, carbon emissions, life satisfaction, and health conditions in China. Further research is needed to gain a deeper understanding of these disparities and their implications for Chinese society and the environment.

3.3 Data

A newly published national survey conducted in China, the China Comprehensive Social Survey (CGSS), was used. The first round of CGSS was launched in 2003. The 2018 CGSS primary survey covered 12,787 households from 29 provinces, municipalities directly under the central government, and autonomous regions Households, which are energy modules, cover 4147 households. After controlling for the missing values, the final valid sample in this study analysis was 2245. 873 samples have no urban living experience, and 1372 samples have urban living experience. Several comparative advantages of using this general survey data are as follows: First, this study can use a larger sample size. Despite the small size of the energy module, the effective samples are still significantly higher than most existing studies. Second, associations with general surveys provide richer information about personal characteristics, allowing this study to test different settings. It comprehensively covers the details of household energy consumption. Therefore, it is the perfect data set to solve this study problem.

Table 3-1 Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
WTP-A	4147	0.45	0.498	0	1
UL	4091	0.61	0.487	0	1
Age	4147	51.93	16.811	18	118
Marriage	4147	0.75	0.433	0	1
Gender	4147	0.54	0.498	0	1
GD	4010	3.47	0.687	2	5
Attitude	3999	3.72	0.833	1	5
EUP	4017	3.71	0.619	2	5
Air quality	4122	3.50	1.109	1	5
Education	4147	2.45	1.101	1	5
Energy policy understanding	4136	1.73	0.739	1	5
Social status	4102	2.29	0.855	1	4
Income	4108	2.58	0.722	1	5
Household income	3784	10.29	2.192	0	15.94
Car ownership	4147	0.28	0.455	0	2
Investment	4147	0.09	0.306	0	2
Trust	4131	3.54	1.005	1	5
Health	4144	3.53	1.089	1	5

	N	Mean	Std. Deviation	Minimum	Maximum
Happy	4145	3.88	0.824	1	5
Depressed	4139	2.14	0.969	1	5
Employment	4147	3.21	1.411	1	6
Local	4115	1.33	0.498	1	3
Hukou in four types	4144	1.78	1.041	1	4
Living community	4147	0.70	0.458	0	1

3.4 Results

The results are consistent with previous studies: urban living experience significantly increases people's income, and the average age of people with urban living experience is younger than those who do not have it.

Among those with urban experience, there is an inconspicuous positive correlation between the length of time they live in the city and their willingness to pay for clean energy.

This study uses binary logistic regression analysis to calculate the profit of willingness to pay for clean air.

The first step is correlation checking.

The following factors were concluded to be related to the willingness to pay： Total household expenditure for the whole family in 2017, Household income per capita, birth year, Since the age of 14, the total amount of time spent in the city in years, Families spend an average of time in the dwelling each week and some other factors. Dummy variable and ordinal variables are showed in Table 3-2.

Table 3-2 Variables Used in Estimations

Variables	Type
UL-Ever lived-in urban are	Dummy
Average knowledge of energy policy	Ordinal
Average awareness of pollution caused by energy use	Ordinal
Agreement on the air quality in the living area	Ordinal
An evaluation of the happiness	Ordinal
The evaluation of one's social class	Ordinal

The second step is to check the collinearity between the dependent variables.

The third step is to perform binary logistic regression analysis.

Table 3-3 Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 10	Step	4.326	1	0.038
	Block	268.620	43	0.000
	Model	268.620	43	0.000

Omnibus Tests of Model Coefficients is a composite test of model coefficients. The Model line outputs the likelihood ratio test junction of whether all parameters in the Logistic regression model likelihood ratio test are 0. P<0.05 indicates that there is at least one variable OR in the variable included in the fitted model. The values have a statistical meaning, that is, the model has a meaning. It is shown in Table 3-3.

Table 3-4 Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
10	11.008	8	0.201

The Hosmer and Lemeshow Test is a test of the goodness of fit of a model. When the P value is not less than the test level (that is, P>0.05), the information in the current data is considered to have been fully extracted, and the model fit is high. It is shown in Table 3-4.

Table 3-5 Classification Table

Observed			Predicted		Percentage Correct
			Willingness to pay		
			no	yes	
Step 10	Willingness to pay	no	471	496	48.7
		yes	306	972	76.1
	Overall Percentage				64.3

    a. The cut value is 0.500.

The ratio of observations predicted to be "yes" to the number of observations that are "yes" is sensitivity. In this study, 76.1% of the study subjects who were willing to pay were predicted to be willing by the model. The proportion of observations predicted to be "none" to the number of observations that are actually "none" is the specificity. In this study, 48.7% of study subjects who did not have an intention to pay were predicted by this model. Similarly, the willingness forecast value (972/ (972+496) = 66.2%) sum can be calculated Involuntary predictions (471/ (471+306) = 60.6%). It is shown in Table 3-5.

This study employed binary logistic regression to examine the influence of factors such as age, urban living experience, awareness of pollution caused by energy use, and understanding of energy conservation policies on the likelihood of having a willingness to pay (WTP) for clean air. The Box-Tidwell method was utilized to assess the linear relationship between a continuous predictor and the logit-converted dependent variable. The logistic model resulting from the analysis was found to be statistically significant.

Specifically, the analysis revealed that urban living experience is significantly associated with WTP for quality air. Individuals with urban living experience were found to be 1.2 times more likely to have a willingness to pay for clean air compared to those without urban living experience. The detailed findings and numerical values are presented in Table 3-7 as part of the comprehensive table included in the study.

Among respondents expressing an intention to pay for quality air, there is a trend where willingness to pay (WTP) increases and then decreases as age decreases. This suggests that younger individuals are more likely to have a higher WTP. Additionally, people residing in cities tend to exhibit a greater willingness to pay for quality air compared to those in rural areas.

The probability of WTP is positively correlated with education level, social strata, and agreement that the government needs to take more action. Higher education, higher social strata, and stronger

agreement with government action are associated with a higher likelihood of WTP.

Income level also plays a role, with individuals with higher incomes showing a greater willingness to pay compared to those with lower incomes.

Happiness also influences WTP, as happy respondents tend to be more willing to pay for quality air.

Furthermore, women exhibit a higher propensity to pay compared to men, and married respondents show a greater likelihood of WTP compared to unmarried respondents.

In summary, the factors influencing WTP for quality air include age, city residence, education level, social strata, agreement with government action, income level, happiness, gender, and marital status.

Respondents with jobs are more willing to pay. It shows the following.
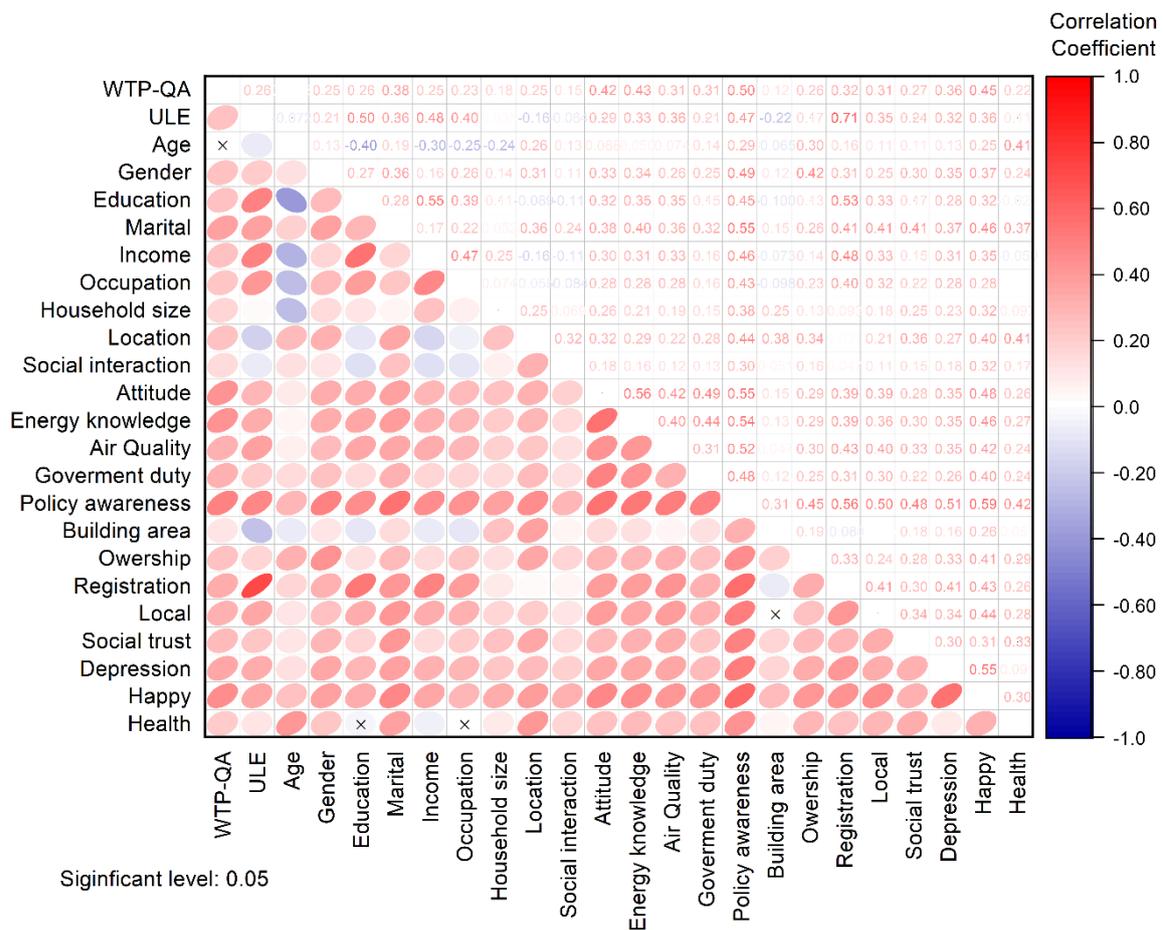
Figure 3-2 Correlation of Variables Concerning WTP-QA

Prior to using binary logistic regression, a classification tree model was utilized to gain a comprehensive understanding of the data. Details can be seen from Figure 3-3.

Table 3-6 Classification of WTP-QA

Classification		
Observed	Predicted	

	No or unsure	Yes	Percent Correct
No or unsure	1674	597	73.7%
Yes	1071	805	42.9%
Overall Percentage	66.2%	33.8%	59.8%

Growing Method: CHAID

Dependent Variable: D willing to pay for quality air

Figure 3-3 illustrates the factors influencing the willingness to pay (WTP) for quality air among 4,147 respondents. Out of the total respondents, 45.2% expressed a willingness to pay for quality air. The most influential factor was the respondents' attitude toward the environment. Among those with a cheerful outlook, 51% showed a willingness to pay. Furthermore, respondents who agreed that energy use causes pollution had a higher likelihood of WTP (54%), while those who disagreed had a lower chance (41.1%).

When considering age, respondents under 28 had the highest probability of WTP (64.8%). Those aged between 28 and 56 also had a higher chance (45.3%), but respondents over 56 had a lower likelihood (31.8%). Household income also affected WTP among respondents who agreed that energy use causes pollution. Respondents with above-average income showed a WTP probability of 65.7%, while those with below-average income had a probability of 49.0%.

Additionally, even among respondents with a positive attitude toward the environment, their knowledge about the impact of energy use on pollution influenced their WTP. Moreover, income had a positive impact on WTP, while age had a negative impact among those who disagreed that energy use causes pollution.

Respondents with a negative attitude had a 32.9% chance of expressing WTP. Household income further affected their WTP likelihood. High-income respondents had a higher chance of WTP, and middle-income respondents under the age of 47 also had an increased probability (44.3%). Among low-income respondents, those with an attitude toward the government had a higher likelihood of WTP (24.3%) compared to those without (5.9%). In summary, income, age, and attitude toward the government were identified as factors that could influence the WTP among individuals with a negative attitude toward environmental issues.
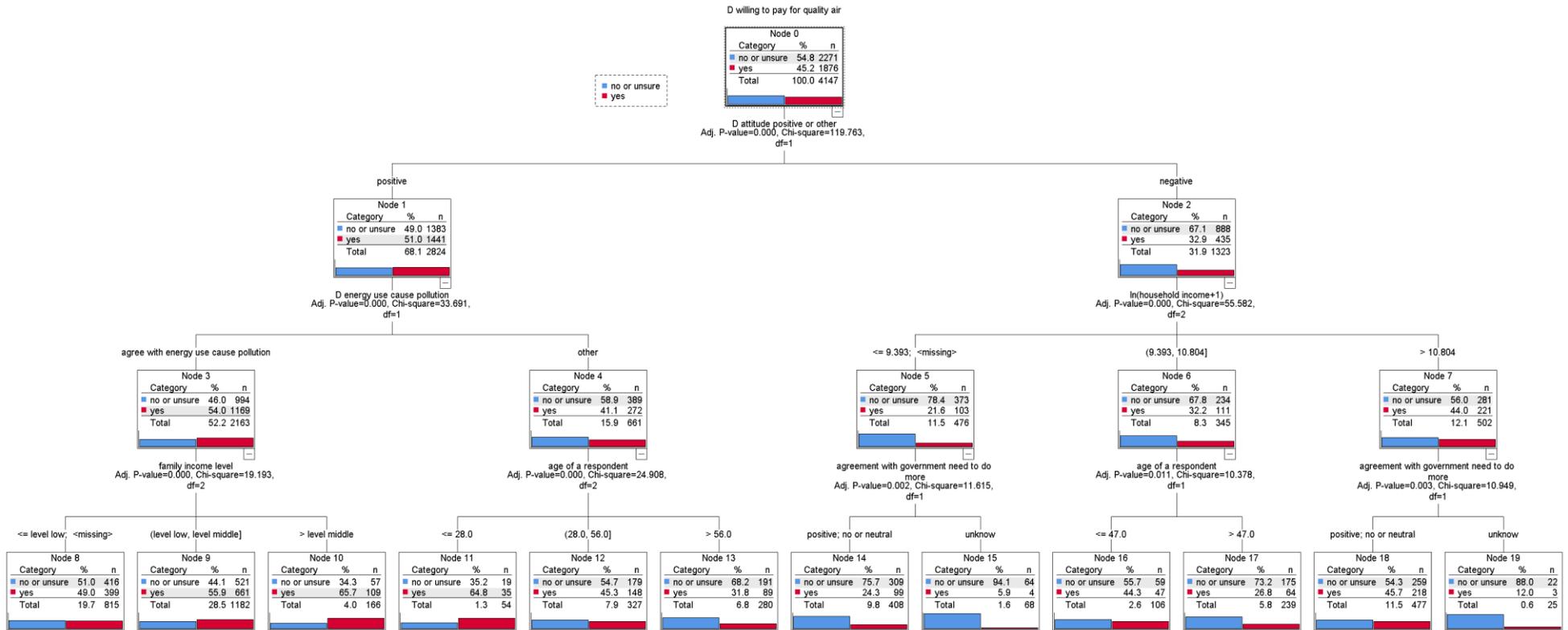
Figure 3-3 Tree Diagram of WTP-QA

Table 3-7 Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Utensils and recreation	0.019	0.007	8.092	1	0.004	1.019	1.006	1.033
Birth year	0.011	0.003	13.141	1	0.000	1.011	1.005	1.017
Urban living experience	0.206	0.099	4.334	1	0.037	1.228	1.012	1.491
Constant	19.908	5.928	11.277	1	0.001	0.000		

Variable(s) entered on step 10: Have urban living experience since the age of 14.

Table 3-8 Logistic Regression of Variables on Willingness to Pay

	Model 1		Model 2		Model 3	
Variable	B	Odds ratio	B	Odds ratio	B	Odds ratio
Constant	-1.06		-1.14		-1.01	
Urban living experience(1=yes)	-		0.22*	1.25	0.24*	1.27
Energy using cause pollution (Ref. "disagree")						
Neither agree nor disagree	0.40	1.49	0.37	1.45	0.31	1.36
Agree	0.78**	2.19	0.74**	2.10	0.65**	1.92
Strongly agree	0.60*	1.83	0.55*	1.73	0.46	1.59
Cannot answer	-0.49	0.61	-0.50	0.60	-0.32	0.72
Social strata level (Ref. "Lower strata")						
Lower middle	0.42***	1.53	0.39***	1.48	0.40***	1.49
Middle strata	0.57***	1.77	0.54***	1.72	0.54***	1.72
Upper and upper middle	0.66***	1.93	0.61***	1.84	0.58***	1.79
Do not know	-0.15	0.86	-0.16	0.85	-0.19	0.83
Scarify money to protect environment (Ref. "strongly disagree")						
Disagree	0.15	1.16	0.11	1.11	0.07	1.08
Neither agree nor disagree	0.01	1.01	-0.02	0.98	-0.03	0.97
Agree	0.49	1.63	0.44	1.56	0.36	1.43

Variable	Model 1 B	Model 1 Odds ratio	Model 2 B	Model 2 Odds ratio	Model 3 B	Model 3 Odds ratio
Strongly agree	0.77*	2.15	0.73	2.07	0.61	1.84
Cannot answer	-0.62	0.54	-0.63	0.53	-0.24	0.79
Age group (Ref. "<= 29")						
30 - 39	-0.39**	0.68	-0.37**	0.69	-0.37**	0.69
40 - 49	-0.27*	0.76	-0.22	0.80	-0.21	0.81
50 - 59	-0.59***	0.55	-0.52***	0.59	-0.51***	0.60
60 - 69	-0.75***	0.47	-0.69***	0.50	-0.71***	0.49
70+	-0.67***	0.51	-0.63***	0.54	-0.66***	0.52
Government needs to do more (Ref. "disagree")						
Neither agree nor disagree	-		-		0.10	1.11
Agree	-		-		0.20	1.22
Strongly agree	-		-		0.43*	1.54
Cannot answer	-		-		-1.08*	0.34
Air quality is good (Ref. "strongly disagree")						
Disagree	-		-		-0.04	0.96
Neither agree nor disagree	-		-		-0.24	0.78
Agree	-		-		0.14	1.15
Strongly agree	-		-		-0.11	0.89
Cannot answer	-		-		-0.59	0.55
Education (Ref. "take no education experience"						
Have a primary school or middle school education	-		-		-0.21	0.81
Have a high school education	-		-		-0.32*	0.72
Short time college education	-		-		-0.03	0.97
University education or above	-		-		-0.02	0.98
Nagelkerke pseudo r^2	10.1%		10.4%		11.7%	
x^2	293.9, df=18, P<0.000		303.1, df=19, P<0.000		342.5, df=32, P<0.000	

3.5 Discussion and Conclusion

There is a significate impact on willingness to pay for clean air among people who have urban living experience or do not have urban living experience. Nevertheless, this study does not involve undercover the mechanical how urban living experience works. The experience of urban life may represent income, education, energy use patterns, understanding of energy policies, et al. Also, CGSS is panel data covering a wide range of areas, avoids sampling defects, but is somewhat insufficient for studying dynamic differences. Although there are still more than 2,000 valid samples to ensure the statistical analysis's reliability, there is likely some unknown factor hidden in this.

Further research needs to use longitudinal data and combine ethnological methods; this study can further grasp the interaction between changes in social norms caused by migration on energy demand and energy conservation behavior.

Chapter 4 Comparison of Willingness to Pay for Quality Air and Renewable Energy Considering Relocation in China

Currently, quality air and renewable energy are main concerns in protecting the environment. Comparing willingness to pay for quality air and renewable energy is rare in the existing literature. However, the public faces these issues simultaneously. In addition, population mobility under China's household registration system, i.e., urban living experience, may affect the willingness to pay for environmental protection. Consequently, the difference between people's willingness to pay for quality air and renewable energy in China is discussed. Binary logistic regression is adopted to analyze the correlation factors based on data from the China General Social Survey. The results show that willingness to pay is influenced by environmental attitudes, awareness of energy use, government responsibilities, age, household income level, and trust. The effects of urban living experience on willingness to pay weakens as age decreases. Thus, improving environmental awareness and specialized knowledge remain important means of promoting willingness to pay. This study's findings can help marketers and policy designers develop balanced or targeted measures when taking joint actions.

4.1 Introduction

The study of human intentions and behavior has always been a hot topic in energy conservation and mitigation. Ali et al. point out that urbanization is positively correlated with carbon emissions and that carbon emission reductions without affecting industrialization can be achieved through applying clean technologies[81] and using renewable energies[67]. Policymakers should introduce effective regulation to encourage financial development and innovation measures in the clean energy sector to offset environmental damage[82]. Surveys of the public's willingness to pay are a common basis for evaluating policies[83]. Breathing fresh air and using renewable energy are immediate needs and requirements. It is necessary to consider the willingness to pay for both at the same time.

Many studies focus on social and environmental interactions. This paper focuses on a comparative study of willingness to pay for quality air (WTP-QA) and willingness to pay for renewable sources electricity (WTP-RE) in the Chinese context.

China accounts for 18 percent of the world's population. China has the largest amount of carbon dioxygen emission[84], and it has undergone rapid urbanization over the past decades and has continued to grow[85]. According to National Bureau of Statistics of China, at present, there are 250 million intra-provincial floating population and 124 million inter-provincial floating population in China (The floating population refers to the population whose place of residence does not coincide with the registered place of residence and who have left the registered place of residence for more than six months.)[86]. In China, most of the migration or residential relocation occurs as people move from rural areas to urban areas. Such massive energy consumption and urbanization rate, as well as massive populating movements, make China a key concern for the world to reduce carbon emissions.

In the context of China's urban-rural dual structure, urban Hukou means higher explicit and implicit benefits such as education, working income, pension, and medical care[87]. Since the introduction of the Hukou in 1958, access to urban living experience (movement of persons with rural Hukou to the city) has been strictly controlled. With the initiation of economic reforms in 1978, China has gradually implemented the reform of the household registration system and relaxed the restrictions on the movement of people from rural to urban areas in small and medium-sized cities[88]. Large cities such as Beijing and Shanghai have strict restrictions on settlement, such as the adoption of points-based settlement, which is only open to limited highly qualified people[89,90]. The impact of the household registration system is still very significant[91]. It is difficult to accurately characterize Chinese mobility using hukou or household registration place. Using 2006 survey data, Hu et al. found that permanent rural migrants were less than 1/10th of circular migrants[92]. After 10 years of development, the gap between permanent and circular migrants narrowed, with permanent migrants accounting for 30% of the total and circular migrants still in the majority[93]. This leads to the fact that using whether one now lives in an urban or rural community to describe China's population movements is also not accurate. This is coupled with the environmental behavioral perspective that past experiences have an impact on human behavior. Therefore, this study proposes to describe Chinese mobility in terms of urban living experience(ULE) and examine whether it is related to willingness to pay for environmental protection.

Similar to other studies on lived experiences[94–96], the influence of past experiences on present behavioral intentions is discussed, while, slightly different from them, the urban living experiences in this paper focuses more on whether there is rural to urban movement, i.e., population mobility. The proposal to use urban living experience belongs to the innovation of this paper.

Other contributions of this study include the use of national-level statistics to explore willingness to pay, extending the scope of existing research. The similarities and differences in willingness to pay for quality air and renewable energy are compared. And this study also explained the above differences.

The rest of this article is arranged below. The second part is literature review and hypotheses. The third part is surveys, data, and methods. The fourth part is the results of the study. Part five and six

contain discussion and conclusion.

4.2 Literature Review and Hypotheses

Interdependent metatheory assumes that human action is continually created, reinforced, or eroded by experiences and other factors[54]. Lewin's Equation points out that behavior is environmental decided[17], although people tend to stick to their past patterns[19], such as the saving behaviors of the past will be carried over to the new environment[55], residential relocation or considering relocation offer an opportunity to reform their behavior[18,20,21], according to habit discontinuity theory. There is a complex relationship between attitudes, habits, and behavior change. According to the planned behavior theory, attitudes are an important starting point for habit change[57]. The above studies illustrate that human behavioral intentions are influenced by environmental changes.

Changes have been found that migration impact on energy consumption[22], transportation[23], and prosocial activities[24]. Population mobility is related to carbon emissions. The use of urban living experience to describe population mobility in China, which has been demonstrated in the previous chapter, is very rare in available studies on behavioral intentions.

At the same time, carbon emissions are higher in cities than in rural areas[26,28,29] and show regional differences[15,25,27]. Urban citizens are more willing to pay for environmental protection than rural villagers[15,25].

In different parts of China, residents' willingness to pay is influenced by environmental perceptions and other factors, showing regional differences[15].A survey of residents in China's first-tier cities for recycling garbage showed that residents are willing to pay, but the cost is low[16].Different spatial distribution of people have different energy consumption patterns, because people's lifestyles determine where they live[27]. Fear of waste promotes sustainable behavior in people's use of electricity[97]. Chinese people are frugal and not wasteful, and they are especially frugal in rural areas where resources are poor. These studies conclude that carbon emissions, environmental awareness, and willingness to pay vary from place to place. So, how will people's willingness to pay change after their movement experience?

Hypothesis 1: Urban living experience influences people's willingness to pay for quality air.

Hypothesis 2: Urban living experience influences people's willingness to pay for renewable energy.

The main theoretical basis for the study of willingness to pay is the theory of planned behavior and an extended theory of planned behavior that consider various factors[98–102]. The study of willingness to pay has involved environmental protection[8,9], pollution prevention[14], garbage recycling[16], renewable energy[5–7,10,11], quality air[9,13,26,103,104], ecological consumption[15], and urban parks[12], etc., and the factors affecting the willingness to pay include social-demographic characteristics, such as gender, age, income, education, professional status, household size, marital status, health, happy. It is also affected by attitudes, specific knowledge, payment experience, political trust, pollution, green energy conviction, environmental awareness, cost, social norms, etc.. Living experience is seldom studied in the field of WTP.

Zhang et al. state air pollution would increase willingness to pay for environmental protection in China, while locals do not show differences because they are used to local pollution[9]. Guo et al. also state air pollution is a determinant factor to WTP-QA in China[105]. An empirical estimation in Pakistan points to the effect of political trust and health on WTP-QA[13]. Wang et al. state that governmental credibility regarding air pollution prevention also influence WTP-QA[106]. One reason for the reluctance to pay for quality air is the perception that air quality is a social responsibility, not an individual issue[107], or NIMBY syndrome(not in my backyard public attitude)[104]. Together, these studies point to air quality as being more of a public good at some distance from everyday life.

As for WTP-RE, suffering from electricity shortage[5,101] or investment in renewable energy is

influential[5]. The type of renewable energy used to generate electricity can also make a difference in WTP-RE[108,109]. A study in Lithuania points out that WTP-RE has little to do with environmental issues, but environmental issues have an indirect effect on willingness to pay[110]. Along with WTP-QA, government involvement and awareness of benefits influence WTP-RE[111]. WTP-RE is more biased towards private sphere experiences and perceptions than WTP-QA.

Few studies have looked at two different willingness to pay at the same time, conducting comparative studies. Although there are studies of differences in willingness to pay between urban and rural populations, these are static studies. Studies comparing locals and nonlocals have mostly focused on a particular region, mainly in urban areas. There are also a few studies that have looked at the impact of people's past migration experiences and life experiences on their willingness to pay.

Environmental concerns are general attitudes and have different effects on different environmental behaviors. Because determining a particular environmental behavior is determined by specific situational cognition[112]. So, respondents may show different preferences for quality air and renewable energy payments.

Hypothesis 3: Willingness to pay for renewable energy is different from willingness to pay for quality air.

4.3 Materials and Methods

4.3.1 Survey

CGSS [72] data was chosen for this study, because it contained the residential relocation situation and information on household energy consumption.

A newly published national survey conducted in China, the China General Social Survey (CGSS), was used. The first round of CGSS was launched in 2003. The 2018 CGSS primary survey covered 12,787 households from 29 provinces, municipalities directly under the central government; and autonomous region households, which are energy modules, covered 4147 households.

Several comparative advantages of using this general survey data are as follows: First, a larger sample size could be used. Despite the small size of the energy module, the effective samples are still significantly higher than most existing studies. Second, associations with general surveys provide richer information about personal characteristics, allowing this study to evaluate different settings. It comprehensively covers the details of household energy consumption. The questionnaire of CGSS is used worldwide, and thus, reliability and authority of the data are ensured.

After controlling for the missing values, the final valid sample size in this study analysis was 3734. Among them, 1459 samples have no urban living experience, and 2275 samples have urban living experience.

Of those, 46% are male and 75% are married. Respondents averaged about middle school of education and 52 years of age. Descriptive statistics are listed in Table 4-1.

Table 4-1 List of Variables and Descriptive of Statistics

variables		Mean	Std.dev	Min	Max
WTP.QA	Dummy variable: 1 if willing to pay for quality air	0.45	0.50		
WTP.RE	Dummy variable: 1 if willing to pay renewable energy	0.48	0.50		
Age	Continuous variable: age of a respondent	51.93	16.81	18	118
Gender	Dummy variable: 1 if female	0.54	0.50		
Marital status	Dummy variable: 1 if married	0.75	0.43		
Education	Continuous variable: education years	8.63	4.88	0	19
Household size	Discrete variable: number of households' members.	2.78	1.33	1	6
Income	Continuous variable: ln (household last year income+1)	10.29	2.19	0	15.94
Employment	Categorical variable: employment economic active from 1 to 6. 1=student, unemployment, retired with no money; 2=no work income but has other income; 3=only farming income; 4=private employee; 5=state employee or retired from it; 6=entrepreneur.	3.21	1.41		
Car	Dummy variable: 1 if household have car	0.28	0.45		
Income Level	Ordinal categorical variable: 1=family income level low; 2=middle; 3=level high.	1.64	0.60	1	3
ULE	Categorical variable: 1=never living in urban; 2=having rural and urban living experience; 3=always living in urban.	1.94	0.84		
Air Quality	Ordinal categorical variable: 1=air quality is bad; 2=neither bad nor good; 3=air quality is good.	2.40	0.87	1	3
Government Duty	Categorical variable: 0=disagree with government need to do more; 1=agreement with government need to do more; 99=do not know1.	0.48	0.50		
EPU	Ordinal categorical variable: 1=do not understanded energy policy; 2=neutral; 3=understanding energy policy.	1.15	0.40	1	3
D.EUP	Dummy variable: 1 if agree with energy use cause pollution	0.66	0.47		

variables		Mean	Std.dev	Min	Max
Attitude	Dummy variable: 1 if attitude positive	0.68	0.47		
Trust	Dummy variable: 1 if trust	0.66	0.47		
Depressed	Dummy variable: 1 if depressed	0.33	0.47		
Happy	Dummy variable: 1 if happy	0.79	0.41		
Health	Dummy variable: 1 if health	0.58	0.49		
Hukou	Categorical variable: 1=agricultural; 2=nonagricultural; 3=uniformed used to be agricultural; 4=uniformed used to be nonagricultural.	1.78	1.04		
Unit	Dummy variable: 0=village committee; 1=city committee	0.70	0.46		
Local	Categorical variable: 1=born local; 2=moved here; 3=nonlocal	1.33	0.50		

Notes: in these descriptive statistics valid answers are not counted.

[1]:137 respondents' opinion on government were not tolled. In these statistics this part is not counted in mean value and St. Deviation value. But as government duty is a key factor, the unknown answer of government duty is taken as one of the categories when doing binary logistic regression.

4.3.2 Measures

3.2.1. Willingness to Pay

Common methods for measuring WTP are experimental, direct, or indirect surveys, in which contingent valuation methods are widely used. Double-bounded dichotomous choice and open-ended measures are commonly used for WTP elicitation formats [113]. CGSS asked, "How much money are you willing to pay per month to ensure an increase of 1 day per month in the number of days with good air quality in 2018?" This is an open-ended measure. These questions were asked two more times assuming increases of 3 or 5 days. This open-ended question allowed respondents to state their specific WTP. Their answers varied from RMB 0 to 3050, and 754 respondents refused to answer or chose unsure how much to pay.

From Table 4-2, reveals the statistical information for different payment willingness. For households that were willing to pay for quality air and reported income (N = 1577, excluding values greater than 5 standard deviation), their yearly household income has an RMB 87900 mean value. The average cost paid for quality air was 195.81 RMB/month. $y = 6.01x + 15.513$, $R2 = 0.9992$; the formula was calculated based on respondents' responses to the three questions of willingness to pay for quality air. CGSS asked, "By now, every 100-kWh household electricity has 7 kWh produced from renewable energy sources. How much money are you willing to pay to increase your monthly electricity to 10 kWh using renewable energy sources every 100 kWh?" It is an open-ended measure. These questions were asked two more times assuming increases of 15 or 20 kWh. Their answers varied from RMB 0 to 1000, and 795 respondents refused to answer or chose unsure how much to pay.

Also, in Table 4-2 reveals the statistical information for different payment willingness. For households that were willing to pay for renewable energy generation and reported income (N = 1561, excluding values greater than 5 standard deviation), their yearly household income has an RMB 83,203 mean value. The average monthly electricity consumption was 156.94 kWh. According to the 14th Five-year Plan for Renewable Energy Development, published by the National Development and Reform Commission of China [114], in 2030, the proportion of non-fossil energy consumption will reach about 25%. If 25% of household electricity is generated from renewable sources, that is 39.23 kWh, they are willing to pay RMB 45.94 more per month. $y = 0.807x + 14.744$, $R2 = 0.9999$; the formula is calculated based on respondents' responses to the three questions of willingness to pay for renewable energy.

The results in Table 4-2, 47% of the respondents showed a willingness to pay for renewable energy, while 43% expressed a willingness to pay for high-quality air, slightly less than the former. In terms of the payment amount, the average value for paying for high-quality air is higher, with an average payment of approximately 28 Yuan per month for one day of high-quality air. The average payment for increasing renewable energy generation from the current 7 kilowatt-hours out of 100 kilowatt-hours to 10 kilowatt-hours out of 100 kilowatt-hours is approximately 24 Yuan, with a payment willingness of 8 Yuan per kilowatt-hour, which is several times higher than the average electricity price in China at that time. Therefore, it appears that respondents have a higher willingness to pay for renewable energy generation rather than for quality air.

When multiplied by the corresponding proportion of respondents with payment willingness, the average payment willingness for the entire sample population, WTP-RE (Willingness to Pay for Renewable Energy) and WTP-QA (Willingness to Pay for High-Quality Air), is obtained as 11.24 yuan and 11.85 yuan, respectively. The difference between the two values is not significant, with WTP-QA slightly higher.

Table 4-2 Descriptive Statistics of Payments

Descriptive Statistics		Payment willingness for clean energy generation per 100 kilowatt-hours of electricity			Payment willingness for the number of days with high-quality air per month		
		10 kWh	15 kWh	20 kWh	1 day	3 days	5 days
N	Statistic	1956	1949	1956	1772	1801	1833
(above0)	Percent	47.17%	47.00%	47.17%	42.73%	43.43%	44.20%
Minimum	Statistic	0.10	0.05	0.05	0.10	0.10	0.10
Maximum	Statistic	1000.00	1000.00	1000.00	2080.00	1000.00	3050.00
Sum	**Statistic**	**46602.73**	**54232.25**	**64279.82**	**49144.30**	**68573.80**	**94726.00**
Mean	**Statistic**	**23.83**	**27.83**	**32.86**	**27.73**	**38.08**	**51.68**
	Std. Err	1.72	1.69	1.81	1.85	1.82	2.89
Std. Dev	Statistic	76.24	74.54	80.17	77.78	77.06	123.89
Variance	Statistic	5812.44	5556.26	6427.51	6049.63	5937.91	15348.97
Skewness	Statistic	10.93	10.55	9.40	14.43	5.91	10.52
	Std. Err	0.06	0.06	0.06	0.06	0.06	0.06
Kurtosis	Statistic	134.61	131.14	106.44	311.84	51.65	201.35
	Std. Err	0.11	0.11	0.11	0.12	0.12	0.11
Mean (N=all, 4147)		**11.24**	**13.08**	**15.50**	**11.85**	**16.54**	**22.84**

Counting only the willingness to pay and wages will result in a large sample loss. Therefore, binary logistic regression was used to consider samples with no willingness to pay and uncertain samples at the same time to explore the differences.

In this research. Having will or not, i.e., a choice, was studied for three reasons: First, there is a huge gap between having or not having an intention; thus, even some people answered only a small amount of money, which is different from others that said no or not sure. Second, China is a developing country, although it has megacities that are as developed as other developed countries, but throughout China, people share a low average GDP. Combined with the regional price differences, the same amount of money has a different value; thus, comparing this amount does not fit this study research aim. Thirdly, among 4147 respondents, 754 answered unknown or rejected to answer WTP-QA, and 795 respondents answered unknown or rejected to answer WTP-RE. Three groups of people were set: group W with a willingness to pay, who answered an exact amount of money above zero; group UW contained those that answered zero and have no willingness to pay; and group UC contained those that answered unknown or rejected to answer, such that their willingness was not certain. Group UC was half as large as the unwilling group (UW). After running the Bonferroni's multiple comparisons test, this study found that group UW and UC shared many similarities in many ways, and they are both different from group W. Eventually, the UC group and the UW group were combined to form a binary variable with the W group for WTP. Through this, this study contained as many respondents as possible.

The aim of this study is to explore the relationship between urban living experience and willingness to pay. Migration in China is a cross-province movement; thus, the differences in different province were not considered.

Intention to pay was low, with 54.8% giving a negative or no response. Figure 4-1 plots the results of how many people are willing to pay by age group, urban living experience and other categories. Overall, the 18–29 years age group had the highest aspirations, with 58.0% of respondents indicating an intention to pay for quality air, which gradually decreased with age. The overall trend is that as the age decreases, people in cities experience more willingness to pay.
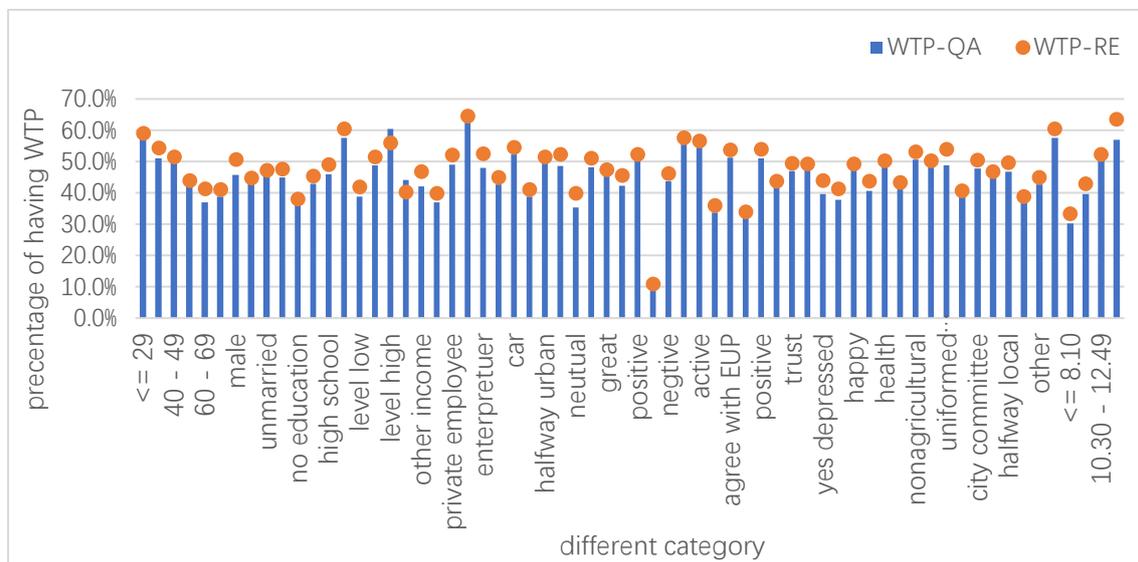
Figure 4-1 Line Chart of Percentage of WTP-QA and WTP-RE in Each Category

WTP possibility declines with age, with respondents below 30 declaring the highest possibility. Possibilities rise with education, social strata, and agree that government needs to do more. People with high incomes are more willing to pay than people with lower incomes. Happy respondents are more willing to pay. Women are more unwilling to pay than men. Married respondents are more

willing to pay than unmarried respondents. People with jobs are more willing to pay. Only 10% of people in the category of having no idea about the government's duty showed willingness to pay. Low-income respondents showed little willingness to pay.

3.2.2. Urban Living Experience

China is one of the few countries in the world that still has a Hukou system, and despite the issuance of the Hukou Reform in 2014, the social benefits behind the Hukou have not completely changed [88].

Having urban living experience has a lot to do with Hukou. However, with the change in the management of the migrant population, the urban living experience and Hukou relationship are different.

There was a significant difference between the type of household registration and whether the respondents' residence belonged to a village committee or a city committee (Figure 4-2b). Among the locals surveyed, the largest number of people had agricultural Hukou (Figure 4-2c), while most of the locals lived in city committees (Figure 4-2a). Most of them are concentrated in city committees, indicating that the direction of population movement is concentrated in city committees. There is an intersection between these classifications, and one cannot simply divide the urban and rural populations by registration or place of residence. Likewise, the local or non-local division does not reflect the direction of respondents' mobility (Figure 4-2a,c). However, using the presence or absence of urban living experience, and the three categories: respondent with no urban living experience, respondent with rural and urban living experience and respondent with only urban living experience, could include all respondents who have moved or worked from rural to urban areas.

The population flow here considers the flow of population from rural to urban in line with most of China's conditions, plus the rural-to-urban flow is periodic and incomplete, and the division of urban experience blurs the boundaries, focusing on exploring the experience of mobility, moving, and living in a different place.

CGSS asked "How many years have you been in the city from 14 years old?". Answers varied from 0 to 99, in which 99 means do not know, 98 is refused to answer, 97 means have always been in the city, 96 means never lived in the city. In total, 56 respondents chose not to answer the question. This study categorized those who answered 0 and 96 as the group with no urban living experience, 97 as the group that has been living in the city, 98 and 99 were discarded from the sample, and the other numbers from 1–95 were the group that lived in the city halfway. The variable of urban experience is classified into three groups.

(a) Autonomous organizational unit of residential place BY residence situation in the interviewed place

(b) Autonomous organizational unit of residential place BY four types of Hukou
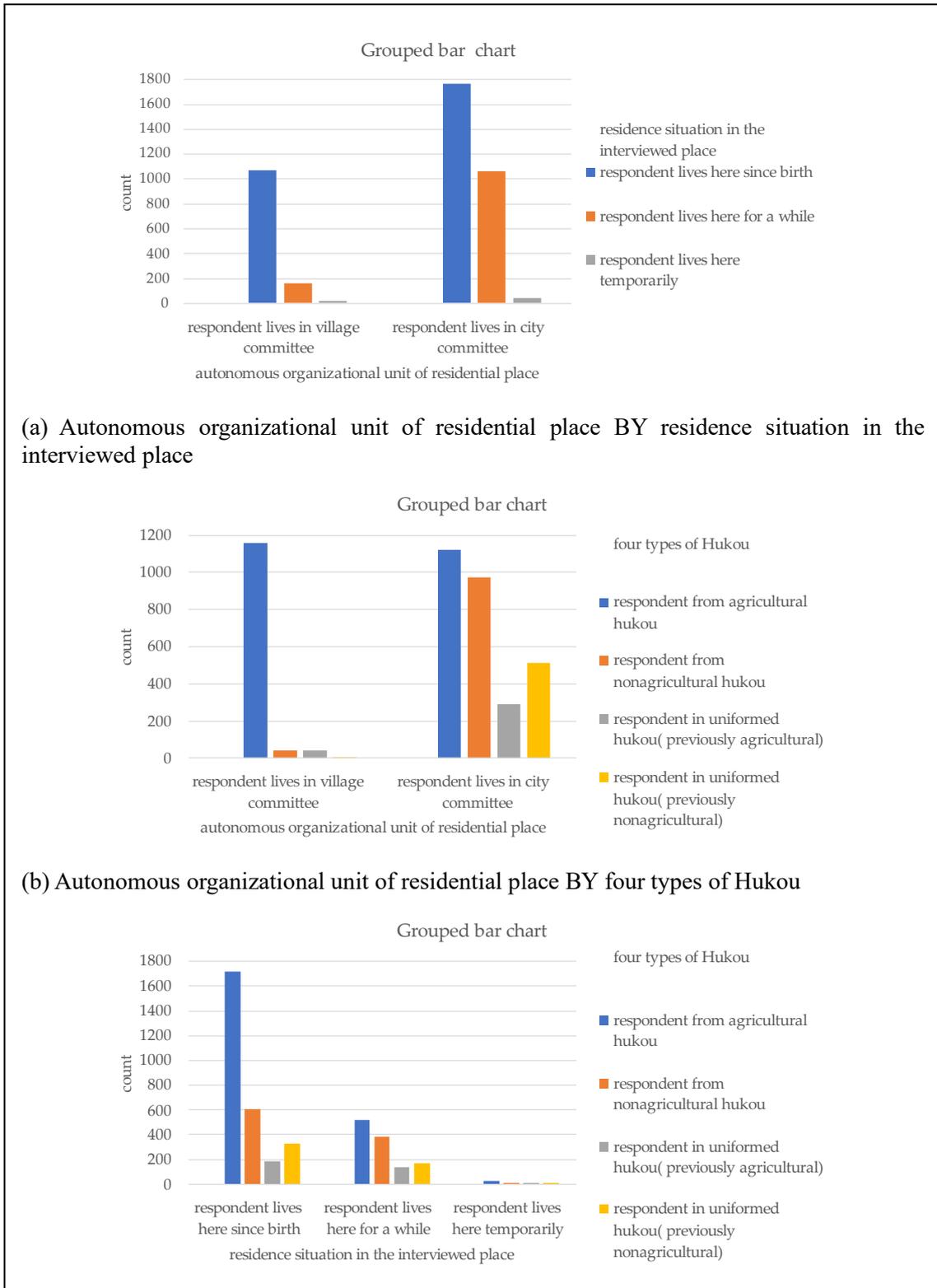
Figure 4-2 Grouped Bar Chart of Hukou, Unit, and Local.

3.2.3. Other Variables

Sociodemographic and economical characteristics (SDC) include age, gender, education level, marital status, household income, employment economic activity, car ownership, and self-reported household income level.

Related variables are specific knowledge or attitude on energy. According to the Theory of Planned Behavior, intention is controlled by three different beliefs, which is behavioral attitude and normative and control belief [115–118]. Respondent's attitude, energy cognition, which is their awareness of energy usage causing pollution (EUP), and policy understanding (EPU) are under review. As quality air is a public product, it is part of the government's responsibility. The government needs to do more to calculate how respondents think of the responsibility of government (GD). At the same time, respondent's view on air quality is also in this category; refer to Table 4-3.

Table 4-3 Environmental Attitudes and Energy Understanding Questions in the CGSS.

Original question	Variable name
To protect the environment, human should sacrifice some money.	Attitude
The government should impose additional taxes on energy products to limit energy consumption.	Government's duty (GD)
The government should introduce some mandatory policies to restrict the consumption of certain energy products.	
Personal efforts in saving energy and protect the environment is limited.	
How much you agree or disagree with the following：Energy use is the main cause of acid rain.	Energy using cause pollution. (EUP)
Energy use is the main cause of smoggy days.	
Energy use is the main cause of greenhouse effect.	
Different type of energy product cause different level of pollution.	
The air quality is good where I live.	Air quality

Mood variables are respondent's mindset when they are answering the questionnaire. It is their view on social trust, depression, happiness, and health.

Location variables are factors such as ULE, as mentioned before, Hukou, ULE, unit and local. Their classifications are intertwined with each other. This is used to evaluate the ULE. By replacing the position and order, the similarities and differences of their influence effects were examined in the model. KMO and Bartlett's test was performed for the factors selected for analysis. The KMO measure of sampling adequacy was 0.753 (larger than 0.7), and the p value of the Bartlett's test of sphericity was less than 0.001. The validity analysis met the requirements. The correlations of the factors were analyzed using the Spearman's rho test. The results showed that gender, marital status, household size, air quality, and local or not were not related to WTP-QA in this study. Gender was related to WTP-RE. Similarly, marital status, household size, air quality, and local or not were not related to WTP-RE. Respondent's perception of government responsibilities was also unrelated to WTP-RE. Other unmentioned factors were related to WTP.

4.3.3 Method

Articles used to analyze the willingness to pay for a particular type of environmental protection are often based on an extended theory of planned behavior, using structural equation modeling or

OLS regression models[7,8,13,14,55]. Spike model is also often employed when there is a large number of zero responses for willingness to pay[119–121]. This study focused on a comparative study of willingness to pay for quality air and willingness to pay for renewable energy, hoping to find as many factors as possible and to discover which of them are the ones that play a more significant role. The purpose of this study is to discover the varied factors too.
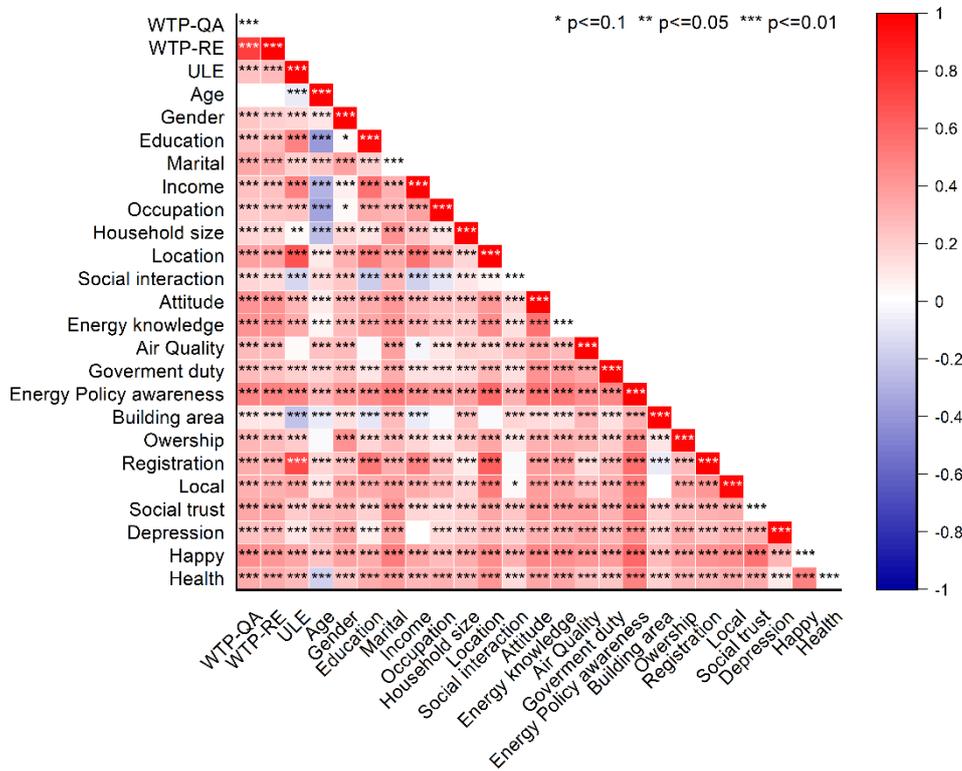
Figure 4-3 Correlation Plot of Variables

Binary logistic regression fits this study's needs. The empirical model is based on existing research[5,122,123] and incorporates urban living experiences. Regression analysis was used to study factors influencing WTP, as this study took WTP as a binary dependence, 1 for have WTP, and 0 for other (no or unsure).

Prior to using binary logistic regression, a classification tree model was utilized to gain a comprehensive understanding of the data. Details can be seen from Figure 4-4.

The classification tree model for willingness to pay (WTP) for renewable energy shares some similarities with the WTP for quality air (WTP-QA) model, but also exhibits some differences.

Table 4-4 Classification of WTP-RE

Classification			
	Predicted		
Observed	No or unsure	Yes	Percent Correct
No or unsure	1385	787	63.8%
Yes	852	1123	56.9%

Overall Percentage	53.9%	46.1%	60.5%

Growing Method: CHAID

Dependent Variable: D willing to pay for renewable energy

Among the 4,147 respondents, 47.6% expressed a willingness to pay for renewable energy (WTP-RE). The most influential factor was the respondents' attitude, with a positive attitude leading to a higher probability of WTP (54%).

Further analyzing the impact of income among those with a positive attitude, high-income individuals had a higher chance of WTP (61%), while middle-income individuals had a slightly lower probability (52.7%). Low-income individuals exhibited the lowest probability of WTP (40.1%).

When examining low-income respondents who agreed that energy use causes pollution, there was a higher chance of WTP (45%), whereas those who disagreed had a significantly lower probability (28.6%). Among the middle-income group, residing in a city committee resulted in a higher likelihood of WTP compared to residing in a village committee (55.5% vs. 48.5%). In the high-income group, being married was associated with a lower chance of WTP (58.6%), while being unmarried had a higher probability (70.6%). It is important to note that these findings differ from what is observed in South Korea or Japan, suggesting potential regional variations in the factors influencing attitude and WTP.

In summary, income, marital status, and knowledge about energy use, in combination with income, can impact individuals' attitudes and their likelihood of expressing WTP for renewable energy.

Among respondents with a negative attitude, 34.1% expressed a willingness to pay for renewable energy (WTP). However, the influence of knowledge further impacted this group. Among those who agreed that energy use causes pollution, the chance of WTP was higher compared to those who disagreed (42.8% vs. 27.6%).

Examining the subgroup of respondents who agreed that energy use causes pollution, their employment status and economic activity played a role. State employees or retirees with a state pension had the highest chance of WTP, with a probability of 70.0%. Private employees or entrepreneurs had a moderate chance of WTP at 49.3%. On the other hand, other respondents such as students, unemployed individuals, retirees without a pension, those with no income, or those with only farming income had the lowest chance of WTP at 35.3%. In summary, the more actively involved respondents were in income-generating activities, the higher their likelihood of expressing WTP.

For respondents who disagreed that energy use causes pollution, having a clear attitude toward the government slightly increased the chance of WTP (30.1%), whereas those without a clear attitude had a much lower probability (8.9%).

These findings highlight the nuanced impact of knowledge, employment status, economic activity, and attitudes toward the government on the WTP for renewable energy among individuals with a negative attitude overall.
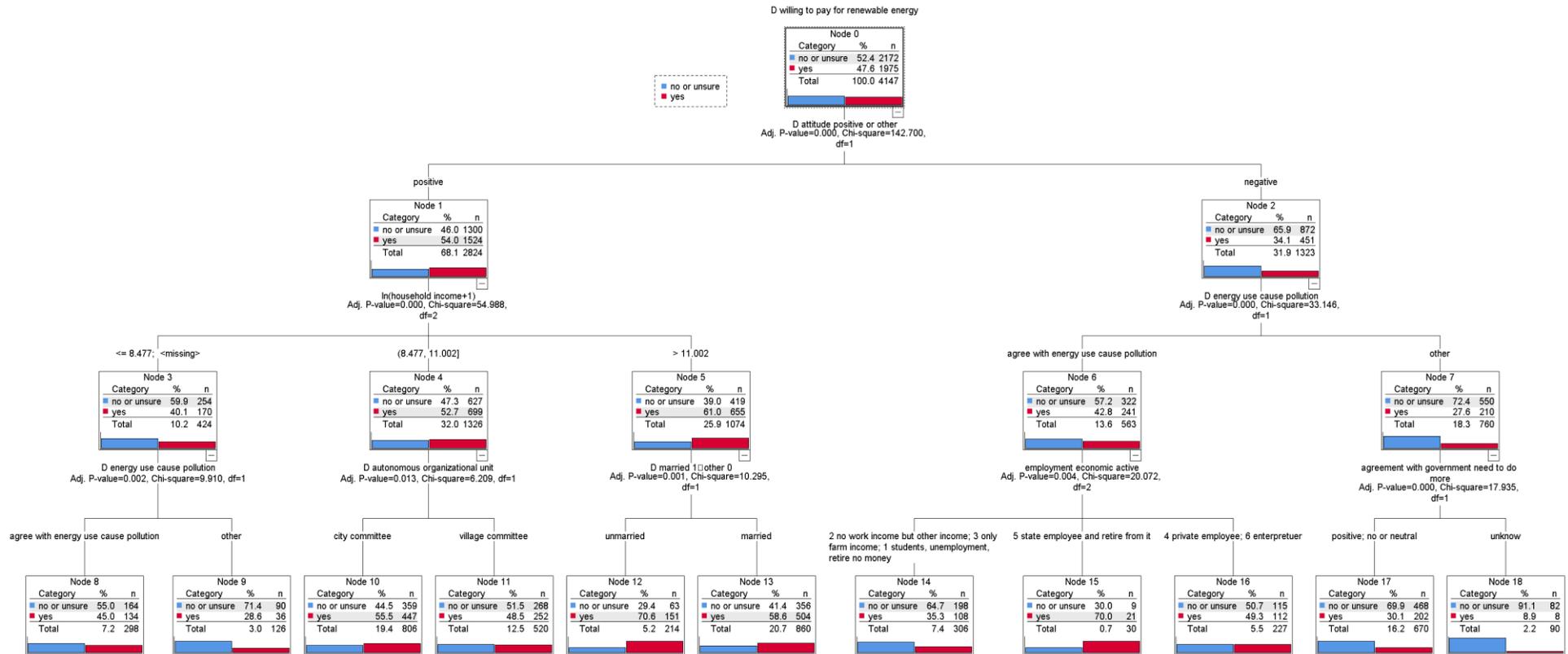
Figure 4-4 Tree Diagram of WTP-RE

Many influencing factors affect residents' willingness to pay for renewable energy and quality air, including personal characteristics, social characteristics, and policy factors.

The process of analysis is summarized in Figure 4-5. Use blocks to add variables to the binary logistic regression model. Maximum likelihood stepwise approached. The model can always replace an existing variable with a new one if the regression works better.

Block1 includes SDC factors: age, gender, marriage, education, income, employment, car, and family income level.

Block2 contains ULE. This article focuses on urban living experience. Take the absence of urban living experience as a reference.

Block3 includes relevant variables that have a significant impact on WTP: Air Quality, GD, EPU, EUP, and Attitude.

Block4 covers mood variables which refer to the respondent's state of body and mind when answering the questionnaire: Trust, Depressed, Happy, Health.

Block5 includes location variables which are ULE similar but different classifications: local, Hukou, and Unit.
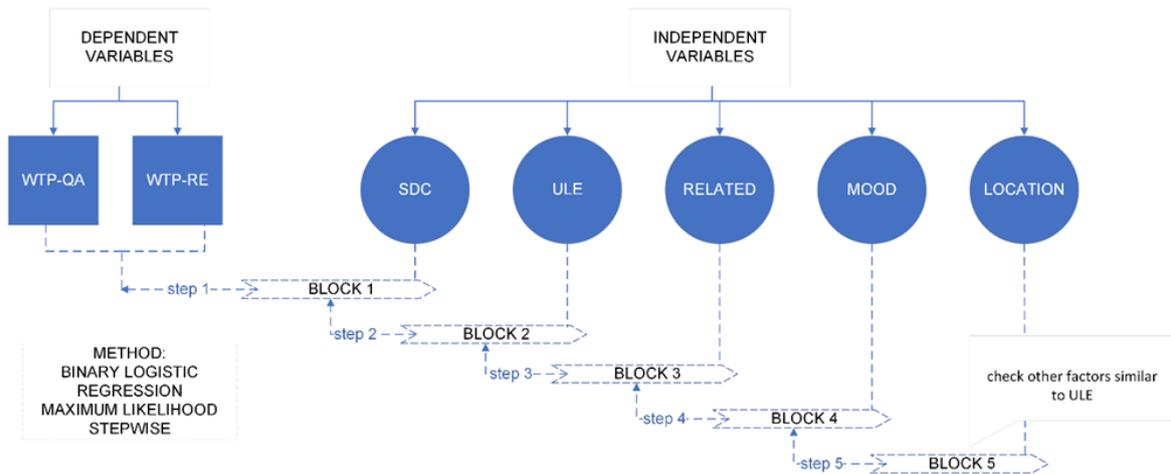
Figure 4-5 Flowchart of Analysis

4.4 Results

This study uses binary logistic regression analysis to calculate the probability of willingness to pay for quality air and renewable energy.

A logistic regression was completed to determine the relationship between the respondents' background variables (gender, year group, education, wealth, knowledge), urban living experience and willingness to pay. The results of WTP-QA are presented in model 1 to model 5 of Table 2. The results of WTP-RE are presented in model 1 to model 5 of Table 3.

4.4.1 Regression Results of Willingness to Pay for Quality Air

In model 1, age has a negative effect on WTP-QA, household income increases WTP-QA, compare to unemployment students, or retired with no income respondents, respondents only have farming income shows less willing. Self-reported family income level has positive correlation with WTP-QA.

There was no significant association between gender or marital status and willingness to pay. Overall, respondents background explains little (5.9%) of the variance in willing to pay.

Table2 model 2, adds the urban living experience factor scores, and this increases the explanatory power of the model a little by around 0.4% of the variance. People who halfway ULE are 1.3 times

more likely to pay than those who have no ULE.

Model 3 adds related factors, four factors' scores had significant associations with willing to pay: high "air quality" "EUP" "Attitude", and unknow "GD"($p < 0.05$ in all cases).Respondents who answered unknow about GD are 4.2 times less willing to pay than those answered no about GD. There was no significant association between EPU and willing to pay. The positive relationship between household income and WTP becomes insignificant. This increases the explanatory power of the model by around 4.3% of the variance.

Model 4 adds mood factors, two factors' scores had significant associations with willing to pay: high "trust", and low "depress"($p < 0.05$ in all cases). Happy can promote WTP, but the association is not statistically significant. There was no significant association between health and willingness to pay. This increases the explanatory power of the model by around 0.6% of the variance.

Model 5 adds location factors like ULE, no one had significant associations with willing to pay. The model variance stays the same as model 4.

WTP-QA is significantly related to age, awareness of energy use causes pollution, agreement of government duty, attitude, family income level, urban living experience, trust, and depression.

Hypothesis 1 Urban experience influences people's willingness to pay for quality air.

Verified and it holds. The resulting logistic model is statistically significant, urban living experience is related to the willingness to pay for quality air, and people with urban living experience are 1.3 times more willing to pay for quality air than people without urban living experience. Figures are shown in Table 4-5.

Table 4-5 Logistic Regression of Variables with WTP-QA

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Age	0.985**[1]	0.986**	0.988**	0.987**	0.987**
Ln (household income +1)	1.057**	1.049*	1.035	1.029	1.029
Employment economic active: ref. No work and no income	**	*	*	*	*
No work income but other income	0.942	0.91	0.869	0.874	0.874
Only farm income	0.699**	0.764*	0.753*	0.766*	0.767*
Private employee	0.868	0.842	0.828	0.843	0.843
State employee and retire from it	1.417	1.358	1.301	1.304	1.304
Entrepreneur	0.797	0.774	0.777	0.790	0.790
Family income level: ref. Level low	**	**	**	**	**
Level middle	1.321**	1.329**	1.287**	1.214*	1.214*
Level high	2.033**	2.026**	1.874**	1.744**	1.744**
ULE: ref. Never living in urban		**	*	*	*
Halfway urban		1.366**	1.302**	1.295**	1.295**

Always urban	1.195	1.145	1.128	1.128	
Air quality: ref. Neither good nor bad			*		
Bad			1.231	1.219	1.219
Great			1.402*	1.360*	1.360*
Agreement with government need to do more: ref. No or neutral			**	**	**
Positive			1.15	1.142	1.142
Unknow			0.238**	0.244**	0.245**
Energy use cause pollution: agree			1.471**	1.471**	1.471**
Attitude positive			1.443**	1.413**	1.413**
Trust				1.187*	1.187*
Depressed				0.846*	0.847*
Happy				1.183	1.183
Nagelkerke r square	5.90%	6.30%	10.60%	11.20%	11.20%
χ^2	164.773, df=9, P<0.0001	176.245, df=11, P<0.0001	302.868, df=17, P<0.0001	320.215, df=20, P<0.0001	320.215, df=20, P<0.0001
Overall percentage correct	58.2	59.0	61.4	62.0	62.0

Notes: data are from CGSS, some classifications were combined.

[1]: number is odds ratio and ** is p<0.01, *p<0.05.

4.4.2 Regression Results of Willingness to Pay for Renewable Energy

In model 1, age has a negative effect on WTP-RE, household income increases WTP-RE, women are less willing to pay than men. Compared to unemployment students, or retired with no income respondents, respondents who are state employees or retired show higher willing. Self-reported family income at the middle level has a positive correlation with WTP-RE than low level respondents.

There was no significant association between marital status or household size and willingness to pay. Overall, respondents background explains little (5.3%) of the variance in willing to pay.

Table3 model 2, adds the urban living experience factor scores, nothing had significant associations with willing to pay. The model variance stays the same as model 1.

Model 3 adds related factors, three factors' scores had significant associations with willing to pay: "EUP" "Attitude", and unknow "GD"(p < 0.05 in all cases). Respondents who answered unknow about GD are 3.3 times less willing to pay than those who answered no about GD. There was no significant association between air quality or EPU and willingness to pay. The positive relationship between household income and WTP becomes insignificant. This increases the explanatory power of the model by around 4.3% of the variance.

Model 4 adds mood factors, only one factor's scores had significant associations with willing to pay: high "trust"(p < 0.05 in all cases). There was no significant association between health, happiness, or depression with willingness to pay. This increases the explanatory power of the model

by around 0.3% of the variance.

Model 5 adds location factors like ULE, no one had significant associations with willingness to pay. The model variance stays the same as model 4.

WTP-RE is significantly related to attitude, age, agreement with energy use cause pollution, trust, family income level, and gender.

Hypothesis 2: Urban experiences influence people's willingness to pay for renewable energy.

It does not hold.

The resulting logistic model is statistically significant, urban living experience is not related to the willingness to pay for renewable energy. Figures are shown in Table 4-6.

Table 4-6 Logistic Regression of Variables with WTP-RE

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Age	0.988**[1]	0.988**	0.989**	0.989**	0.988**
Gender-female	0.833**	0.833**	0.849*	0.850*	0.850*
Education	1.015	1.015	1.002	1.001	1.001
Income	1.056**	1.056**	1.041*	1.040*	1.040*
Employment: ref. Student, unemployment, retire no money	**	**	*	*	*
No work income but other income	1.254	1.254	1.213	1.235	1.235
Only farm income	0.94	0.94	0.969	0.972	0.972
Private employee	1.087	1.087	1.093	1.116	1.116
State employee and retire from it	1.779**	1.779**	1.781**	1.798**	1.798**
Entrepreneur	1.089	1.089	1.107	1.124	1.124
Income level: ref. Level low	**	**	**	*	*
Level middle	1.278**	1.278**	1.255**	1.214**	1.214**
Level high	1.298	1.298	1.228	1.205	1.205
GD: ref. Disagree with government need to do more			**	**	**
Agree with government need to do more			1.022	1.013	1.013
Unknow			0.305**	0.306**	0.306**
EUP agree with energy use cause pollution			1.476**	1.473**	1.473**

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Attitude:　positive			1.677**	1.653**	1.653**
Trust: trust				1.249**	1.249**
Nagelkerke R square	5.30%	5.30%	9.60%	9.90%	9.90%
x^2	148.365, df=11, P<0.0001	148.365, df=11, P<0.0001	273.821, df=15, P<0.0001	282.773, df=16, P<0.0001	282.773, df=16, P<0.0001
overall　percentage correct	58.2	58.2	61.0	61.0	61.0

Notes: data are from CGSS, some classifications were combined.

[1]: number is odds ratio and ** is p<0.01, *p<0.05.

4.4.3 Differences between Willingness to Pay for Quality Air and Renewable Energy.

Hypothesis 3 Willingness to pay for renewable energy is different from willingness to pay for quality air.

Verified and it holds.

Apply Chi-Square Test, it shows x^2=1828.7, df=1, p<0.0001, means the distributions of different values across willingness to pay for quality air and renewable energy are not equally likely. Willingness to pay for quality air and renewable energy has differences. There was a statistically significant difference in people's preferences for the two willingness to pay. Phi value is 0.664. There is a statistical correlation between the two willingness to pay, and the degree of correlation is strong.

Using the same independent variables for regression analysis, the equation for air willingness to pay has urban experience, but energy willingness to pay has not. Moreover, energy payments are related to gender. The two willingness to pay are different and partly influenced by varied factors. It may also have something to do with the fact that air is a public good.

Table 4-7 Regression of WTP-QA in China

		Model 1	Model 2	Model 3	Model 4	Model 5
Urban living experience	Living in rural area	***	***	**	**	**
	Relocated in urban	1.687***	1.349***	1.318***	1.300***	1.287***
	Living in urban area	1.555***	1.203**	1.203	1.186	1.156
Age			0.987***	0.988***	0.987***	0.987***
Income			1.075***	1.058***	1.053***	1.042**
Employment economic active	Students, unemployment, retire no money		***	***	***	***
	No work income but other income		0.869	0.825	0.837	0.844

		Model 1	Model 2	Model 3	Model 4	Model 5
	Only farm income		0.723***	0.719***	0.703***	0.720**
	Private employee		0.816	0.808	0.810	0.827
	State employee and retire from it		1.377	1.343	1.339	1.332
	Entrepreneur		0.784	0.774	0.785	0.795
Social interaction	Never			***	**	**
	Once a year			1.170	1.117	1.092
	Several times a year			1.289**	1.245	1.215
	Once a month			1.513***	1.467**	1.463**
	Several times a month			1.217	1.177	1.160
	Once or twice a week			1.468***	1.438***	1.404***
	Almost everyday			1.420***	1.349**	1.302**
Attitude positive or other				1.635***	1.469***	1.433***
Energy use cause pollution				1.591***	1.505***	1.501***
Air quality	Bad				**	*
	Middle				0.831	0.841
	Good				1.155	1.128
Agreement with government need to do more	No or neutral				***	***
	Positive				1.145	1.138
	Unknow				0.240***	0.245***
	Building area				0.9999***	0.9999***
Social trust						1.174**
Depression						0.841**
Happy						1.249**

	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	-0.413	-0.148	-0.932	-0.786	-0.825
Chi-square	50.688	145.256	363.326	308.652	330.248
df	2	9	17	22	25
Sig.	0.0001	0.0001	0.0001	0.0001	0.0001
Nagelkerke R Square	1.8	5.2	9.2	10.7	11.4
overall percentage correct	55.0	58.2	60.5	61.6	61.8

Table 4-8 Regression of WTP-RE in CGSS2018

		Model 1	Model 2	Model 3	Model 4	Model 5
Urban living experience	Living in rural area	***	**			
	Relocated in urban	1.545***	1.236**	1.165	1.136	1.142
	Living in urban area	1.599***	1.227**	1.171	1.132	1.132
Age			0.987***	0.990***	0.990***	0.989***
Gender			0.822***	0.844**	0.857**	0.858**
Income			1.069***	1.052***	1.047**	1.039**
Employment economic active	Students, unemployment, retire no money		**	*	*	*
	No work income but other income		1.196	1.142	1.158	1.176
	Only farm income		0.948	0.972	0.982	0.997
	Private employee		1.052	1.036	1.048	1.079
	State employee and retire from it		1.744***	1.668***	1.676***	1.684***
	Entrepreneur		1.084	1.099	1.110	1.139
Attitude positive or other				1.768***	1.689***	1.645***
Energy use cause pollution				1.501***	1.468***	1.463***
Agreement with government need to do more	No or neutral				***	***
	Positive				1.019	1.005

		Model 1	Model 2	Model 3	Model 4	Model 5
	Unknow				0.312***	0.312***
Building area					0.9999**	0.9999**
Social trust						1.206**
Happy						1.252***
Constant		-0.299	-0.145	-0.737	-0.613	-0.785
	Chi-square	44.907	135.932	247.007	271.349	287.384
	df	2	10	12	15	17
	Sig.	0.0001	0.0001	0.0001	0.0001	0.0001
	Nagelkerke R Square	1.6	4.8	8.6	9.5	10.0
	overall percentage correct	55.3	57.7	60.5	60.8	61.4

4.5 Discussion

4.5.1 SDC Differences

Willingness to pay is related to age. This is along with other studies. Older people have less WTP. Robustness tests were performed using a change-factor approach. Changing age group and education level are these two independent factors. Also change urban living experience as a binary variable, the results stay robust. Table 4-9, Table 4-10, model 8 showed the results including all factors at once without block.

Table 4-9, Table 4-10, model 6 and model 7 showed the results. Age above 40, urban living experience is still affecting their willingness to pay for quality air.

Respondents age above 40 born before 1978, which is the year China started reform and open-up, many chance and opportunity to move. And it is also the release of Hukou system. As to WTP-RE, age above 40, ULE also has a significant positive effect. It can be seen from that urban living experience is a positive factor to these age's respondent.

Table 4-9, Table 4-10, shows the test of all variables entre the regression at same time and respondents divided in below 40 and other.

It shows ULE has little effect on the age below 40, which is very reasonable. On the other hand, along with the open-up, urban living experience is no longer a significant positive factor, it is a good sign that the government should continue open-up.

Males tend to pay more than females[124], in this study, Gender only has a negative effect on willingness to pay for renewable energy. WTP-RE is correlated with gender may be due to the moderating role of gender[6,125,126].There is also literature that writes that women spend money more cautiously. Female-dominated households consume less energy and tend to be greener[127].

A Nigerian study correlates marital status with WTP-RE[10]. However, marital status was not associated with WTP-QA or WTP-RE in this study. This is consistent with the findings of Xie and Zhao[124].

Education can improve the environmental sustainability of a region and reduce CO2 emissions[128]. Education is a crucial factor influencing willingness to pay in many studies. However, it did not enter the binary logistic regression. This did not suggest that it was less important, but simply that other factors were more significant than education in this study.

4.5.2 Urban Living Experience and Willingness to Pay for Quality Air

A hierarchical chi-square test is used to evaluate connection between ULE and WTP-QA under different circumstances.

This study analyzes the association between ULE and WTP-QA under different Trust conditions and uses a hierarchical chi-square test. The ratio test showed P<0.05, indicating that the OR values between the layers were heterogeneous. Stratified by trust, the correlation between ULE and WTP-QA was statistically significant among people who trust, with an OR of 1.763 (95% CI 1.509 ~2.061), X 2=51.266, P<0.001. Among people who are not trusted, there is no significant correlation between ULE and WTP-QA.

Similarly, stratified by Air quality, the correlation between ULE and WTP-QA was statistically significant among people who felt good air quality, with an OR of 1.787 (95% CI 1.532 ~2.084), X 2=55.123, P<0.001. Among people who felt good air quality is bad or normal, there is no significant correlation between ULE and WTP-QA.

Stratified by Energy policy understanding, the correlation between ULE and WTP-QA was statistically significant among people who Negative group, with an OR of 1.584 (95% CI 1.382 ~1.815), X 2=43.914, P<0.001. Among people who felt positive, there is no significant correlation between ULE and WTP-QA.

Stratified by Hukou, the correlation between ULE and WTP-QA was statistically significant among people who are agricultural Hukou, with an OR of 1.590 (95% CI 1.337 ~1.892), X 2=27.630, P<0.001. Among people with other Hukou, there is no significant correlation between ULE and WTP-QA.

ULE is more likely to influence people who feel socially trusted, believe the air quality is good where they live, know less about energy policies, and have an agricultural hukou. Having urban living experience can increase the willingness to pay for quality air of these people. In these cases, WTP-QA can be increased by promoting people to have urban living experience, including work or study in urban area.

One explanation is that having urban living experiences allows for a larger reference sample than in rural areas where the reference group is narrow and local. Both anthropological studies[129,130] and evolutionary studies in zoology[131] have found that people or mammals raised in cities have a better sense of adventure and the ability to learn. Ju noted that those employed in urban nonfarm jobs exhibited more sewage disposal behavior than those employed in local nonfarm jobs[132]. Le and Nakagawa pointed out that workers who go out to work are more pro-social when they return home[24]. That means the urban living experience has brought positive effects.

Combined with the early study in literature review, quality air is more of a public good, while electricity is more of a private sphere. Therefore, urban living experience retains a significant impact on willingness to pay for quality air among many other factors.

4.5.3 Connections

A hierarchical chi-square test was used to evaluate connections between WTP-QA, WTP-RE and ULE.

The two willingness to pay are related. To discuss whether ULE increases WTP-QA, a controlled study was designed that treated WTP-RE as a confounding factor, considering the correlation between WTP-RE and WTP-QA. The ratio test showed P<0.05, indicating that the OR values between the layers were heterogeneous. Stratified by willingness to pay for renewable energy, the correlation between urban experience and willingness to pay for quality air was statistically significant among people without willingness to pay for renewable energy, with an OR of 1.700 (95% CI 1.311 ~2.204), X^2=16.299, P<0.001. Among people who are willing to pay for renewable energy, there is no significant correlation between urban experience and willingness to pay for quality air.

Stratified by WTP-QA, the correlation between ULE and WTP-RE was statistically significant among people who Negative group, with an OR of 1.580 (95% CI 1.259 ~1.983), X 2=15.752, P<0.001. Among people who felt positive, there is no significant correlation between ULE and WTP-RE.

Abdullah and Jeanty noted that people are more willing to pay for grid power than for PV power[108]. People gravitate toward what they are familiar with[133]. Electricity use is a daily exposure, while air pollution is not always exposed or aware of its importance. This is probably why people are more willing to pay for renewable energy than quality air.

Table 4-9 Robust Test of WTP-QA

Variable	Model 5	Model 6	Model 7	Model 8
	Block 5	Below 40	Above 40	All
Age	0.987**[1]	0.961**	0.984**	0.987**
Ln (household income +1)	1.029	-	-	-
Employment economic active: ref. No work and no income	*	**	-	*
No work income but other income	0.874	2.248	-	0.921
Only farm income	0.767*	0.511*	-	0.809
Private employee	0.843	0.743	-	0.891
State employee and retire from it	1.304	1.533	-	1.391
Entrepreneur	0.790	0.652	-	0.825
Family income level: ref. Level low	**	-	**	**
Level middle	1.214*	-	1.312**	1.235**
Level high	1.744**	-	2.136**	1.826**
Ule: ref. Never living in urban	*	-	**	*
Halfway urban	1.295**	-	1.400**	1.294*
Always urban	1.128	-	1.218*	1.120
Air quality: ref. Neither good nor bad		*	-	-
Bad	1.219	0.509*	-	-
Great	1.360*	1.092	-	-
Agreement with government need to do more: ref. No or neutral	**		**	**
Positive	1.142	1.262	1.121	1.157*
Unknow	0.245**	0.000	0.269**	0.254**
Energy policy understanding: ref. Negative	-	**	-	-

Variable	Model 5	Model 6	Model 7	Model 8
	Block 5	Below 40	Above 40	All
Neutral	-	1.979**	-	-
Active	-	2.293	-	-
Energy use cause pollution: agree	1.471**	-	1.517**	1.485**
Attitude positive	1.413**	1.545*	1.443**	1.448**
Trust	1.187*	1.342*	-	1.199*
Depressed	0.847*	-	-	0.839*
Happy	2.183	-	1.280*	1.198*
Nagelkerke R square	11.20%	12.20%	9.60%	10.90%
χ^2	320.215, df=20, P<0.0001	86.246, df=14, P<0.0001	205.262, df=10, P<0.0001	312.546, df=17, P<0.0001
Overall percentage correct	62.0	57.4	61.7	61.9

Notes: data are from CGSS, some classifications were combined.

[1]: number is odds ratio and ** is p<0.01, *p<0.05.

Table 4-10 Robust Test of WTP-RE

	Model 5	Model 6	Model 7	Model 8
Variable	Block 5	Age below 40	Age above 40	All
Age	0.988**[1]	-	0.985**	0.987**
Gender-female	0.850*	-	0.766*	0.842*
Education	1.001	-	-	-
Income	1.040*	1.097*	-	1.037
Employment: ref. Student, unemployment, retire no money	*	*	-	-
No work income but other income	1.235	1.388	-	-
Only farm income	0.972	0.466**	-	-
Private employee	1.116	0.650*	-	-
State employee and retire from it	1.798**	1.177	-	-
Entrepreneur	1.124	0.648	-	-
Household size	-	0.891**	-	-
Income level: ref. Level low	*	-	**	*

Level middle	1.214**	-	1.324**	1.207*
Level high	1.205	-	1.284	1.155
Gd: ref. Disagree with government need to do more	**	-	**	**
Agree with government need to do more	1.013	-	1.001	0.998
Unknow	0.306**	-	0.361**	0.319**
EPU	-	-	-	-
EUP agree with energy use cause pollution	1.473**	-	1.491**	1.463**
Attitude: positive	1.653**	2.059**	1.660**	1.662**
Trust: trust	1.249**	-	1.200*	1.211*
Happy	-	1.674**	-	1.188
Four types of hukou: ref. Agricultural	-	-	**	**
Nonagricultural	-	-	1.298**	1.236*
Uniformed used to be agricultural	-	-	1.336*	1.293
Uniformed used to be nonagricultural	-	-	1.610**	1.417**
Constant				
Nagelkerke R square	9.90%	8.30%	9.40%	10.00%
χ^2	282.773, df=16, P<0.0001	57.199, df=9, P<0.0001	200.670, df=14, P<0.0001	284.473, df=14, P<0.0001
overall percentage correct	61.0	54.7	60.8	61.2

Notes: data are from CGSS, some classifications were combined.

[1]: number is odds ratio and ** means p<0.01, *p<0.05.

4.6 Conclusions

Based on the frontier hotspots of population and environment, this study discusses the similarities and differences in willingness to pay for quality air and renewable energy. Both willingness to pay is influenced by environmental attitudes, awareness of energy use, government's duty, age, household income level, and trust. WTP-QA is also influenced by urban living experience, occupational economic activity, and emotional state. Gender and Hukou affect WTP-RE. The willingness to pay for quality air is influenced by more factors.

Urban living experiences have an impact on people's willingness to pay, and this effect remains significant after controlling people's awareness of air quality, energy, and income levels. The migration of people to cities is of excellent value for both personal development and social development. Exploratory research conducted against the background of China General Social Survey has obtained preliminary and effective positive results and may well dispel the public's doubts about the various problems that the relaxation of household restrictions on the floating population

will bring. This study research also shows that more young people have urban living experiences. The restriction of flow in China is gradually weakening.

Policy implications

The results showed a lower WTP for quality air than for renewable energy. Willingness to pay for renewable energy is more acceptable and can be boosted by increasing it to promote willingness to pay for quality air. Willingness to pay for quality air is related to more factors and can be promoted by enhancing all aspects. The multifaceted impacts of targeted measures need to be considered when developing policy measures.

In China, the urbanization in large cities is more rapid than small cities. Measures to promote the movement of people to cities should be continuously strengthened, such as government public rental housing. Enhancing the movement of people to the city and promoting diverse types of people to live and work in the city is good for the overall functioning of the city and for increasing the willingness to pay for environmental protection.

The popularity of energy-saving policies should be enhanced to raise public awareness. The type of resources varies from region to region in China, and local policies should be developed accordingly.

Limitations and further research

Even giving some explanations, this study is not involved in revealing the mechanical how urban living experience works. The experience of urban life may represent income, education, energy use patterns, understanding of energy policies, et al. interaction between changes in social norms caused by migration on energy demand and energy conservation behavior should be further grasped. Impact mechanisms need to be further explored.

CGSS is panel data, further research may use longitudinal data and consider the possible impact of period and length of urban living experience.

Considering that population movements within China cross provincial boundaries, future research could assign regional differences to cities where people get urban living experience.

Education and willingness to pay are statistically significant correlations, but education does not enter the regression equation, one reason being that the general level of education is low (mean education year is 8.6, nearly 6 years of primary school and three years middle high school.) Meanwhile the mean value of energy policies understanding, only 1.15, standard deviation is 0.4, range from 1 "not know" to 3 "know". Respondents do not have enough knowledge of energy. If they don't, their answers may not reveal true preferences[134]. Future research could explore the effects of low knowledge levels.

Chapter 5　Pro-Environmental Behaviors and the Intention of Relocation in Korea

In South Korea, to analysis the behavior and intention, this study takes three surveys to evaluate them. KGSS2014, KGSS2018 and KGSS2021 were used to discuss. Main dependent variables are individual's willingness to pay for protection the environment and their daily recycling behaviors. Main independent variables are divided into four groups. Their social-domestic characteristics, living surroundings, awareness of pollution, and mobility situation which include their desire to move to rural area. Their view on government is also taken into consideration.

5.1 Introduction

5.1.1 Urbanization in South Korea

South Korea has experienced a rapid urbanization process since 1960. The urbanization rate more than doubled between 1960 and 2010 and exceeded 90% in 2014 (Korea Statistical Information Service Center, 2016). This unprecedented rapid pace of urbanization has been driven primarily by industrialization. This period represented unprecedented economic development, as Korean society finally emerged from the absolute poverty it had suffered since modernization. Gross national income per capita increased nearly 100-fold, from less than $300 in the early 1970s to about $28,000 in 2014. From a predominantly agricultural society 60 years ago, South Korea has developed into one of the world's leading industrial nations. The proportion of the labor force employed in the agricultural sector declined from about 80 percent in 1960 to less than 10 percent in this period[2].

5.1.2 Types of Housing in South Korea

There are many types of residential properties in South Korea, each with its own characteristics, advantages, and disadvantages.

1. Detached house: A house where a family lives alone and the property is owned by only one person. The biggest advantage of this type of housing compared to other house types is absolute independence, having a private space and land that can be designed according to personal preferences and needs. Also, it has a large land area, low density, and usually has a courtyard for a better environment.

2. Collective house (다가구주택: also called multi-family house) refers to multiple suites in one building equipped with kitchen, bathroom and other facilities, which means that many occupants live in one building. Multi-suites are one residence, so there is only one person who owns the real estate. Multi-family dwellings have a total floor area of less than 660 square meters, have less than 3 floors, and can house 2-19 households.

3. Townhouse (연립주택): A household is like a condominium in that a building has a total floor area greater than 660 square meters and less than 4 floors. Unlike multi-family dwellings, townhouse dwellings can register properties according to the number of housing units.

4. Multi-family house (다세대주택): Like a townhouse, it has less than 4 floors and has multiple independent housing units in one building, each with space and facilities such as an entrance, bathroom, and kitchen. The residents share a portion of the hallway, stairs, and other facilities. Unlike townhouses, the total floor area of a building is less than 660 square meters. Unlike multi-family dwellings, properties can be registered according to the number of housing units, and each household can be sold independently.

5. Condominiums: Condominiums (아파트) refer to a common house of 5 floors or more and are the most numerous and most frequently traded type of housing in South Korea. It is surrounded by a full range of convenient facilities such as supermarkets, restaurants, schools, hospitals, parking lots, etc. Due to the good environment and convenience of living, the price of housing is also more expensive than other types of housing and has risen the most.

6. City-type living houses: These are mini-apartments that have been unveiled since 2009 and are designed for ordinary people and 1-2 person households. They are divided into townhouses, multi-family houses, one-room apartments (원룸), and small apartments (주택), which are for less than

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[2] http://kosis.kr/

300 households.

Due to the type of housing, there is insufficient space for most residential retrofitting in South Korea. One of the challenges in promoting the use of renewable energy in South Korea is the physical space limitation for renewable energy installations in buildings [135].

5.1.3 Urban-Rural Differences in South Korea

A study of a four-country comparative analysis of urban-rural differences in children's lives and subjective well-being noted that children in urban areas in South Korea had higher well-being in terms of housing quality, friendships, and satisfaction with school and local (safety and facilities). However, rural children reported higher levels of engagement with family and friends than urban children and no urban-rural differences in deprivation or overall subjective well-being [136]. The differences are not considered significant.

5.1.4 Urban-Rural Migration in South Korea

South Korea, Korea, was an agricultural country like other East Asian countries until the 1950s. As in other developed countries, surplus agricultural labor from rural Korea moved into urban employment. However, since the late 1990s, the movement of the urban population to rural areas has begun to receive attention and has attracted the attention of policy makers. Therefore, the study by Ma et al. aims to describe the trends of urban-rural migration in South Korea and to identify the factors that influence the successful settlement of migrants. Urban-rural migration in Korea is 20 years later than in developed Western countries, and the number of immigrants is increasing. Economic and demographic factors as well as personal preferences are closely related to this trend. To investigate the factors influencing successful migration, the study by Ma et al. analyzed a dataset collected from a national sample of urban and rural migrants. The study by Ma et al. identified personal characteristics, non-economic motivation, community life, and government support as key factors associated with successful migration[60].

Migration policy was conducted since the 1990s after Korea archived high urbanization. The Korea's 5-year basic plan for improving the quality of life of farmers and fishman. The first plan was conducted from 2005 to 2009, followed by the second one from 2010 to 2014, then the third one was from 2015 to 2019. It continues.

The Ministry of Agriculture, Food and Rural Affairs of Korea, also known as MAFRA, is dedicated to transforming rural areas into comfortable and revitalized communities. Since 2021, FRA has implemented the "Living in rural areas"(농촌에서 살아보기) plan, by providing financial and political support for a period of one to two years for those who want to live or work in rural areas. According to the Director General, "Living in Rural Areas program provides urban citizens who wish to return to rural life with the opportunities to adapt to new environments in advance and exchange with local rural residents by having direct experience of living in rural areas. By doing so, it significantly helps those who want to return to farming or rural areas prepare and migrate to rural life. MAFRA will support migration to and settlement in rural areas by connecting the urban citizens' interest in and demand on return to rural life with rural areas."

The Types of "Living in Rural Areas"

The types of the program are categorized into "return to farming," "return to rural areas," and "project participation." The villages specialized in cultivating specific varieties offering in-depth activities will be expanded so that more tangible achievement can be made.

Return to Farming Type: Providing support for overall experience of farming, such as cultivation techniques for major crops in the region, guide on using agricultural machinery. (General, specialized: long-term practice type by cultivation variety)

Return to Rural Areas Type: Providing support for overall rural life, such as understanding rural

areas, communication with local rural residents and exploring the region (General, specialized: a type operated in line with urban students' transferring to rural schools, a type living in central areas).

Project Participation Type: Short-term projects are developed and offered to allow youth to experience various jobs and activities in rural areas.

MAFRA's efforts have resulted in several significant accomplishments, including the participation of 882 households from 119 villages in 95 cities and counties in 2022. Of those households, 125, or 14.2%, migrated to rural areas. "Living in Rural Areas" is becoming a leading program that supports those who wish to return to farming or rural areas, well-received by not only urban citizens who want to return to rural life but also the residents in rural villages that run the program. This program not only benefit to those who wish to return to farming or rural areas, but also benefit to the rural residents who participant the program[60]. Participants gained acquired information on rural areas, deepened understanding of regions, and networking, while the villages benefited in rejuvenated rural areas, influx of people, monetization, and resolved labor shortage.

In October 2022, a survey was conducted with 590 participants from 107 villages, which indicated that both the participants and the villages evaluated the program as beneficial for "returning to rural life." The details of the survey results are illustrated in Figure 5-1.

In February 2023, MAFRA announced an expansion of the "Living in rural areas" program of this year[3], with plans to accommodate 900 households in 130 villages selected from 102 cities and counties. These efforts are a part of MAFRA's ongoing commitment to revitalizing rural areas and creating sustainable communities throughout Korea.

Details can be found at the Back-to-farm Center's website[4].
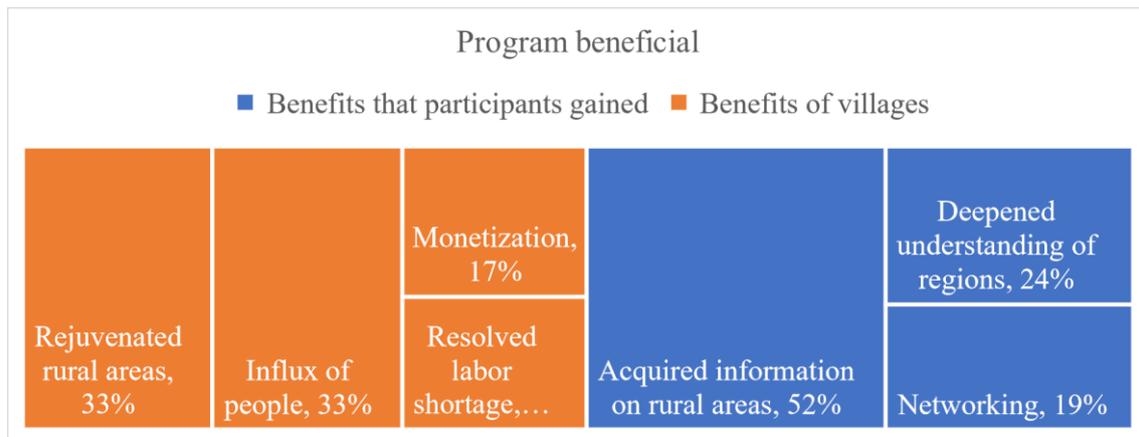
Figure 5-1 Program Beneficial

(Source[5])

5.2 Methods and Data

KGSS2018

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[3] https://www.mafra.go.kr/home/5109/subview.do?enc=Zm5jdDF8QEB8JTJGYmJzJTJGaG9tZSUyRjc5MiUyRjU2NTM3OSUyRmFydGNsVmlldy5kbyUzRg%3D%3D

[4] www.returnfarm.com

[5] https://www.mafra.go.kr/english/756/subview.do?enc=Zm5jdDF8QEB8JTJGYmJzJTJGZW5nbGlzaCUyRjI1JTJGNTY1NDg2JTJGYXJ0Y2xWaWV3LmRvJTNGcmdzRW5kZGVTdHIlM0QlMjZiYnNOPcGVuV3JkU2VxJTNEJTI2cGFnZSUzRDMlMjZyb3clM0QxMCUyNnNhc3N3b3JkJTNEJTI2cmdzQmduZGVTdHIlM0QlMjZiYnNObFNcSUzRCUyNnNnY2Y2hDb2x1bW4lM0QlMjZzc1ZpZXdXblJTNEZmFsc2UlMjZzcmNoV3JkJTNEJTI2

The data for this study were obtained from the 2018 Korean General Social Survey (KGSS)[137]. Beginning in 2003 and conducted by the Survey Research Center of Sungkyunkwan University, the survey follows the latter format of asking respondents some of the same questions, with each survey supplemented with repeated thematic questions in intermittent years. It consists of questions on major political, economic, and social issues in Korea, questions from the International Social Survey (ISSP) conducted in 45 countries around the world, and questions from the East Asian Social Survey (EASS). Given that the survey interviews different individuals, the KGSS is inherently cross-sectional. The KGSS was released annually between 2003 and 2014 and every two years after 2014.

4.2.2 Variables

Dependent variable

Respondents' opinion on government spending:

KGSS asked about how the respondent thinks about the government spending. Listed below are various areas of government spending. Please show whether you would like to see government spending in each area. Remember that if you say, "much more," it might require a tax increase to pay for it." Respondents show a priority of health, environment police and law enforcement, education, then they prefer the government to not increase the spending on military and defense, old age pensions, unemployment benefits, and culture and the arts. Result is showed in Figure 5-2. Across the eight areas covered by the questionnaire, the average opinion among respondents was that the government needs to spend more. Among them, the items most in need of improving spending are health and the environment. The second is to strengthen politics, law, and education. It is generally believed that for pensions, military expenditures, unemployment, and culture and art, the proportion of maintaining the current expenditure level is the majority. Although this is not enough to explain people's own environmental protection attitude, it can reveal people's concern for the environment.

Independent variables

Dependent variable is willing to move. In KGSS 2018, the survey asked that if you have an opportunity, would you like to move to the countryside and become a farmer? Here is the result. See Table 5-1 44% of respondents would like to move to the countryside, while 51% of respondents would not like to move to the countryside and become a farmer. They would like to respondents are comparatively high. Considering the place where the respondents live, the result is still high? (Need to show another evidence.), see Table 5-2. Only 21.1 percent of respondents live in the countryside or on a farm. Most of the respondents were living in cities, this indicated that the number of respondents would like to move to the countryside and become a farmer is high.
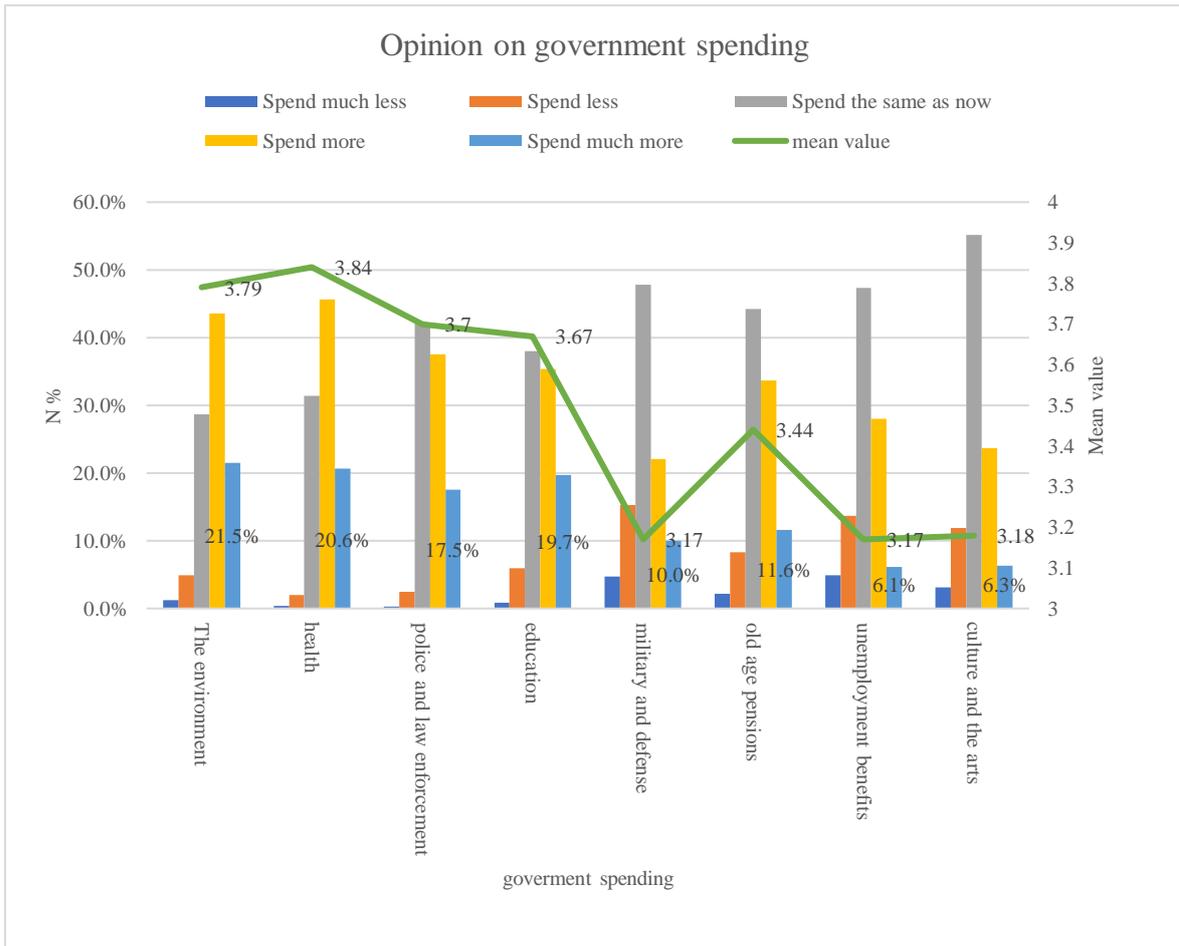
Figure 5-2 Opinion on Government Spending in 2018
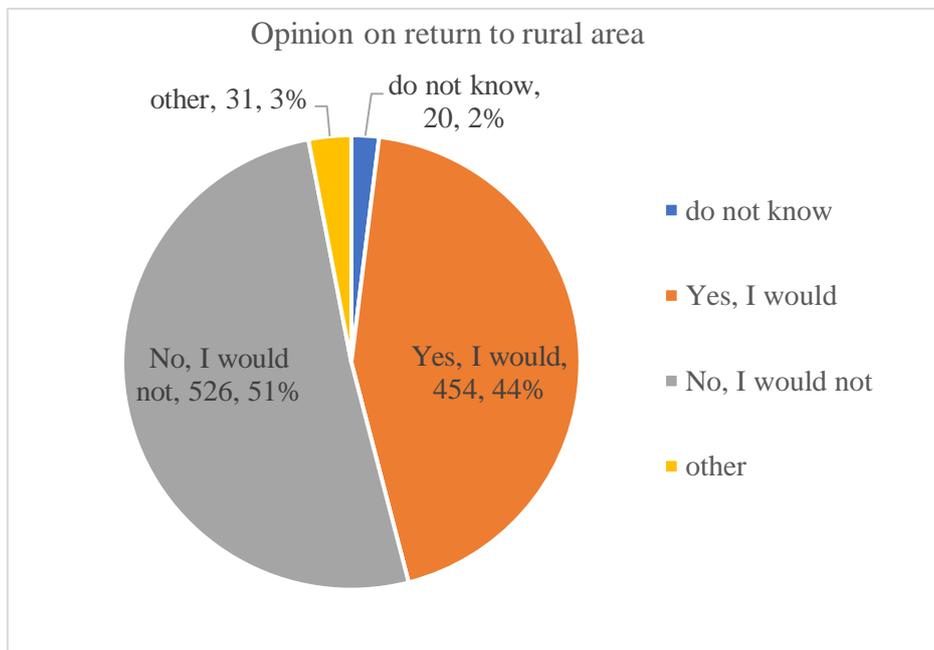
Figure 5-3 Opinion on Return to Rural Area

Table 5-1 Return to Farming

Return to farming

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DK	20	1.9	1.9	1.9
	Yes, I would	454	44.0	44.0	46.0
	No, I would not	526	51.0	51.0	97.0
	Other	31	3.0	3.0	100.0
	Total	1031	100.0	100.0	

Table 5-2 Subjective Assessment on the Size of the Residential Area

subjective assessment on the size of the residential area

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DK	1	0.1	0.1	0.1
	A big city	258	25.0	25.0	25.1
	The suburbs or outskirts of a big city	262	25.4	25.4	50.5
	A town or a small city	292	28.3	28.3	78.9
	A country village	206	20.0	20.0	98.8
	A farm or home in the country	12	1.2	1.2	100.0
	Total	1031	100.0	100.0	

Income:

This survey asked about their work income and other income, also household income. However, some answers were not consistent, for example, family income was lower than personal income. These responses were excluded.

KGSS asked about how successful you think the government in Korea nowadays in each of the following areas: providing health care for the sick, providing a decent standard of living for the old, dealing with threats to Korea security, controlling crime, fighting unemployment, and protecting the environment.

This question in the statistics is described as respondents' opinion on government policy.

The KGSS survey inquired about the public's perception of the Korean government's success in various areas, including providing healthcare for the sick, ensuring a decent standard of living for the elderly, handling threats to national security, maintaining law and order, addressing unemployment, and protecting the environment. This question aimed to gauge the respondents' opinions on the effectiveness of government policies in these areas.

Based on the information provided in Figure 5-4, it can be observed that respondents generally hold a positive view of the government's policies regarding providing healthcare for the sick and dealing with threats to national security. However, the respondents expressed the least satisfaction with the government's policy on fighting unemployment, suggesting that they feel this policy is not meeting their expectations or needs.
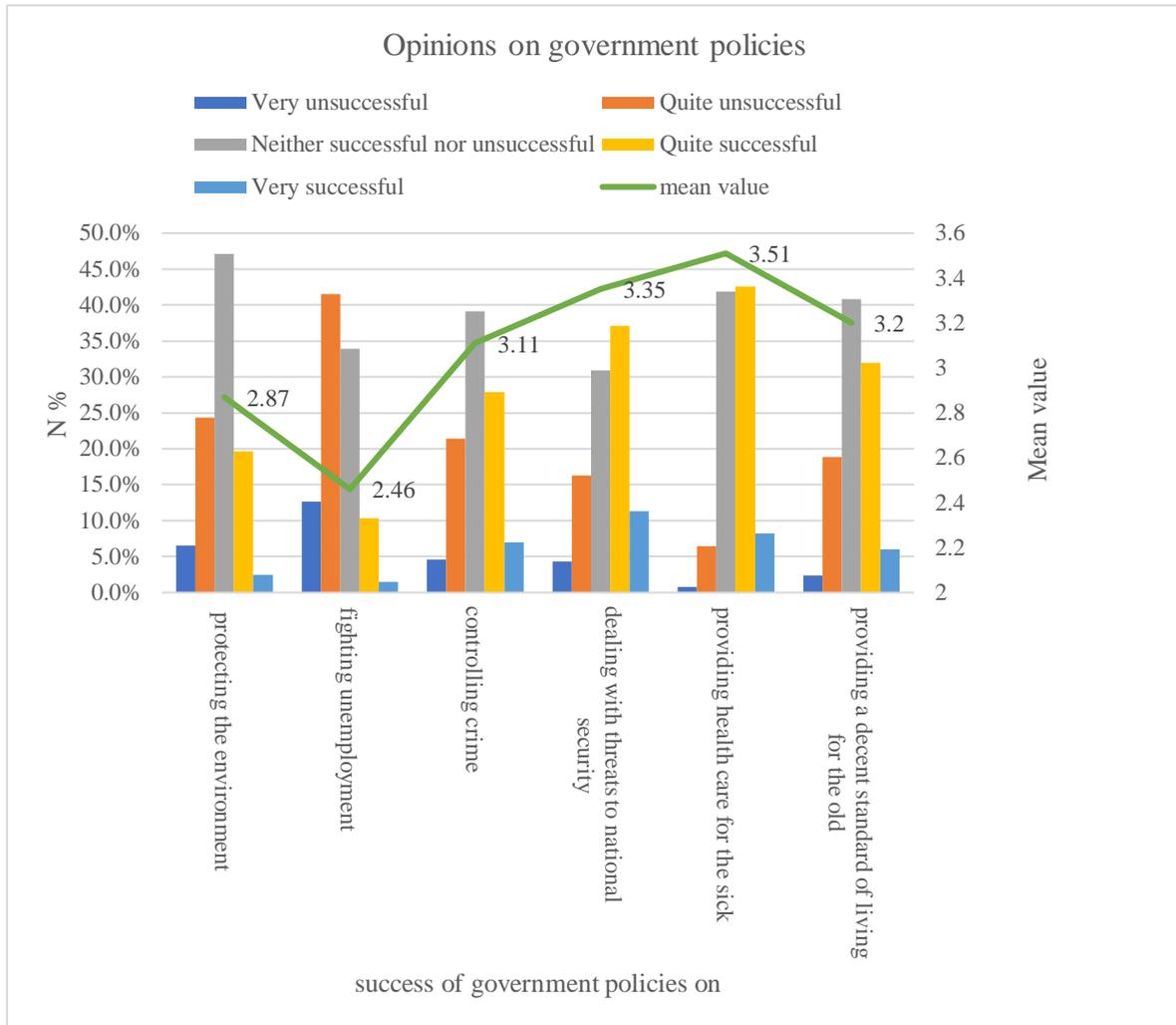
Figure 5-4 Opinion on Government Policies in 2018

In terms of results, South Korean respondents were the most dissatisfied with government policies in fighting unemployment, with 54.2% dissatisfied and very dissatisfied, government policies in the middle of the way in environmental protection, 50.8% most satisfied with government policies in providing health care, and 48.4% in terms of national security. Respondents' perceptions of the degree of success of government policies were ranked as averages: unsuccessful in fighting unemployment, followed by environmental protection, which were scored below three; Successful is providing health care, national security, pension, and crime control, all four of which are above three points.

KGSS inquired about the type of place respondents currently reside in by asking them to select one of the following categories: Big city, Suburbs/outskirts of a big city, Small city/town, Country village, or Farm/home in the country.

Regarding the promotion of migration policies from urban to rural areas, KGSS asked respondents whether they agree or disagree with the policy using a 4-point scale: Agree, slightly agree, slightly disagree, Disagree, or Do not know. The responses were recoded to assign higher scores to those who agreed more strongly with the policy.

KGSS also asked about their opinion on the migration policy from urban to rural areas. See Table 5-3 78.5 percentage of respondents agree with the migration policy from urban to rural areas, while 17 percentage disagree with the migration policy.

Table 5-3 Opinion on the Migration Policy from Urban to Rural Areas

Opinion on the migration policy from urban to rural areas

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DK	47	4.6	4.6	4.6
	Strongly agree	271	26.3	26.3	30.8
	Slightly agree	538	52.2	52.2	83.0
	Slightly disagree	149	14.5	14.5	97.5
	Strongly disagree	26	2.5	2.5	100.0
	Total	1031	100.0	100.0	
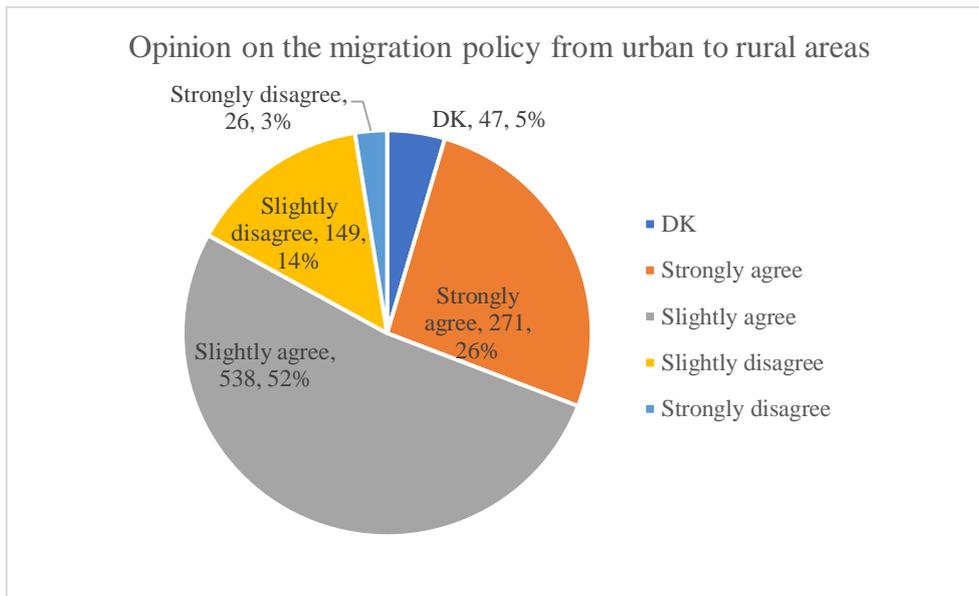
Figure 5-5 Opinion on the Migration Policy from Urban to Rural Areas

To identify the correlation between their support for migration policy and their willing to move to countryside and become a farmer, cross table check was applied. The result showed in Table 5-4 Pearson Chi-Square statistic is significant at the 0.05 level, which means those are different.

Table 5-4 Cross Table of Policy Opinion and Return to Farming.

			Opinion on the migration policy from urban to rural areas			
			Strongly agree	Slightly agree	Slightly disagree	Strongly disagree
			Count	Count	Count	Count
Return to farming		Yes, I would	153	224	53	9
		No, I would not	103	291	93	15

KGSS asked respondents to take political actions such as signing the petitions, attending political rallies, contacting the politicians, or officials and so on. In Figure 5-6, it is shown that people tend to participate less in political activities. There is no specific measure mentioned in the given statement. Among the nine activities listed, the likelihood of participating in three activities (i.e., signing petitions, boycotting certain products, and donating to political activities) is greater than 50%.
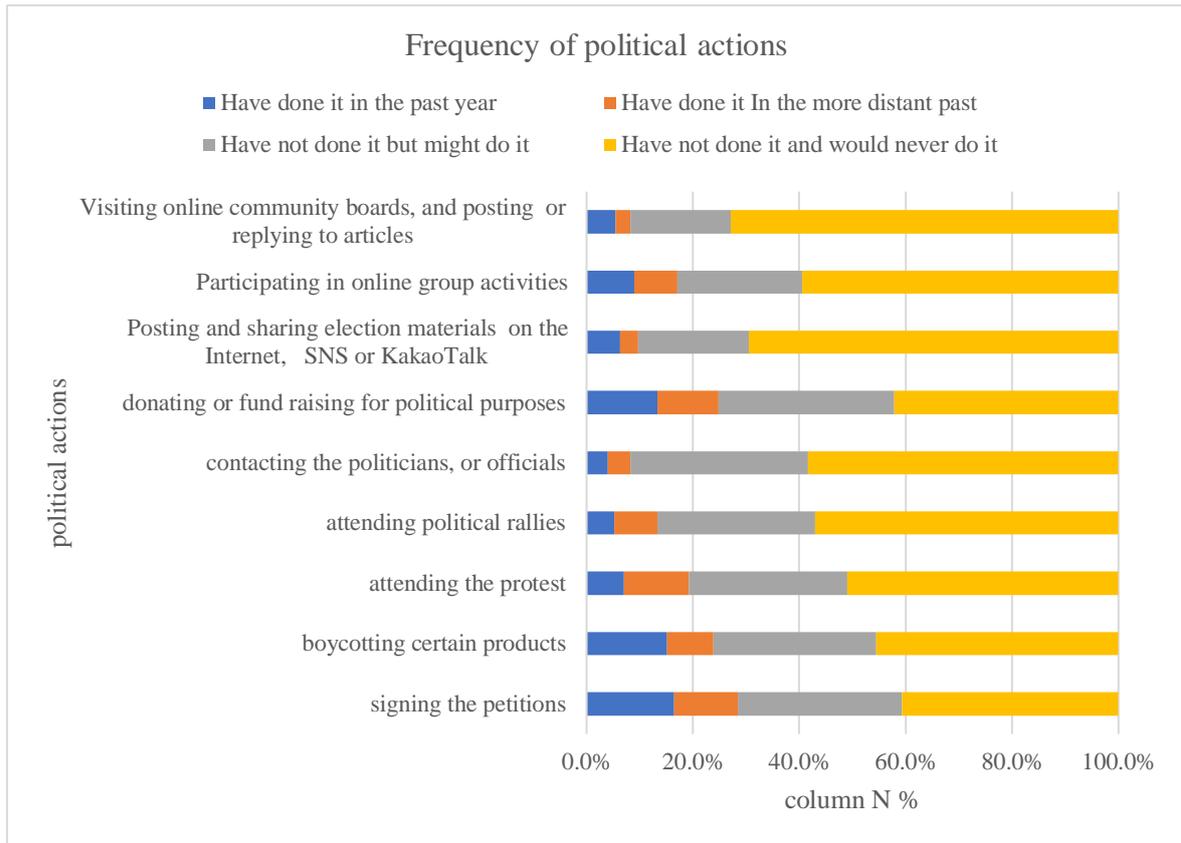
Figure 5-6 Frequency of Political Actions in 2018

KGSS2014

Dependent variable

In the research conducted by KGSS, respondents were asked about their willingness to take certain actions to protect the environment, namely: pay higher prices, pay higher taxes, and accept cuts in the standard of living.

The results, as depicted in Figure 5-7, indicate that more than half of the respondents expressed a willingness to pay higher prices or taxes to protect the environment. However, they were not willing to accept cuts in their standard of living.

It is worth noting that the approach used in the research to measure participants' willingness to pay employed a binary variable, categorizing responses as either "yes" or "no." While this approach simplifies the analysis, it may result in a loss of information regarding the range and variability of participants' willingness to pay.
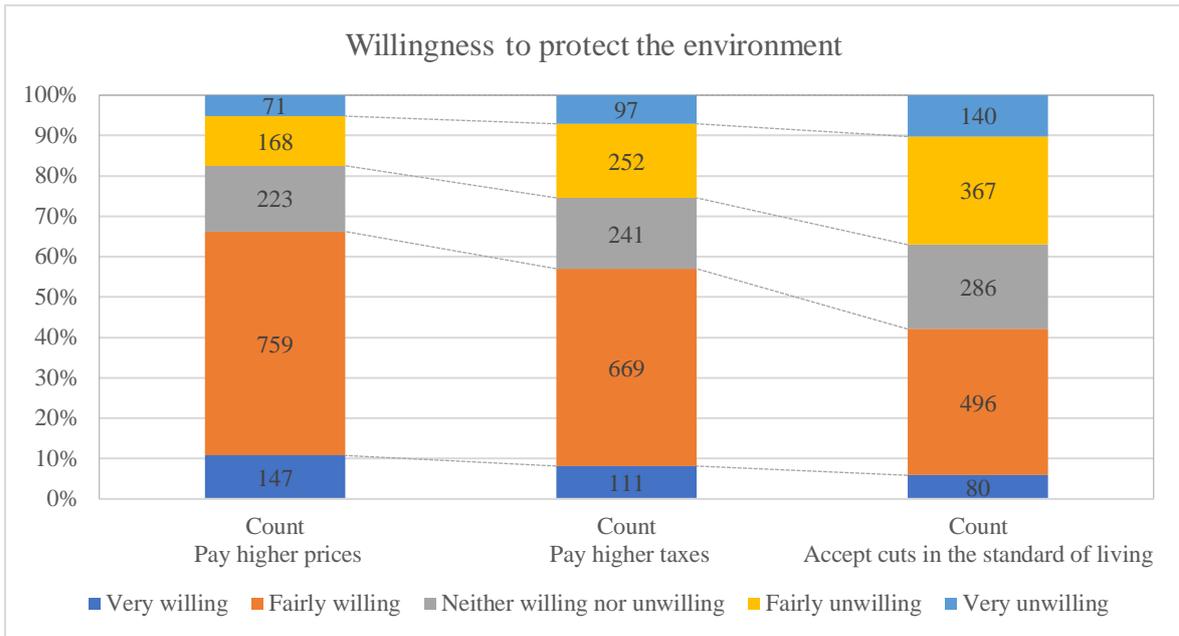
Figure 5-7 Willingness to Protect the Environment in 2014

Independent variables

Based on the survey conducted by KGSS, respondents expressed their opinions regarding threats to the environment. The results indicate that most respondents perceive certain factors as particularly dangerous. Nuclear power stations: This was ranked as the most dangerous threat to the environment according to the respondents' opinions. Rise in world temperature caused by climate change: This was ranked as the second most dangerous threat. Air pollution caused by industry: This was ranked as the third most dangerous threat.

Additionally, more than 50% of the respondents considered the following factors as dangerous: air pollution is caused by industry, pesticides and chemicals used in farming, and modifying the genes of certain crops.

For a more detailed analysis, please refer to Figure 5-8.
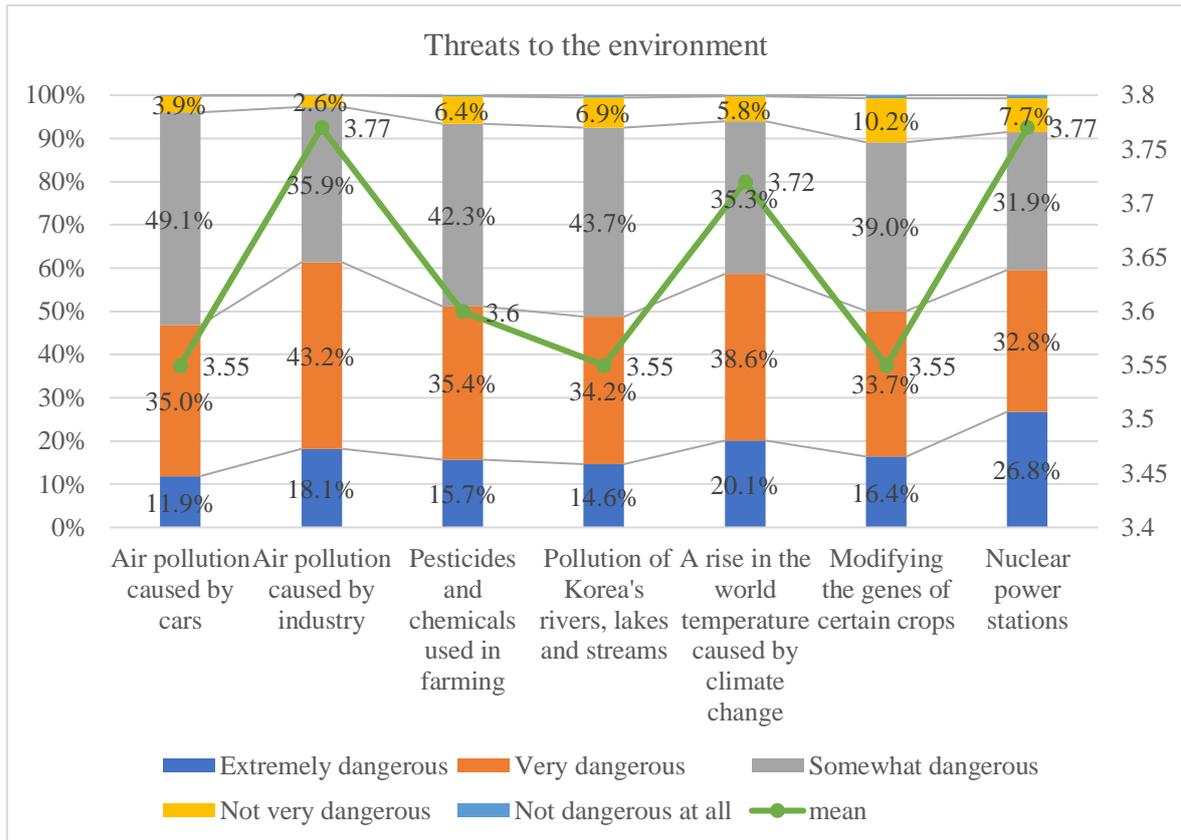
Figure 5-8 Threats to the Environment in 2014

In the KGSS survey, respondents were asked for their opinions on government spending in various areas. The results, as shown in Figure 5-9, indicate that respondents expressed a desire for increased government spending in the following areas: policy and law enforcement, health, environment, education, and old age pensions.

These areas received most of the respondents' support for increased spending. However, less than half of the respondents believed that the government should allocate more funds to the following areas: culture and the arts, unemployment benefits, and military and defense.
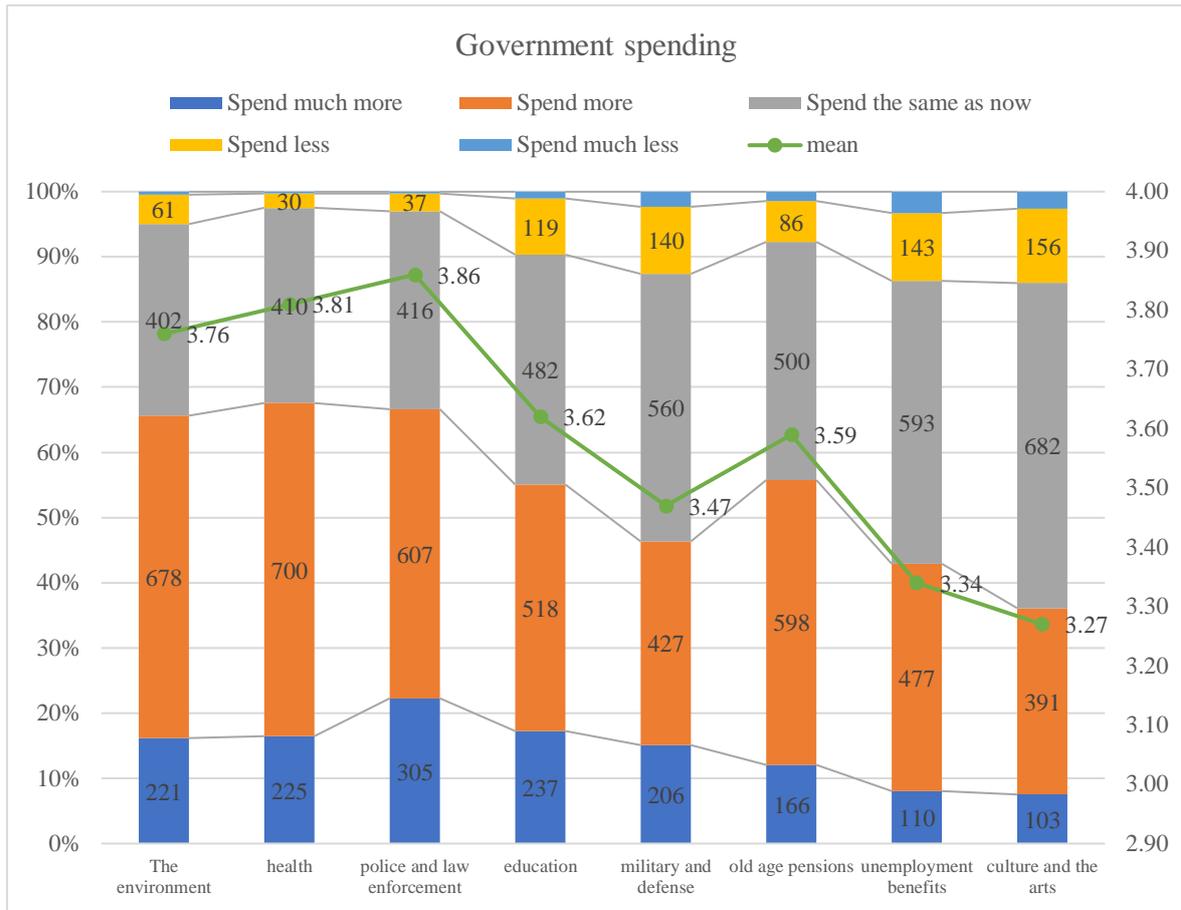
Figure 5-9 Opinion on Government Spending 2014

KGSS asked about the seriousness of pollution in the local residence. They asked about noise pollution. From the statistics, shown as Figure 5-10 respondents are more reported air pollution and noise pollution. Their report about air pollution
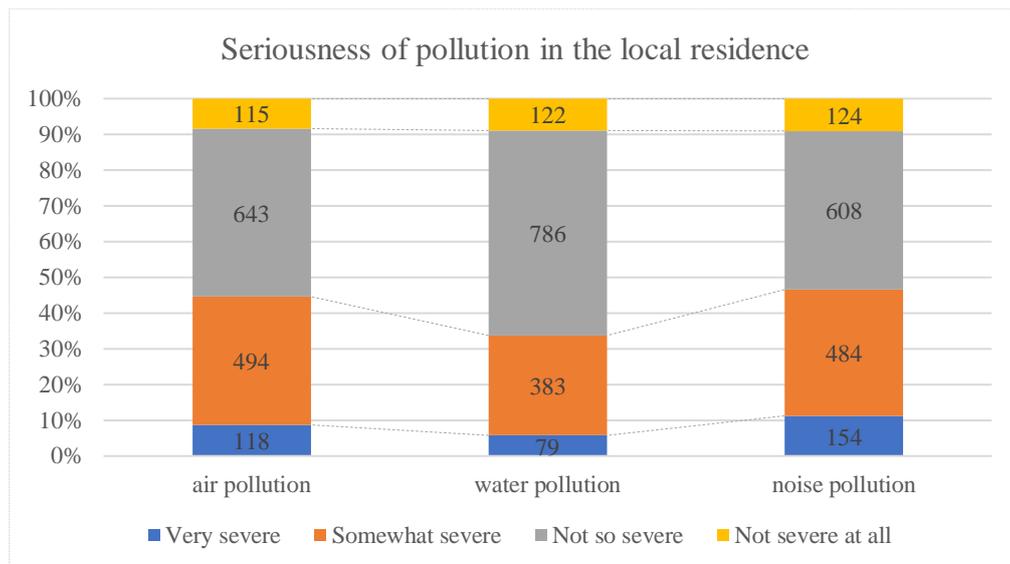
Figure 5-10 Seriousness of Pollution in the Local Residence 2014

KGSS asked about the environmental problems in society and the same problem that affected the

respondent or their family. There are slice difference between these problems. Air pollution, domestic waste disposal and genetically modified foods these three problems affect the family more. While water shortage, nuclear waste, and using up this study natural resource seldom affect the family, respondents also take it as a most important environmental problem. Details can be seen in Figure 5-11.
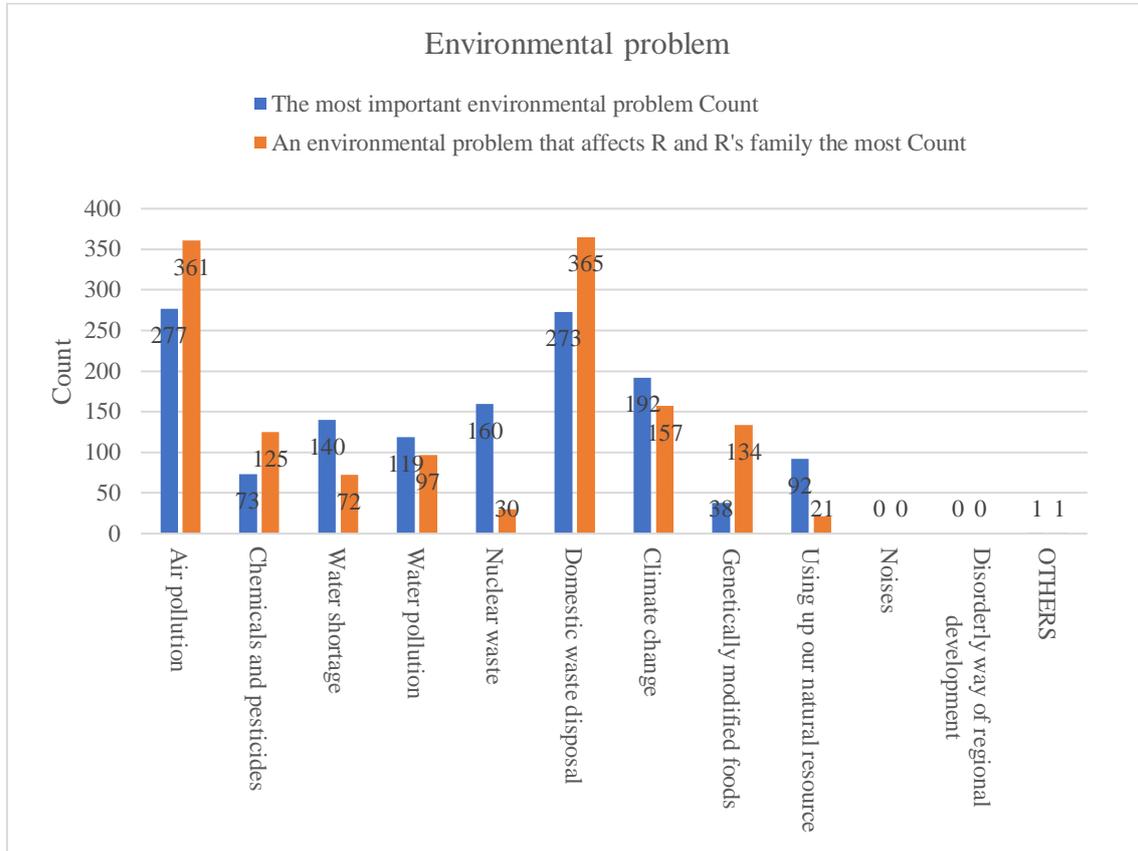
Figure 5-11 Environmental Problem

KGSS2021 surveyed respondents about their willingness to pay for environmental protection and their environmental behaviors such as recycling. Analyzing this data can reveal the relationship between willingness and behavior. Additionally, by comparing the data from 2014, 2018, and 2021, this study can understand how the average awareness of the environment has changed over the years.

In Figure 5-13 respondents' opinions on government spending are depicted. Most respondents express a preference for increased government spending in almost every aspect, except for unemployment benefits, which have a mean value lower than 3. Among the eight aspects considered, the environment is regarded as the most crucial, followed by health and police & law enforcement. Education, military, and old age pensions are of the next level of importance.
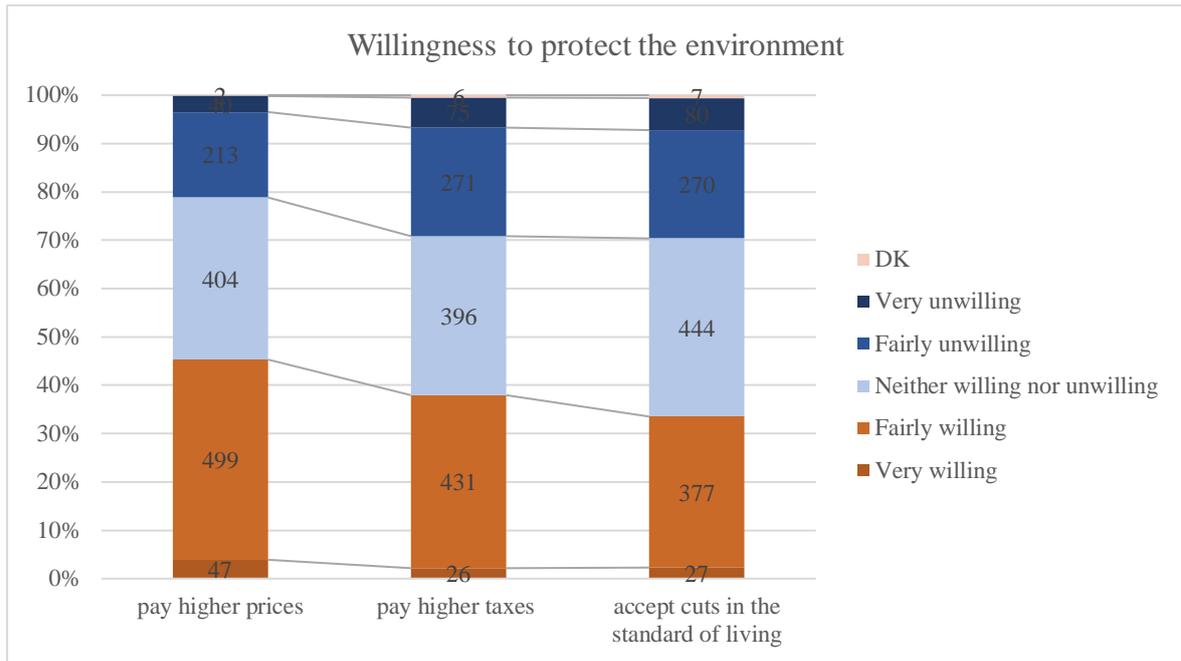
Figure 5-12 Willingness to Protect the Environment in 2021

The results in 2021 regarding government spending preferences appear to differ from those in 2014 and 2018. It is important to consider the potential influence of survey design on respondents' responses. Given that the environment is listed as the top priority in the survey, respondents may be more inclined to pay greater attention to environmental issues. This could potentially impact their responses and influence their willingness to allocate resources towards environmental protection.
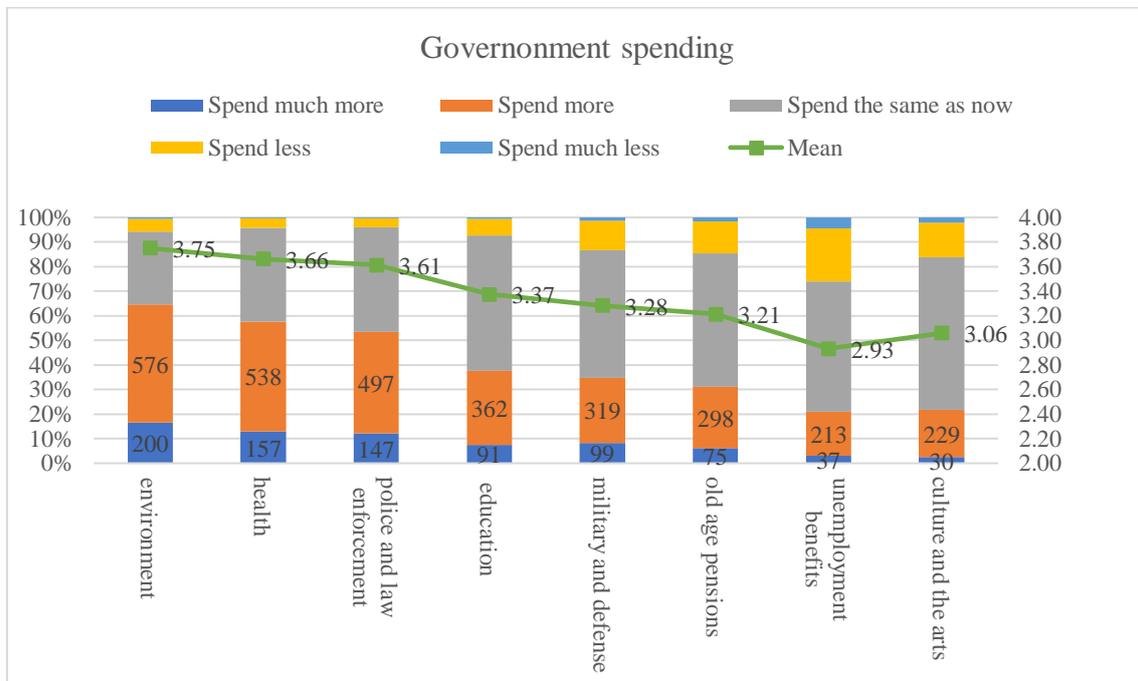
Figure 5-13 Government Spending in 2021
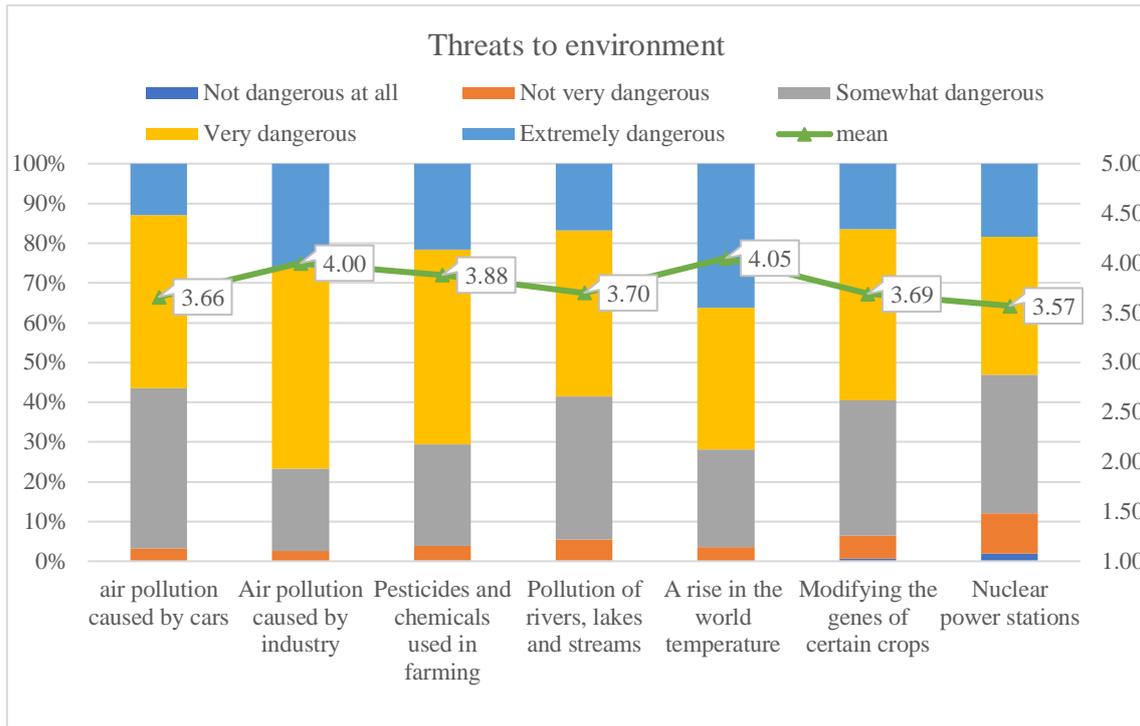
Figure 5-14 Treats to Environment in 2021

Respondents perceive all types of environmental threats as dangerous, with mean values exceeding 3 in Figure 5-14 . The most significant concern is the increase in global temperature due to climate change. However, there are differences in respondents' perceptions of the dangerous aspects of environmental threats compared to the last two surveys.

In the previous survey conducted in 2021, respondents identified domestic waste disposal as the most significant environmental problem, with 30% of respondents reporting it as their primary concern. Climate change was the second most critical issue, followed by air pollution. Only less than 10% of respondents considered water pollution as the most critical environmental problem. These findings indicate a difference in the perceived importance of environmental threats compared to the current survey. Details can be seen in Figure 5-15.
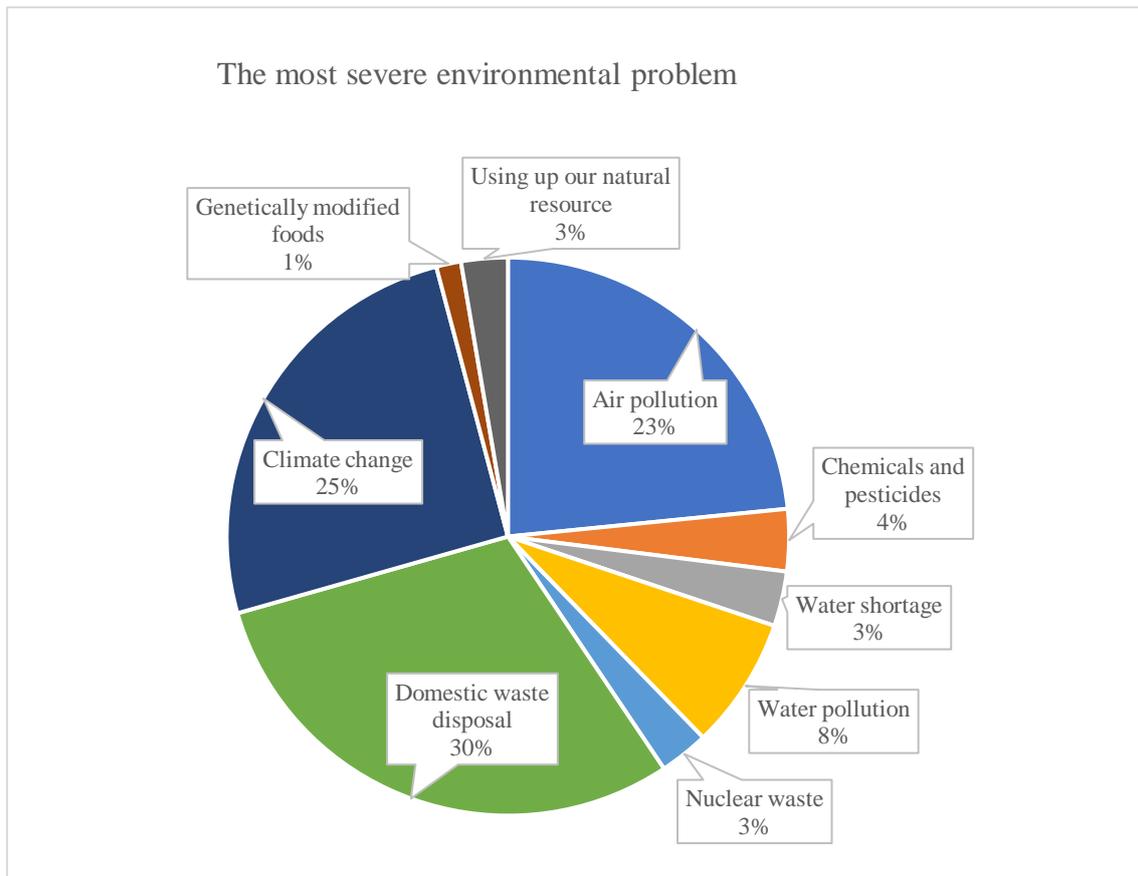
Figure 5-15 The Most Severe Environment Problem in 2021

5.3 Results

5.3.1 Return to Farming and Favor for Return Policy in KGSS 2018

Table 5-5 Descriptive Statistics of Variables in KGSS 2018

Descriptive Statistics	N	Min	Max	Mean	Std. Dev
Return to farming	1011	1	3	1.58	0.552
Opinion on the migration policy from urban to rural areas	984	1	4	1.93	0.727
Subjective assessment on the size of the residential area	1030	1	5	2.47	1.105
Happiness in life	1023	1	4	2.04	0.679
R's physical condition	1030	1	5	2.61	1.073
Region	1031	1	7	3.59	1.818
Urban area/rural area	1031	0	1	0.74	0.439
R's sex	1031	1	2	1.55	0.498
R's age	1030	18	97	51.04	18.918

Descriptive Statistics

	N	Min	Max	Mean	Std. Dev
R's marital status	1026	1	6	2.32	1.721
R's employment status	1031	1	2	1.45	0.498
R's academic background: highest school level	1030	0	8	3.47	1.675
Total average monthly income from the main job(if R has a job)	521	0	10000	304.33	514.455
R's monthly income for the current job (categorical)	522	0	21	6.34	4.186
Whether R has any extra income	540	1	2	1.73	0.446
Total average monthly income from other sources (if R has a job)	535	0	1200	28.88	92.630
R's monthly extra income (categorical)	535	0	21	0.76	1.990
Whether R has income (if unemployed)	456	1	2	1.39	0.488
Total average monthly income (if R is unemployed)	447	0	800	52.17	89.126
R's monthly income (if unemployed) (categorical)	447	0	17	1.46	2.039
Total average monthly income of the household	895	0	20000	456.76	817.396
Monthly household income (categorical)	895	0	21	8.75	6.069
Satisfaction on the financial condition of the family	1022	1	5	2.83	1.095
Number of children	1031	0	8	1.72	1.516
R's House type	1031	1	4	1.98	0.734
R's House form	1021	1	5	1.60	0.952
assessment on people's willingness to help	1031	1	3	1.55	0.716
Opinion on what decides individual morality	1030	1	7	3.27	1.756
Political orientation	999	1	5	2.77	0.996
Trust on people	1029	1	4	2.58	0.762
Political actions: signing the petitions	1031	1	4	2.96	1.089
Political actions: boycotting certain products	1031	1	4	3.06	1.070
Political actions: attending the protest	1031	1	4	3.25	0.922
Political actions: attending political rallies	1030	1	4	3.39	0.845
Political actions: contacting the politicians, or officials	1029	1	4	3.46	0.757
Political actions: donating or fund raising for political purposes	1030	1	4	3.04	1.033
Political actions: Posting and sharing election materials such as writings, pictures, videos, and audios on the Internet, SNS or Kakao Talk	1031	1	4	3.53	0.834
Political actions: Participating in online group activities (ribbon & banner, memorial activity, sharing	1031	1	4	3.33	0.960

Descriptive Statistics

	N	Min	Max	Mean	Std. Dev
posts, etc.)					
Political actions: Visiting online community boards, online cafes, and club, web portals, or online news sites, and posting politics-related messages or replying to articles	1031	1	4	3.59	0.790
Government spending: The environment	1017	1	5	2.21	0.878
Government spending: health	1023	1	5	2.16	0.780
Government spending: police and law enforcement	1022	1	5	2.30	0.793
Government spending: education	1018	1	5	2.33	0.888
Government spending: military and defense	1018	1	5	2.83	0.967
Government spending: old age pensions	1024	1	5	2.56	0.880
Government spending: unemployment benefits	1018	1	5	2.83	0.911
Government spending: culture and the arts	1003	1	5	2.82	0.835
Success of government policies on providing health care for the sick	1017	1	5	2.49	0.770
Success of government policies on providing a decent standard of living for the old	1019	1	5	2.80	0.895
Success of government policies on dealing with threats to national security	1012	1	5	2.65	1.021
Success of government policies on controlling crime	1018	1	5	2.89	0.972
Success of government policies on fighting unemployment	1011	1	5	3.54	0.894
Success of government policies on protecting the environment	1015	1	5	3.13	0.885
Number of family members living together	1031	1	8	2.47	1.279
Number of family members living away from R	1031	0	4	0.33	0.747

Correlation analysis

What is the relation between opinion on the mobility policy and their wishes to return to rural areas for living or farming? See Table 5-6 Respondents having wish to return to rural areas are more likely to agree with migration policy from urban to rural areas. The positive correlation is significant.

The correlation between these variables is low. Details can be seen from Figure 5-16. Environmental care and return to farm significantly correlate at 0.05 level, but the value is only 0.057.
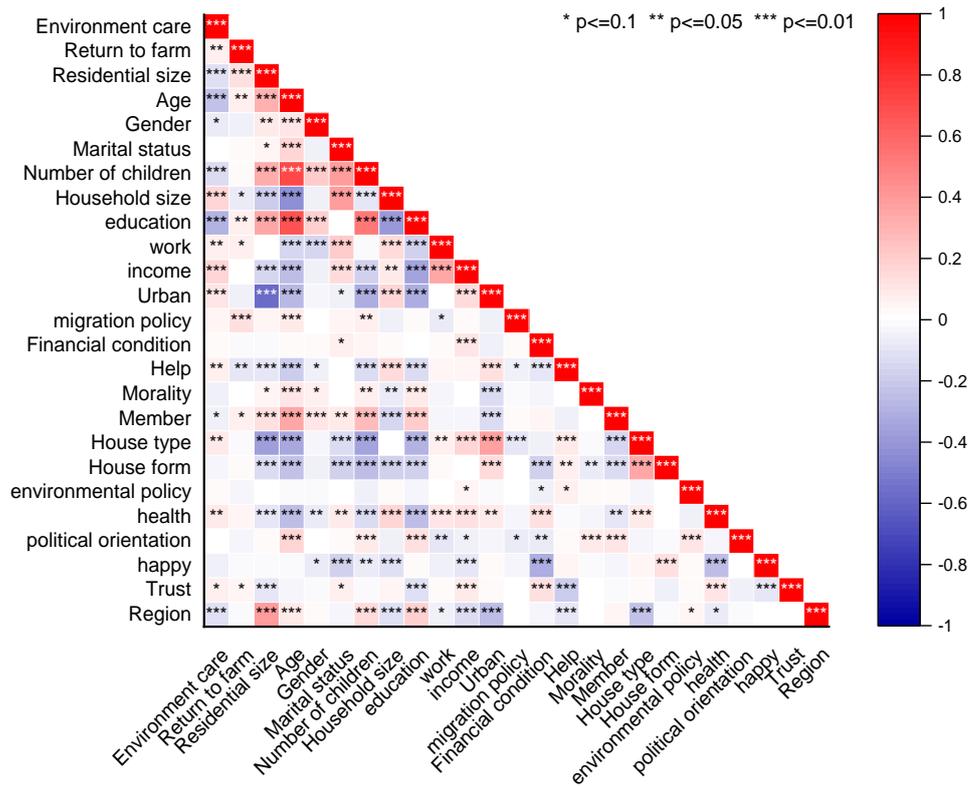
Figure 5-16 Correlation of Variables in KGSS 2018

Table 5-6 Nonparametric Correlations between Return to Farming and Opinion on the Migration Policy.

Correlations

			Return to farming	Opinion on the migration policy from urban to rural areas
Spearman's rho	Return to farming	Correlation Coefficient	1.000	.124**
		Sig. (2-tailed)		0.000
		N	1011	968
	Opinion on the migration policy from urban to rural areas	Correlation Coefficient	.124**	1.000
		Sig. (2-tailed)	0.000	
		N	968	984

**. Correlation is significant at the 0.01 level (2-tailed).

The proportion of people who think that the government should spend more on the environment is the proportion of the average of all projects, and more than 1 indicates that people are more concerned about environmental protection, equal to or less than less than weak concern for the environment.

Statistically, 37.7% of people have weak concern about environmental protection, and 62.3% have strong concern about the environment. Most people agree that the government should spend more on improving the quality of the environment. Showed in Table 5-7.

Table 5-7 Statistic of Attitude on Spending on Environment

government spending on environment above all

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<= .89	190	18.4	19.3	19.3
	.90 - 1.00	181	17.6	18.4	37.7
	1.01 - 1.10	171	16.6	17.4	55.1
	1.11 - 1.19	165	16.0	16.8	71.8
	1.20 - 1.29	109	10.6	11.1	82.9
	1.30+	168	16.3	17.1	100.0
	Total	984	95.4	100.0	
Missing	System	47	4.6		
Total		1031	100.0		

On the other hand, a similar approach is used to see how people's perceptions of the success of government policies on the environment compare with the overall average. 32.3 percent of respondents believe that government policies on the environment are more successful than average, while 67.7 percent believe that government policies on the environment are less successful. Showed in Table 5-8.

Table 5-8 Statistic on Attitude towards Polices on Environment

polices on environment above all

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<= .71	147	14.3	14.9	14.9
	.72 - .86	156	15.1	15.8	30.8
	.87 - .95	214	20.8	21.7	52.5
	.96 - 1.00	150	14.5	15.2	67.7
	1.01 - 1.14	153	14.8	15.5	83.2
	1.15+	165	16.0	16.8	100.0
	Total	985	95.5	100.0	
Missing	System	46	4.5		
Total		1031	100.0		

The two data showed a weak significant negative correlation. Showed in Table 5-9 That is, people who feel that the government should spend more on the environment do not think that the government's policies on the environment are successful. The two reflect a largely consistent understanding. However, the correlation is not strong, the correlation coefficient is 0.138, which means that there is a clear difference between the two, and neither can be replaced with the other. In this article, this study pays more attention to people's concern about the environment, so this study chooses the variable that respondents thought the government should spend more on environmental

protection to quantify people's concern for the environment, and the higher the number, the stronger the respondent's concern for the environment. Of course, there is also a potential uncertainty, and it cannot be absolutely said that respondents who think that the government should spend more on the environment must be concerned about the environment. However, respondents who regard the government should spend more than 1 in the ratio of money spent on the environment to the average for all projects are almost certain that they are concerned about the environment.

Table 5-9 Correlations Spending and Policy.

Correlations

		Government spending on environment above all	Polices on environment above all
Government spending on environment above all	Pearson Correlation	1	-.138[**]
	Sig. (2-tailed)		.000
	N	984	958
Polices on environment above all	Pearson Correlation	-.138[**]	1
	Sig. (2-tailed)	.000	
	N	958	985

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5-10 Crosstabs of Policy and Spending

Policy on environment success * spending enough Crosstabulation

			Spending enough		
			Not enough 0	Enough 1	Total
Policy on environment success	Unsuccessful 0	Count	421$_a$	229$_b$	650
		Expected Count	405.7	244.3	650.0
	Successful 1	Count	177$_a$	131$_b$	308
		Expected Count	192.3	115.7	308.0
Total		Count	598	360	958
		Expected Count	598.0	360.0	958.0

Each subscript letter denotes a subset of spending enough categories whose column proportions do not differ significantly from each other at the .05 level.

Initially, subjective assessment on the size of residential area is correlated to many other viables, such as region, which is something for sure, but it is corelated to physical condition, urban area/ rural area, which is sure too. Age is correlated too, that is something new. Education, income, number of children, house type, are all significantly correlated with the subjective assessment on the size of the residential area.

Decision tree model

The decision tree model was used to explore the interrelationships between different variables, as shown in Figure 5-17. The results show that the group most likely to show willingness to return to

the countryside are those who strongly agree with the government's policy of migrating urbanites to rural areas, and who also have 1-2 children and are in very good health. This group has an 83.3% probability of choosing to return to agriculture. This means that they have a strong strength to return to the countryside.

In contrast, young people who live in large cities or suburbs of large cities and do not strongly agree with the immigration policy (those under 33 years old) have a very low probability of returning to agriculture, only 18.4%. Therefore, they may need more support and encouragement to increase their willingness to return.

Figure 5-17 Tree Diagram of People Returns to Farming.
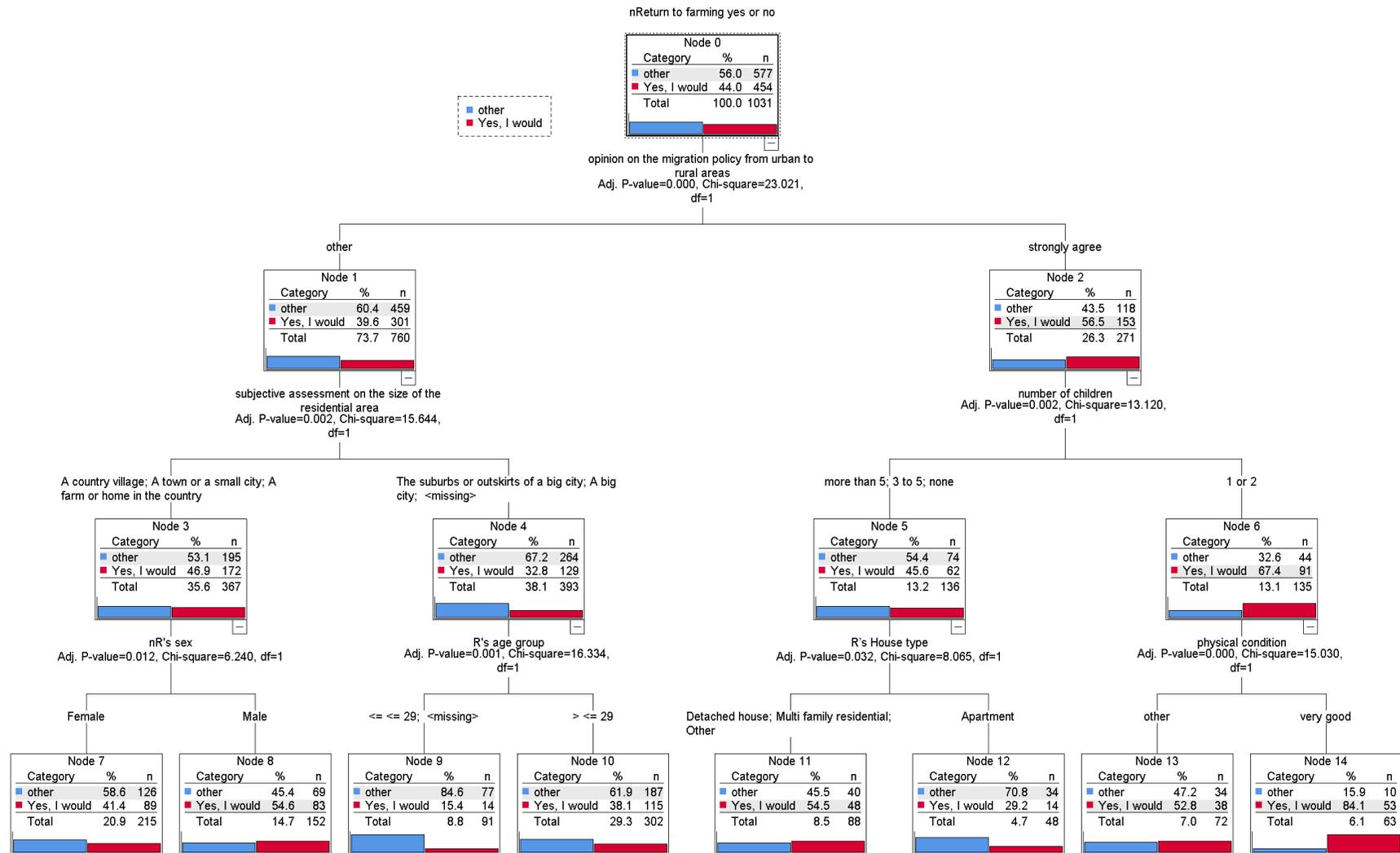
Binary logistic regression of return to rural area in 2018.

Compared to respondents living in a big city, individuals residing in a town or small city have a 2.4 times higher tendency to return to a rural area. Moreover, those living in the countryside demonstrate an even stronger inclination, with a 3.2 times greater desire to return to a rural area. Specifically, people living on a farm or in a home in the county exhibit a significant 6.3 times higher likelihood of wanting to return to a rural area. However, individuals residing in the suburbs or outskirts of a big city do not show a significant difference in their inclination to return to a rural area when compared to those living in a big city. Details can be found from Table 5-11.

Compared to respondents under the age of 30, individuals aged 30 and older consistently express a stronger desire to return to a rural area. The extent of this inclination varies, ranging from 1.8 times to 3.7 times higher. In other words, individuals older than 30 are significantly more likely to wish for a return to rural areas compared to those under the age of 30, with the specific increase in desire depending on the age group.

Compared to respondents living in Seoul, individuals residing in the regions of Gangwon, Chungcheong, and Jeolla exhibit a lower likelihood of returning to a rural area. The specific decrease in the desire to return to rural areas may vary across these regions. However, overall, residents of Gangwon, Chungcheong, and Jeolla are less inclined to express a wish to return to rural areas compared to individuals living in Seoul.

Table 5-11 BR Results of Return in 2018

Variables in the equation

		B	S.E.	Wald	Df	Sig.	Exp(b)	95% c.i.for exp(b) Lower	Upper
Step 5ᵃ	Subjective assessment on the size of the residential area: ref. Big city			22.873	4	**.000**			
	The suburbs or outskirts of a big city	.453	.233	3.765	1	.052	1.573	.995	2.486
	A town or a small city	.867	.244	12.600	1	.000	2.379	1.474	3.839
	A country village	1.163	.270	18.617	1	.000	3.199	1.886	5.426
	A farm or home in the country	1.839	.776	5.611	1	.018	6.291	1.374	28.817
	Opinion on the migration policy from urban to rural areas: other compared to strongly agree	-.747	.168	19.790	1	.000	.474	.341	.659
	R's marital status: other compared to married	.414	.172	5.829	1	.016	1.513	1.081	2.117
	R's age group: ref. <30			26.844	6	.000			
	30-39	.824	.291	8.008	1	.005	2.279	1.288	4.032
	40-49	1.305	.295	19.529	1	.000	3.688	2.067	6.580
	50-59	1.277	.291	19.292	1	.000	3.586	2.028	6.341
	60-69	1.174	.304	14.917	1	.000	3.236	1.783	5.871
	70-79	.615	.299	4.233	1	.040	1.849	1.030	3.322
	80+	.877	.368	5.691	1	.017	2.404	1.169	4.941
	Region: ref. Seoul			19.073	6	.004			

Gyeonggi	-.045	.264	.029	1	.865	.956	.570	1.604
Gangwon	-1.256	.455	7.619	1	.006	.285	.117	.695
Chungcheong	-.846	.314	7.258	1	.007	.429	.232	.794
Gyeongsang	-.459	.248	3.414	1	.065	.632	.388	1.028
Jeolla	-.830	.307	7.295	1	.007	.436	.239	.796
Jeju	-.474	.631	.563	1	.453	.623	.181	2.145
Constant	-.919	.320	8.232	1	.004	.399		

A. Variable(s) entered on step 5: r's marital status married or not.

Table 5-12 Classification Table of BR in 2018

Classification Table ͣ

			Predicted		
			Return to farming yes or no		
Observed			other	Yes, I would	Percentage Correct
Step 5 Return to farming yes or no	other		320	132	70.8
	Yes, I would	182		196	51.9
Overall Percentage					62.2

a. The cut value is .500
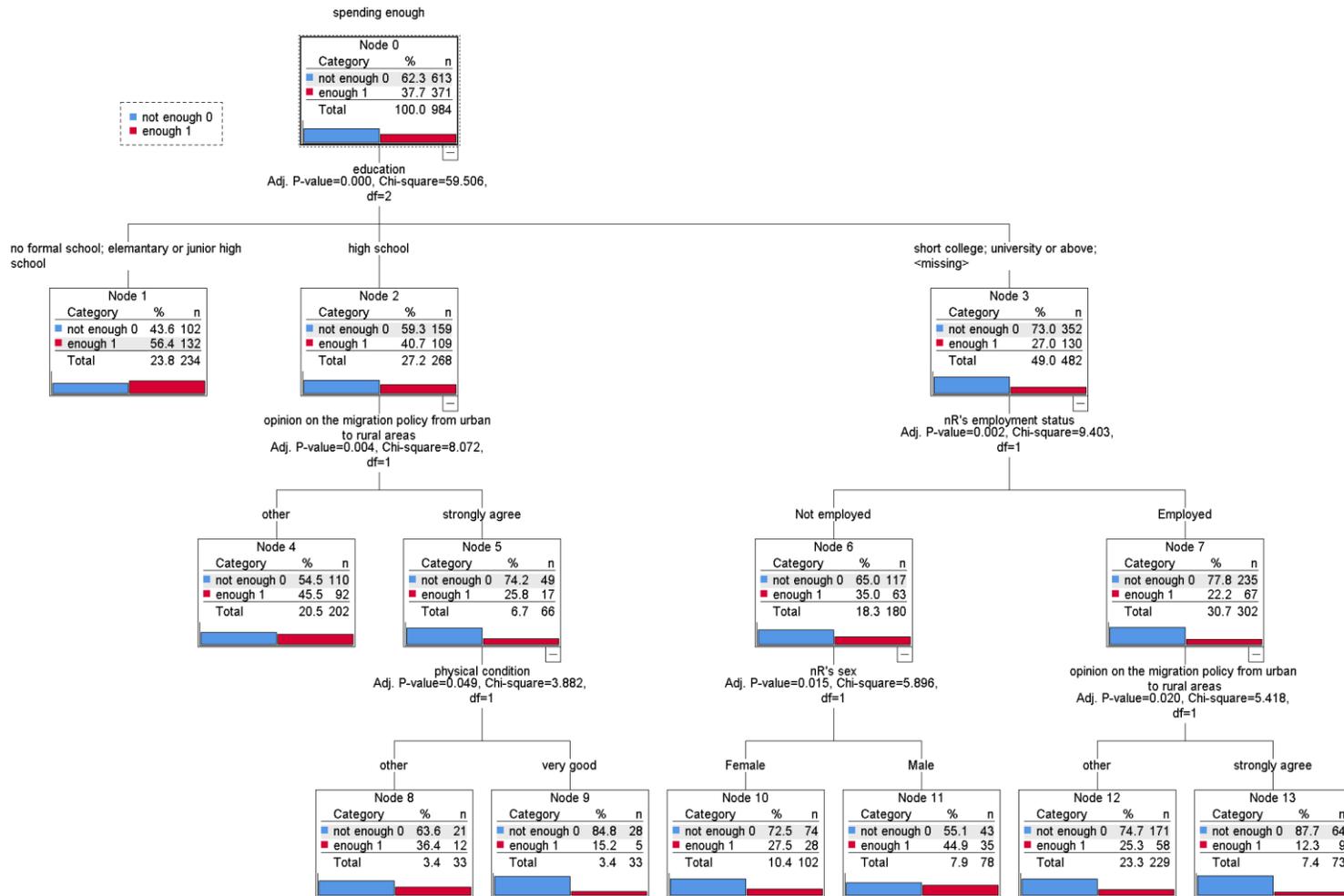
Figure 5-18 Tree Diagram of Government Spending in 2018

Binary logistic regression

A binary logistic regression was conducted to analyze the data. The model demonstrated good performance, with a Nagelkerke R Square of 11.5%, as shown in Table 5-13. The Hosmer and Lemeshow test also indicated that the model has good applicability, as displayed in Table 5-14. The model accuracy was found to be 66.8%, as presented in Table 5-15.

Table 5-13 Model Summary

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1170.202[a]	.057	.078
2	1154.292[a]	.073	.100
3	1143.284[a]	.084	.115

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 5-14 Hosmer and Lemeshow Test of Regression Model.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	3	1.000
2	1.291	6	.972
3	4.349	8	.824

Table 5-15 Classification Table

Classification Table [a]

Observed			Predicted		
			Spending enough		Percentage Correct
			Not enough 0	Enough 1	
Step 3	Spending enough	Not enough 0	494	85	85.3
		Enough 1	222	125	36.0
	Overall Percentage				66.8

a. The cut value is .500

The relevant factors were analyzed using a binary logistic regression model, and the results are presented in Table 5-16.

Respondents who slightly disagreed with the government's urban-to-rural migration policy were 1.778 (95% CI 1.133-2.791) times more likely to believe that the government's investment in environmental protection was sufficient compared to those who strongly agreed with the policy.

Respondents who disagreed with the government's urban-to-rural migration policy were 1.913 (95% CI 1.362-2.688) times more likely to believe that the government's investment in environmental protection was sufficient compared to those who strongly agreed with the policy.

In other words, respondents who support the urban-to-rural migration policy are more concerned about environmental protection.

Respondents without formal schooling were 2.611 (95% CI 1.275-5.345) times more likely to believe that the government's investment in environmental protection was sufficient compared to those with a university or higher education.

Respondents with elementary school or junior high school education were 3.430 (95% CI 2.300-5.114) times more likely to believe that the government's investment in environmental protection was sufficient compared to those with a university or higher education.

Respondents with high school education were 1.760 (95% CI 1.234-2.510) times more likely to believe that the government's investment in environmental protection was sufficient compared to those with a university or higher education.

Respondents who live in large cities are more concerned about environmental protection than those who live in rural areas.

Respondents living in the suburbs of a big city are 1.500 (95% CI 1.007-2.233) times more likely to believe that the government's spending on the environment is sufficient compared to those living in the big city.

Respondents living in a country village are 1.643 (95% CI 1.055-2.559) times more likely to believe that the government's spending on the environment is sufficient compared to those living in the big city.

In conclusion, the analysis using a binary logistic regression model revealed several significant factors influencing public perceptions of government spending on environmental protection. Firstly, respondents who expressed disagreement or slight disagreement with the government's urban-to-rural migration policy were more likely to believe that the government's investment in environmental protection was sufficient. This suggests a connection between support for the migration policy and concerns for environmental issues.

Additionally, respondents with lower levels of education, including those without formal schooling and those with elementary or junior high school education, were more likely to perceive government investment in environmental protection as sufficient compared to those with a university or higher education. This indicates a potential disparity in perceptions based on educational backgrounds.

Moreover, the analysis indicated that respondents living in large cities, particularly in the suburbs or country villages, showed a greater belief in the government's sufficient spending on environmental protection compared to those living in the city itself. This suggests that individuals residing in more urbanized areas may place a higher emphasis on environmental concerns.

These findings highlight the complex interplay of factors influencing public opinions on government spending in relation to environmental protection. Policymakers should take these factors into consideration when formulating and implementing policies, ensuring they address the varying concerns and priorities of different segments of the population.

Table 5-16 Binary logistic Regression on government spending in KGSS 2018

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 3°	Opinion on the migration policy from urban to rural areas ref. Agree			15.103	3	**0.002**			
	Slightly agree	0.048	0.496	0.009	1	0.923	1.049	0.397	2.772
	Slightly disagree	0.576	0.230	6.272	1	**0.012**	**1.778**	1.133	2.791
	Disagree	0.649	0.173	13.986	1	**0.000**	**1.913**	1.362	2.688
	Education ref. University or above			42.549	4	0.000			
	No formal school	0.960	0.366	6.887	1	**0.009**	**2.611**	1.275	5.345
	Elementary or junior high school	1.232	0.204	36.547	1	**0.000**	**3.430**	2.300	5.114
	High school	0.565	0.181	9.727	1	**0.002**	**1.760**	1.234	2.510
	Short college	-0.065	0.261	0.062	1	0.803	0.937	0.562	1.563
	Subjective assessment on the size of the residential area ref. A big city			9.899	4	**0.042**			
	The suburbs or outskirts of a big city	0.405	0.203	3.982	1	**0.046**	**1.500**	1.007	2.233
	A town or a small city	0.017	0.206	0.007	1	0.936	1.017	0.679	1.524
	A country village	0.497	0.226	4.829	1	**0.028**	**1.643**	1.055	2.559

A farm or home in the country	-0.202	0.690	0.086	1	0.769	0.817	0.211	3.156
Constant	-1.663	0.213	61.063	1	0.000	0.190		

a. Variable(s) entered on step 1: education.

b. Variable(s) entered on step 2: Opinion on the migration policy from urban to rural areas.

c. Variable(s) entered on step 3: subjective assessment on the size of the residential area .

Table 5-17 Regression of Environmental Concern in KGSS2018

		Model 1	Model 2	Model 3	Model 4	Model 5
Education	University or above		***	***	***	***
	Short college		1.050	1.040	1.040	1.040
	High school		0.619**	0.614**	0.614**	0.614**
	Elementary or junior high school		0.289***	0.277***	0.277***	0.277***
	No formal school		0.429**	0.401**	0.401**	0.401**
Opinion on the migration policy from urban to rural areas	Strongly agree ref. other			1.903***	1.903***	1.903***
Constant(B)		0.535	0.971	0.823	0.823	0.823
	χ^2	0.000	46.011	59.855	59.855	59.855
	df	0	4	5	5	5
	P<		0.0001	0.0001	0.0001	0.0001
	Nagelkerke R Square %	0.000	7.4	9.5	9.5	9.5
	overall percentage correct %	63.1	65.9	66.0	66.0	66.0

Table 5-18 Regression of Return to Farming in 2018

		Model 1	Model 2	Model 3	Model 4	Model 5
Subjective assessment on the size of the residential area	A big city		***	***	***	***
	The suburbs or outskirts of a big city		1.301	1.369	1.369	1.513
	A town or a small city		1.732***	1.774***	1.774***	2.375***
	A country village		2.429***	2.466***	2.466***	3.368***
	A farm or home in the country		4.674**	4.584**	4.584**	7.085**
R's age			1.016***	1.015**	1.015**	1.012**
Number of children	None		**	**	**	*
	1 or 2		1.067	1.054	1.054	1.067
	3 to 5		0.565	0.570	0.570	0.626
	More than 5		0.772	0.824	0.824	1.030
R's employment status	Employed ref. Unemployed		1.385**	1.429**	1.429**	1.393**
Opinion on the migration policy from urban to rural areas	Strongly agree ref. Other			2.055***	2.055***	2.104***
Region	Seoul					**
	Gyeonggi					0.979
	Gangwon					0.302***
	Chungcheong					0.485**
	Gyeongsang					0.711
	Jeolla					0.465**
	Jeju					0.830

		Model 1	Model 2	Model 3	Model 4	Model 5
Constant(B)		-0.180	-1.514	-1.676	-1.676	-1.406
	χ^2	0.000	42.073	61.587	61.587	78.786
	df	0	9	10	10	16
	P<		0.0001	0.0001	0.0001	0.0001
	Nagelkerke R Square %	0.000	6.6	9.6	9.6	12.2
	overall percentage correct %	54.5	60.2	59.7	59.7	62.1

Based on KGSS2018, respondents environmental concern is correlated to their education and their opinion on return to farm policy. KGSS surveyed respondents on their opinions regarding increased government spending in eight areas, including the environment, education, and military. This study quantifies respondents' level of concern for the environment based on whether they believe the government should increase expenditure on environmental protection beyond the average for all projects. Regression model results indicate that respondents' environmental concern is influenced by their level of education and their stance on the government's rural revitalization policy.

Specifically, compared to respondents with a college degree or higher, those without formal education exhibit 40% of the environmental concern. Respondents with primary or middle school education show 27% of the environmental concern compared to those with a college degree or higher. However, respondents with a high school education demonstrate 60% of the environmental concern relative to those with a college education. Furthermore, respondents who strongly support the government's rural revitalization policy exhibit 1.9 times the level of environmental concern compared to respondents with other attitudes. Details can be seen from Table 5-17.

Binary regression analysis was conducted on respondents expressing a desire to return to rural areas, revealing correlations with location, age, number of children, and region. Specifically, compared to respondents living in major cities, those residing in small cities or towns have twice the likelihood of wanting to return to rural areas, while respondents living in rural areas have triple the likelihood, and those living in remote rural areas have seven times the likelihood. For each year increase in age, the likelihood of wanting to return to rural areas increases by a factor of 1.012. Individuals with jobs have a 1.4 times higher likelihood of wanting to return compared to those who are unemployed. In contrast to respondents living in Seoul, respondents living in Gangwon, Chungcheong, and Jeolla regions have less than half the likelihood of wanting to return compared to Seoul respondents. People who support the government's rural revitalization policy have twice the likelihood of wanting to return to their hometown compared to individuals with other attitudes. Details can be seen from Table 5-18.

Based on the KGSS2018 survey, the results indicate that respondents' level of environmental concern is correlated with their level of education and their opinion on the government's rural revitalization policy.

Regarding education, respondents without formal education exhibit 40% of the environmental concern compared to respondents with a college degree or higher. Those with primary or middle school education show 27% of the environmental concern, while respondents with a high school education demonstrate 60% of the environmental concern relative to those with a college education. This suggests that higher levels of education are associated with a greater level of environmental concern.

Furthermore, respondents who strongly support the government's rural revitalization policy exhibit 1.9 times the level of environmental concern compared to respondents with other attitudes. This indicates that individuals who are in favor of the government's efforts to revitalize rural areas are more likely to prioritize environmental protection.

Regarding the desire to return to rural areas, binary regression analysis reveals several factors influencing this inclination. Compared to respondents living in major cities, those residing in small cities or towns have twice the likelihood of wanting to return to rural areas. Respondents living in rural areas have triple the likelihood, and those in remote rural areas have seven times the likelihood. This suggests that individuals residing in less urbanized areas are more inclined to consider returning to their rural hometowns.

The analysis also indicates that as age increases by one year, the likelihood of wanting to return to rural areas increases by a factor of 1.012. Additionally, individuals with jobs have a 1.4 times higher likelihood of wanting to return compared to those who are unemployed. This suggests that employment status plays a role in individuals' decisions to return to rural areas.

Furthermore, respondents living in Gangwon, Chungcheong, and Jeolla regions have less than half the likelihood of wanting to return compared to respondents living in Seoul. This implies that individuals living in specific regions within South Korea may have different motivations or opportunities when considering a return to rural areas.

In summary, the results highlight the interplay between education, opinions on the government's rural revitalization policy, and individual characteristics in shaping environmental concerns and the desire to return to rural areas.

5.3.2 Willingness to Pay for Protecting the Environment in KGSS2014

Age, education, environmental concern, vulnerable to air pollution, and opinion on government spending on the environment these factors have positive effect on WTP, details can be seen from Table 5-22.
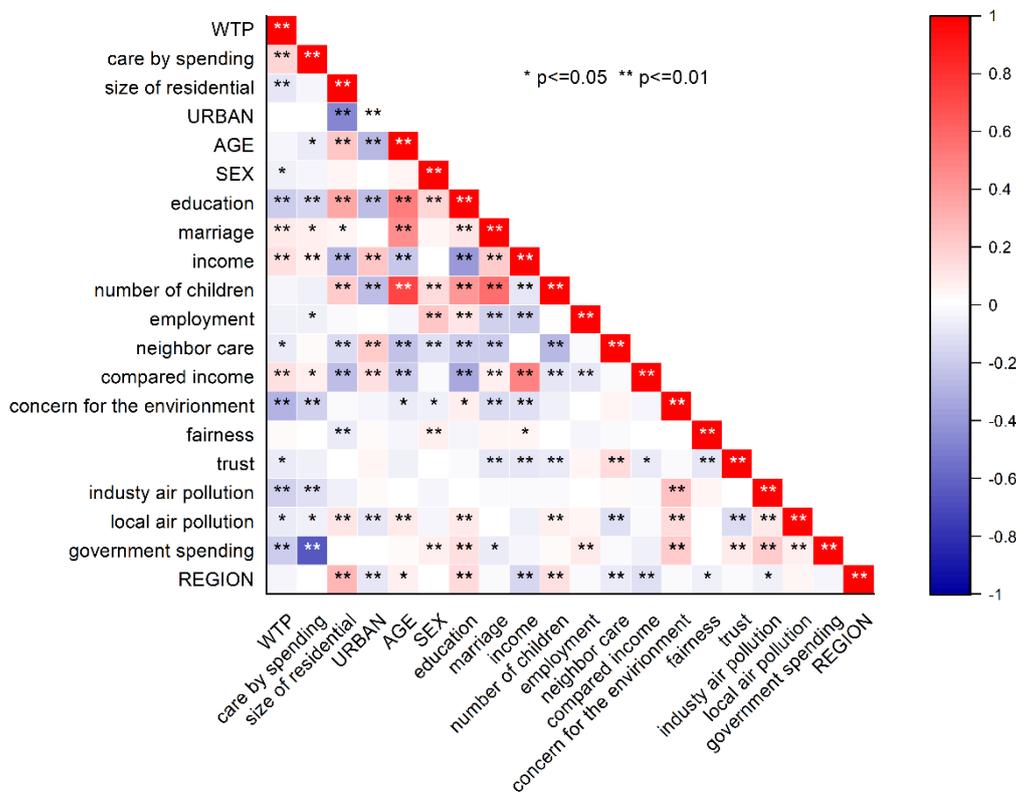
Figure 5-19 Correlation of Variables in KGSS2014

Classification tree

Table 5-19 Model Summary 2014

Model Summary

Specifications	Growing Method	CHAID
	Dependent Variable	willing to protect the environment b

100

Independent Variables	R's age /8little, Region /Jeju Gangwon little, R's sex, monthly household income 5 level, Number of children, size of the residential area, Urban area/rural area, government spending on the environment, assessment on fairness of most people, Threats air pollution caused by industry, R's employment status, marital status, Trust on people /1little, Seriousness of air pollution in the local residence /1little, General concerns for the environment/ 1little, Self-assessment of R's family income compared to general family income (2005) /1little, R's academic background /1 little
Validation	None
Maximum Tree Depth	3
Minimum Cases in Parent Node	30
Minimum Cases in Child Node	5

Results	Independent Variables Included	General concerns for the environment/ 1little, R's academic background /1 little, government spending on the environment, size of the residential area, R's sex
	Number of Nodes	17
	Number of Terminal Nodes	10
	Depth	3

Table 5-20 Classification of Classification Tree

Classification

	Predicted		
Observed	Other	Willing	Percent Correct
Other	115	273	29.6%
Willing	75	907	92.4%
Overall Percentage	13.9%	86.1%	74.6%

Growing Method: CHAID

Dependent Variable: willing to protect the environment b

The decision tree model reveals that the level of concern for environmental issues is a significant factor related to respondents' willingness to pay. Individuals who are environmentally conscious exhibit the highest willingness to pay, reaching 82.6%. In contrast, respondents who do not care about

the environment at all have a willingness to pay only 41.9%. Those who maintain a neutral attitude or claim to be less concerned about the environment show a willingness to pay 58.3%. Additionally, the respondents' educational level plays a role. Respondents with higher education have a willingness to pay 65.1%, which is approximately 20% higher compared to respondents with a moderate education level. Among this group with higher education, those who believe that the government should increase expenditure show a higher willingness to pay, reaching 86.8%, while respondents who support the government's decision to maintain or reduce environmental expenditure have a willingness to pay that is approximately 30% lower. This demonstrates that even for respondents who are not particularly concerned about environmental issues or hold a neutral attitude, their educational background, and views on government spending in the environmental sector also influence their willingness to pay for the environment.

When the educational level is lower, gender differences become apparent. Males report a willingness to pay approximately 20% higher than females, reaching 56.7%.

The impact of educational level is similarly evident among environmentally conscious respondents. Those with higher education exhibit a significantly higher willingness to pay, reaching 86.9%, which is 16% higher than respondents with lower to moderate educational levels. Among this group, respondents who believe that the government should increase expenditure demonstrate a higher willingness to pay, reaching 90.4%. Respondents with lower educational levels who reside in urban areas also show a relatively higher willingness to pay, reaching 70.8%, whereas those residing in rural areas have a willingness to pay of less than half, at 46.3%.

It can be observed that variables such as concern for the environment, government expenditure in the environmental sector, educational level, place of residence, and gender are all related to respondents' willingness to pay for the environment.
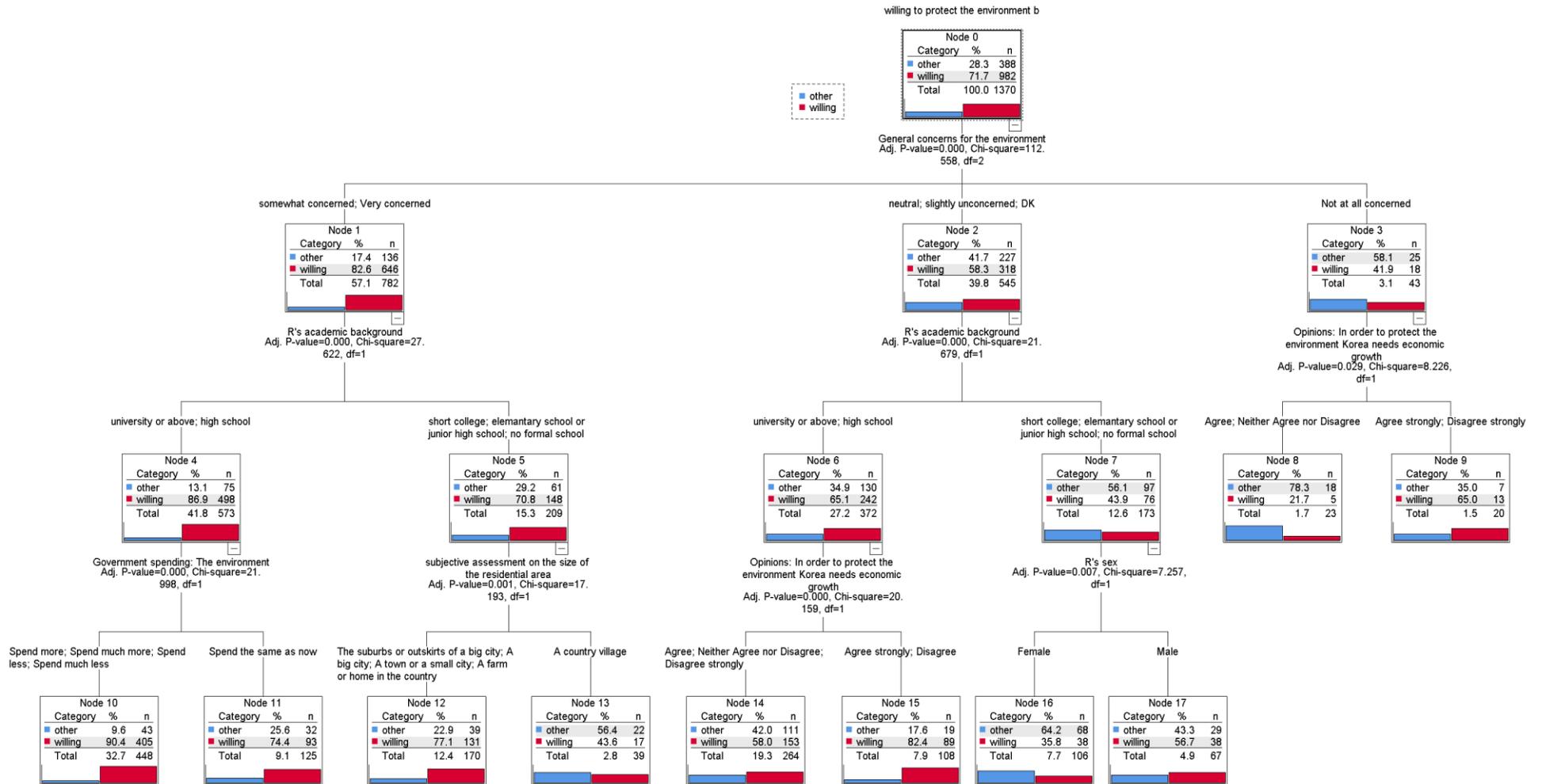
Figure 5-20 Tree Diagram in 2014

Binary logistic regression

The binary logistic regression model shows good performance based on the following indicators:

The Omnibus test of model coefficients yielded a p-value of less than 0.001, indicating the model's statistical significance.

The model explains 24.3% of the variance, as indicated by the Nagelkerke R square value of 0.243.

The Hosmer and Lemeshow test resulted in a significant value of 0.579, suggesting that the model fits well.

Overall, these results suggest that the binary logistic regression model is performing well in explaining the relationship between the variables under consideration.

Table 5-21 Classification Table of BR

Classification Table [a]

Observed			Predicted		
			willing to protect the environment b		Percentage Correct
			Other	Willing	
Step 6	willing to protect the environment b	Other	126	258	32.8
		Willing	79	888	91.8
	Overall Percentage				75.1
a. The cut value is .500					

Table 5-22 Regression of WTP in KGSS2014

		Model 1	Model 2	Model 3
R's age		1.012**	1.011**	1.011**
R's academic background	University or above	***	***	***
	Short college	0.421***	0.451***	0.471***
	High school	0.591***	0.643**	0.668**
	Elementary school or junior high school	0.204***	0.217***	0.234***
	No formal school	0.082***	0.110***	0.122***
Marital status	Married ref. Other	1.393**	1.184	1.203
General concerns for the environment	Very concerned		***	***
	Somewhat concerned		0.637**	0.771
	Neutral		0.216***	0.288***
	Slightly unconcerned		0.201***	0.276***
	Not at all concerned		0.163***	0.187***
Trust on people	People can almost always be trusted		**	**
	People can usually be trusted		1.180	1.305
	You usually can't be too careful in dealing with people		0.880	1.009
	You almost always can't be too careful in dealing with people		0.592	0.666
Threats air pollution caused by industry	Extremely dangerous			***
	Very dangerous			0.830

		Model 1	Model 2	Model 3
	Somewhat dangerous			0.536***
	Not dangerous			0.441
Government spending on the environment	Spend much more			***
	Spend more			0.804
	Spend the same as now			0.482***
	Spend less			0.578
Constant		0.749	1.821	2.175
	χ^2	90.829	193.955	231.694
	df	6	13	19
	P<0.001	0.0001	0.0001	0.0001
	Nagelkerke R Square	9.3	19.5	22.6
	overall percentage correct	72.7	74.6	74.6

Table 5-23 Regression of Environmental Concern in KGSS2014

		Model 1	Model 2	Model 3
Size of the residential area	A big city	***	***	***
	The suburbs or outskirts of a big city	0.830	0.798	0.798
	A town or a small city	0.936	0.916	0.916
	A country village or a farmhouse	1.738**	1.839***	1.839***
Education	University or above	***	***	***
	Short college	0.740	0.792	0.792
	High school	0.642***	0.661***	0.661***
	Elementary school or junior high school	0.409***	0.426***	0.426***
	No formal school	0.272***	0.315***	0.315***
Marital status(1)		1.360**	1.235	1.235
Monthly household income	Lower income	**	**	**
	Lower-middle-income	1.486**	1.483	1.483
	Middle-income	1.686***	1.630**	1.630**
	Upper-middle-income	1.002	0.947	0.947
	High-income	1.332	1.225	1.225
General concerns for the environment	Very concerned		***	***
	Somewhat concerned		0.756	0.756
	Neutral		0.404***	0.404***
	Slightly unconcerned		0.477***	0.477***
	Not at all concerned		0.404**	0.404**
Trust on people	People can almost always be trusted		***	***
	People can usually be trusted		1.663	1.663

		Model 1	Model 2	Model 3
	You usually can't be too careful in dealing with people		1.503	1.503
	You almost always can't be too careful in dealing with people		0.798	0.798
Constant		0.071	0.251	0.251
χ^2		62.912	110.082	110.082
df		12	19	19
P<0.001		0.0001	0.0001	0.0001
Nagelkerke R Square		6.1	10.5	10.5
overall percentage correct		58.3	62.4	62.4

5.3.3 Willingness to Pay for the Environment in KGSS2021

In the binary logistic regression analysis of the Willingness to Pay (WTP) in 2021, a total of 1,205 cases were initially considered in the KGSS2021 dataset. After excluding missing cases, 1,063 cases were included in the analysis. Out of the 1,063 cases included in the analysis, 601 respondents expressed a willingness to pay high prices or taxes to protect the environment or were willing to accept a reduction in their living standard to protect the environment. On the other hand, the remaining 462 respondents indicated that they were not willing to engage in any of the three mentioned actions (paying high prices or taxes or accepting a reduction in living standard) to protect the environment. The Forward Stepwise (Likelihood ratio) method was used to calculate the influences of different variables.

The analysis began by examining the main sociodemographic characteristics, namely education, gender, age, and marital status of the respondents.

Next, the respondent's residential location was included in the regression. This step involved considering the feedback provided by the interviewee regarding whether the respondent lived in a rural or urban area. The size of the respondent's hometown, their house type, and the number of people living together with the respondent were also considered.

The financial situation of the respondents was then assessed. Variables such as household monthly income, the number of rooms in the respondent's house (excluding the kitchen, hallway, bathroom, and storage room), the respondent's perception of their household income relative to others, and the type of insurances they held were examined.

Subsequently, the regression analysis included variables related to the respondents' concerns about nature and the environment. This involved considering factors such as government spending on environmental issues, specific environmental problems, overall happiness, and general concern about the environment.

The regression analysis also incorporated information on the respondents' actual pro-environmental behaviors. Variables such as how frequently they engaged in recycling, donating money to environmental organizations, and other similar behaviors were considered.

Lastly, the regression analysis explored the respondents' values of life and attitudes towards the

environment.

"Omnibus Tests of Model Coefficients" is a comprehensive test of the model coefficients. The Model row represents the test results of whether all parameters in the model are equal to zero. With a χ^2 value of 362.761 and P<0.001, it indicates that in the fitted model, at least one variable's odds ratio (OR) has statistical significance, implying that the overall model is meaningful.

The "Model Summary" evaluates the effectiveness of the model. The Nagelkerke R Square is 0.388, indicating a moderate model fit or effectiveness.

The "Hosmer-Lemeshow test" is a goodness-of-fit test for the model. With a p-value of 0.389, it suggests that the information in the data has been adequately captured, indicating a relatively good model fit.

The "Classification Table" represents the predicted outcomes of the dependent variable using the current model. The "Cutoff" value is 0.500, which means that when the model predicts a probability of the event (willingness to pay) equal to or greater than 0.5, it is classified as the event occurring. If the probability is less than 0.5, it is classified as the event not occurring (other). The accuracy of this model in predicting outcomes is 75.3%. The sensitivity, which is the proportion of correctly predicted willingness to pay, is 78.7%. The specificity, which is the proportion of correctly predicted lack of willingness to pay, is 70.8%.

By including these various sets of variables, the binary logistic regression aimed to examine their respective influences on the Willingness to Pay (WTP) in 2021. Results were showed in Table 5-24.

Table 5-24 Regression of WTP in KGSS2021

		Model 1	Model 2	Model 3	Model 4
Subjective assessment on the size of the residential area	A big city	**		**	***
	The suburbs or outskirts of a big city	0.608***	0.681**	0.672**	0.615***
	A town or a small city	0.782	0.795	0.886	0.867
	A country village or a farm	0.841	0.755	0.517**	0.443***
Education	No formal school	***	***	**	***
	Elementary school or junior high school	2.046**	1.919	2.076	2.393**
	High school	2.637***	2.106**	2.248**	2.273**
	Short college	3.517***	2.901**	2.947**	2.581**
	College or above	4.904***	3.418***	3.494***	3.997***
Monthly household income (categorical) 100		1.070**	1.071**	1.055	1.037
Number of children	NONE	***			
	1	1.523**	1.371	1.391	1.268
	2	1.688***	1.423	1.356	1.282
	3	2.303***	1.680**	1.469	1.323
	4	3.151***	2.657**	1.990	2.015
	More than 4	1.831	1.071	0.909	1.231
Life satisfaction level	Dissatisfied		***	**	***
	Neutral		1.168	1.106	1.161
	Satisfied		1.943***	1.654**	1.898***
General concerns for the environment	Unconcerned		***	***	***

		Model 1	Model 2	Model 3	Model 4
	Neutral		0.875	0.935	1.082
	Somewhat concerned		1.674	1.572	1.835**
	Very concerned		7.625***	6.424***	7.445***
How much of the time R felt downhearted and depressed for the last 4 weeks	None of the time			***	*
	A little of the time			1.849	1.747
	Some of the time			1.149	1.272
	Most of the time			2.130**	1.809
	All of the time			5.479**	4.107**
R's House type	Detached house			***	***
	Apartment			0.512***	0.487***
	Multi-family residential			0.476***	0.438***
	Other			1.348	1.247
How many rooms in your house	1			*	*
	2			1.775	1.743
	3			2.034**	1.776
	4+			3.675***	4.004***
Government spending: The environment g	Spend much more			***	***
	Spend more			0.736	0.734
	Spend the same as now			0.409***	0.366***
	Spend less			0.352***	0.292***
Neighborhood affected by air pollution	It wasn't affected at all			***	***

		Model 1	Model 2	Model 3	Model 4
	It wasn't affected that much			1.377	1.210
	It was mostly affected			1.353	1.348
	It was affected a lot			3.001***	2.564***
Agree to reduce the size of Korean's nature reserves for economic development	Very unwilling				***
	Fairly unwilling				1.362
	Neither willing nor unwilling				1.128
	Fairly willing				6.154***
	Very willing				7.968***
Constant		-1.340	-1.787	-2.084	-2.544
	Chi-square	67.518	178.219	259.54	354.846
	df	13	18	34	38
	sig.	0.0001	0.0001	0.0001	0.0001
	Nagelkerke R Square	8.1	20.2	28.4	37.3
	overall percentage correct	61.2	65.9	70.7	73.8

The results of the analysis indicate that education has a significant relationship with individuals' willingness to protect the environment. Compared to respondents with a college or above level of education, those with no formal school education are 29.4%(95% CI 0.130-0.664) less likely to show willingness to protect the environment. Similarly, respondents with a high school education have a lower likelihood, with only 57.8%(95% CI 0.388-0.859) showing willingness to protect the environment. These findings suggest that higher levels of education are associated with a greater likelihood of expressing a willingness to take actions for environmental protection.

Comparing to respondents living in a big city, individuals residing in the suburbs or outskirts of a big city have a 61.6% lower likelihood of expressing a willingness to pay (WTP) for environmental protection, with a 95% confidence interval (CI) ranging from 0.424 to 0.895. Similarly, individuals living in rural villages have a 39.8% lower likelihood of having WTP, with a 95% CI ranging from 0.219 to 0.723. These results suggest that individuals living in suburban or rural areas are less likely to show a willingness to pay for environmental protection compared to those living in urban city settings.

Compared to respondents living in detached houses, individuals living in apartments have a 44.3% lower likelihood of expressing a willingness to pay (WTP) for environmental protection, with a 95% confidence interval (CI) ranging from 0.280 to 0.700. Similarly, individuals living in multi-family residential settings have a 34.1% lower likelihood of having WTP, with a 95% CI ranging from 0.209 to 0.558. These findings suggest that individuals residing in apartments or multi-family residential units are less likely to show a willingness to pay for environmental protection compared to those living in detached houses.

The analysis indicates that income has a positive influence on the willingness to pay (WTP) for environmental protection. For every 1 level increase in the monthly income of the household, which corresponds to 1 million Won, the chance of having WTP increases by 1.082(95% CI 1.013-1.157) times. This suggests that higher income levels are associated with a higher likelihood of expressing a willingness to pay for environmental protection.

The analysis reveals a positive relationship between respondents' level of concern for the environment and their willingness to pay for its protection. Compared to individuals who are unconcerned, those who are somewhat concerned show a 1.960 (95% CI 1.047-3.669)times higher likelihood of being willing to pay. Moreover, individuals who are very concerned exhibit a significantly higher willingness to pay, with a 6.434 (95% CI 3.014-13.733)times greater likelihood compared to the unconcerned group. On the other hand, individuals with a neutral attitude towards environmental concern do not show a significant difference in willingness to pay when compared to those who are unconcerned. These findings suggest that a higher level of concern for the environment is associated with a greater likelihood of expressing a willingness to pay for its protection.

An interesting finding has emerged regarding people's attitudes towards nature reserves and their willingness to protect the environment. There seems to be a negative correlation between these two factors. Compared to individuals who are willing to reduce the size of nature reserves, those with a neutral attitude or those who are unwilling to reduce the reserves have a lower chance of expressing a willingness to pay for environmental protection.

Specifically, individuals with a neutral attitude have only a 17.8% (95% CI 0.119-0.267)chance of being willing to protect the environment. Among those who are fairly unwilling, the percentage increases slightly to 21%(95% CI 0.139-0.319), while very unwilling individuals show the lowest likelihood at 17%(95% CI 0.093-0.311). This indicates that individuals who are neutral or unwilling to reduce the size of nature reserves are less likely to express a willingness to pay for environmental protection.

This finding suggests that there may be conflicting priorities or beliefs among individuals regarding the preservation of nature reserves and their willingness to contribute financially towards environmental protection. Further research and analysis could shed more light on this unexpected

correlation.

When comparing individuals who believe the government should spend much more on the environment to those who think the government should spend the same as it currently does, the latter group has a lower chance of expressing a willingness to pay (WTP) for environmental protection, with a 47.2%(95% CI 0.284-0.785) likelihood. On the other hand, individuals who believe the government should spend less on the environment have a 38.2%(95% CI 0.177-0.823) chance of expressing a willingness to pay, compared to those who believe the government should spend much more.

These findings suggest that individuals who advocate for increased government spending on the environment are more likely to show a willingness to contribute financially towards environmental protection. Conversely, individuals who support maintaining the current level of government spending or decreasing it are less likely to express a willingness to pay for environmental initiatives.

This indicates a connection between individuals' perceptions of government funding for the environment and their willingness to personally contribute financially. Further analysis could explore the underlying reasons for these attitudes and their implications for environmental policies and public support.

According to the analysis, respondents who reported that their neighborhood is significantly affected by air pollution have a 2.53(95% CI 1.333-4.802) times higher likelihood of expressing a willingness to pay (WTP) for environmental protection compared to those who reported not being affected at all. This suggests that individuals who directly experience the negative impacts of air pollution in their neighborhood are more likely to show a willingness to contribute financially towards environmental protection efforts. The higher likelihood of WTP among those affected highlights the importance of subjective experiences and local environmental conditions in shaping individuals' attitudes and behaviors towards environmental concerns.

The analysis reveals that individuals who sometimes engage in recycling activities have a lower chance of expressing a willingness to pay (WTP) for environmental protection, with only 60.5%(95% CI 0.396-0.925) likelihood compared to those who always engage in recycling. However, there is no significant difference in WTP between individuals who often recycle and those who always do so.

These findings suggest that individuals who only occasionally participate in recycling activities may have a slightly lower inclination to contribute financially towards environmental protection. On the other hand, individuals who frequently or consistently engage in recycling activities show a similar level of WTP as those who always recycle.

When comparing individuals who strongly agree that environmental problems have a direct effect on their everyday life to those who disagree, the former group has a 3.13(95% CI 1.312-7.469) times higher likelihood of expressing a willingness to pay (WTP) for environmental protection. Similarly, individuals who agree (but not strongly) that environmental problems have a direct effect on their everyday life have a 1.922(95% CI 1.128-3.275) times higher likelihood of WTP compared to those who disagree.

These findings indicate that individuals who perceive a direct impact of environmental problems on their daily lives are more likely to show a willingness to contribute financially towards environmental protection. The stronger the agreement with the statement, the higher the likelihood of WTP. This suggests that subjective experiences and perceptions of the relationship between environmental issues and daily life play a significant role in shaping individuals' willingness to support environmental initiatives.

Understanding these relationships can inform strategies to increase public engagement and support environmental protection measures by highlighting the tangible impacts of environmental problems on individuals' lives.

Comparing individuals who have a neutral attitude towards the statement that almost everything

we do in modern life harms the environment to those who strongly agree with the statement, the former group has a lower chance of expressing a willingness to pay (WTP) for environmental protection, with only a 32.1%(95% CI 0.152-0.676) likelihood compared to the latter group.

Based on the analysis, several factors are found to be related to respondents' willingness to protect the environment. These factors include:

Education: Higher levels of education are positively associated with a greater willingness to protect the environment. Respondents with a college or above level of education are more likely to show a willingness to pay for environmental protection compared to those with no formal education.

House type: The type of housing individuals reside in is also related to their willingness to protect the environment. Respondents living in detached houses are more likely to express a willingness to pay compared to those living in apartments or multi-family residential units.

Income: Higher income levels are positively correlated with a higher likelihood of expressing a willingness to pay for environmental protection. As household monthly income increases, the chance of having WTP also increases.

Residential area: The area where individuals live play a role in their willingness to protect the environment. Individuals living in suburbs or outskirts of a big city have a lower likelihood of WTP compared to those living in urban city settings. Similarly, individuals living in rural villages are less likely to show a willingness to pay.

Concerns for the environment: Individuals who have a higher level of concern for the environment are more likely to express a willingness to pay for its protection. The stronger the concern, the higher the likelihood of WTP.

Attitude towards nature reserves: Individuals who are willing to reduce the size of nature reserves to protect the environment are more likely to have a higher willingness to pay. In contrast, those with a neutral or unwilling attitude towards reducing nature reserves show a lower likelihood of WTP.

Attitude towards government spending: Individuals who believe that the government should spend more on the environment are more likely to show a willingness to pay compared to those who think the government should spend the same or less.

Air polluting affection: Respondents who report that their neighborhood is significantly affected by air pollution are more likely to express a willingness to pay for environmental protection.

Recycling behaviors: Individuals who frequently or always engage in recycling activities are more likely to show a willingness to pay compared to those who only sometimes or rarely recycle.

These factors indicate the multidimensional nature of individuals' willingness to protect the environment, with socioeconomic, attitudinal, and behavioral aspects playing a role in shaping their propensity to contribute towards environmental protection efforts.

KGSS2021 also provides information about respondent's pro-environmental behavior. Taking their recycling behavior to analysis, using multi logistic regression to undercover the relationship between vary variables. Details are showed in Table 5-25 and Figure 5-21.

Table 5-25 Statistics of Recycling Frequencies

R's special effort to sort glass, tins, plastic, or newspapers and so on for recycling					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	562	46.6	46.9	46.9
	Often	407	33.8	33.9	80.8
	Sometimes	212	17.6	17.7	98.5

	Never	18	1.5	1.5	100.0
	Total	1199	99.5	100.0	
Missing	IAP	6	.5		
Total		1205	100.0		
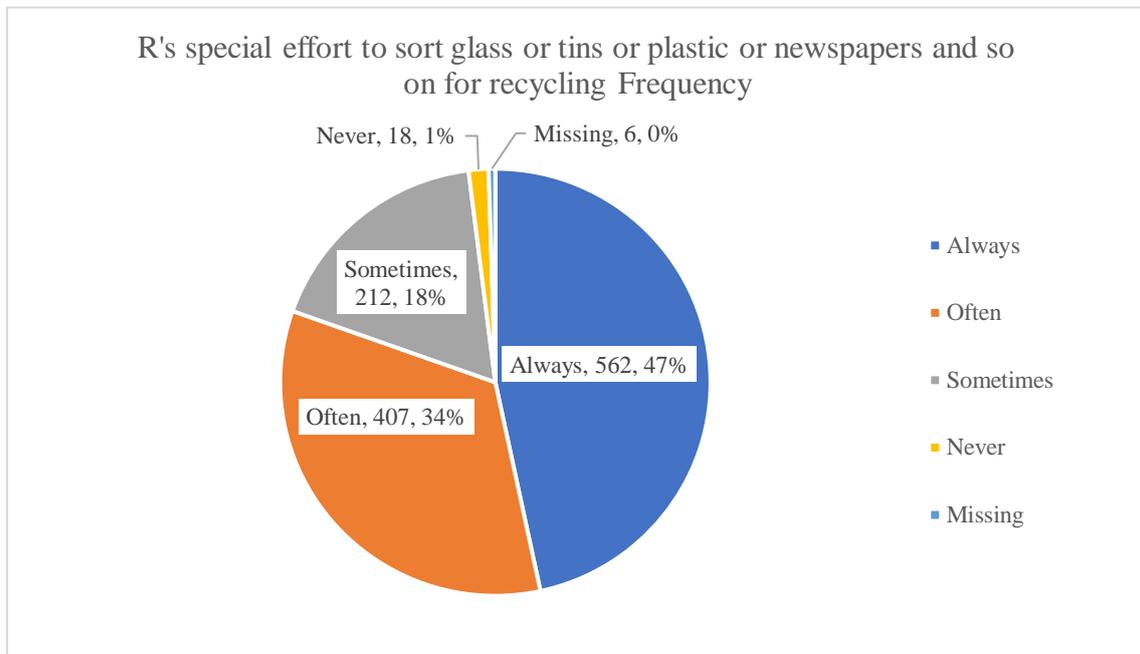
Figure 5-21 Recycling Frequency in 2021

The group that never recycles is small, so this study considers three categories for multi logistic regression: sometimes, often, and always.

When the sometimes group is used as the reference category, the always group exhibits a significant difference compared to the sometimes group. However, the often group does not show a significant difference. Similarly, when the always group is used as the reference category, the often group also does not demonstrate a significant difference. These findings suggest a correlation between the always group and the sometimes group.

Table 5-26 shows the likelihood ratio tests of multi regression, variables which influence recycling behavior difference between always and sometimes are showed. Table 5-27 showed the independent variables.

Compared to age over 80, respondents in their seventies shows less frequency to recycle.
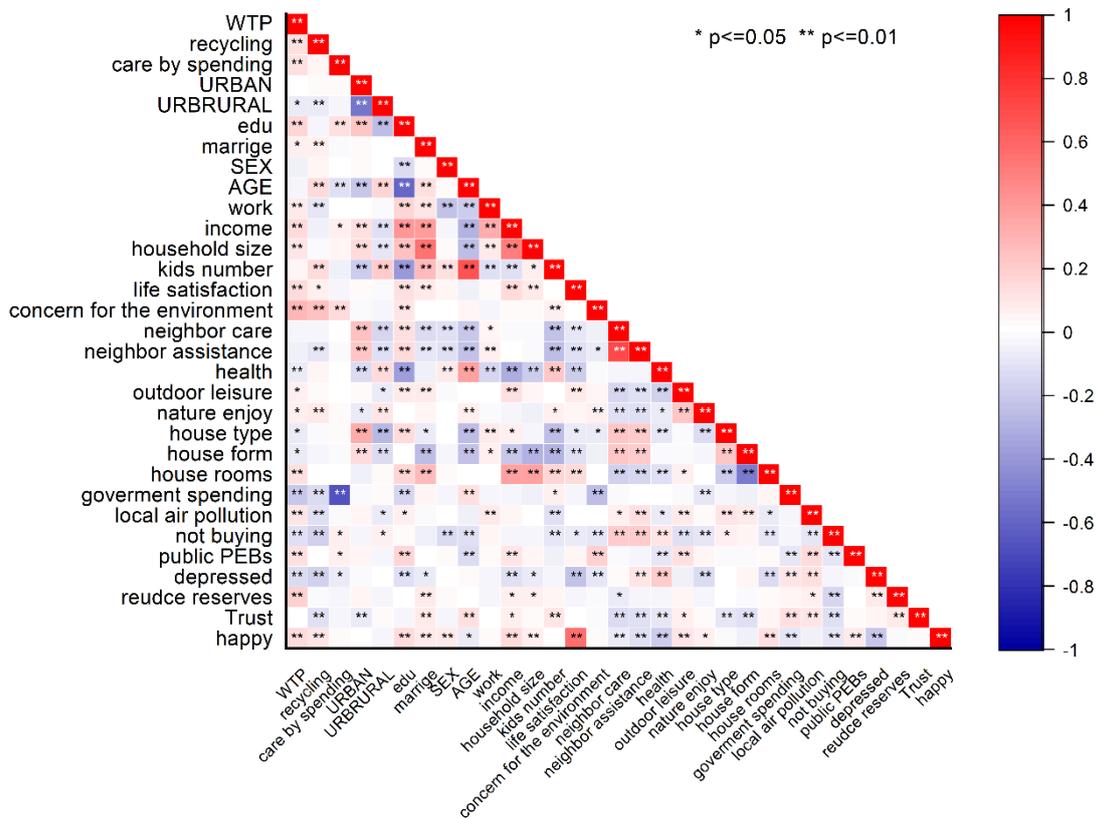
Figure 5-22 Correlation of Variables in KGSS2021

Table 5-26 Likelihood Ratio Tests of Multi Regression in 2021

Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Tests		Ratio
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	1687.541a	0.000	0	
R's age group	1732.615	45.074	12	0.000
subjective assessment on the size of the residential area	1714.418	26.877	8	0.001
R's House type	1710.797	23.257	6	0.001
Whether R has a job	1706.940	19.400	2	0.000
General concerns for the environment	1716.486	28.946	6	0.000
influence of world's climate change in Korea: bad vs. good	1746.586	59.046	20	0.000
neighborhood affected by air pollution	1715.445	27.904	6	0.000
the world's climate change	1708.546	21.006	4	0.000
R's special effort to avoid buying certain	1928.399	240.858	6	0.000

Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood	Ratio		
	-2 Log Likelihood of Reduced Model	Chi-Square		df	Sig.
products for environmental reasons					
Threats to environment: air pollution caused by cars REF.EXD	1708.885	21.344		8	0.006
Agree or disagree: Environmental problems have a direct effect on my everyday life	1706.996	19.455		6	0.003
Important to care for nature and environment	1708.237	20.696		6	0.002
Important to have a good time	1709.772	22.232		10	0.014
Important to understand different people	1715.398	27.858		10	0.002

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Table 5-27 Parameter Estimates in 2021

Parameter Estimates

R's special effort to sort glass, tins, plastic, or newspapers and so on for recycling		B	Std. Error	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
								Lower	Upper
Sometimes	Intercept	19.703	1.983	98.684	1	0.000			
	[R's age group=1]	0.897	0.650	1.905	1	0.167	2.452	0.686	8.762
	[R's age group=2]	-0.676	0.658	1.056	1	0.304	0.508	0.140	1.847
	[R's age group=3]	-0.547	0.645	0.719	1	0.396	0.579	0.163	2.049
	[R's age group=4]	-0.902	0.627	2.070	1	0.150	0.406	0.119	1.387
	[R's age group=5]	-0.983	0.629	2.438	1	0.118	0.374	0.109	1.285
	[R's age group=6]	**-1.380**	**0.691**	**3.990**	**1**	**0.046**	**0.252**	**0.065**	**0.974**
	[R's age group=7]	0[b]			0				
	[subjective assessment on the size of the residential area =1]	-18.497	0.398	2156.163	1	0.000	0.000	0.000	0.000
	[subjective assessment on the size of the residential area =2]	-17.433	0.424	1687.198	1	0.000	0.000	0.000	0.000
	[subjective assessment on the size of the residential area =3]	-17.534	0.412	1812.968	1	0.000	0.000	0.000	0.000
	[subjective assessment on the size of the residential area =4]	-17.423	0.000		1		0.000	0.000	0.000
	[subjective assessment on the size of the residential area =5]	0[b]			0				
	[R's House type=1]	**1.621**	**0.788**	**4.232**	**1**	**0.040**	**5.058**	**1.080**	**23.692**
	[R's House type=2]	0.363	0.770	0.222	1	0.638	1.437	0.318	6.502
	[R's House type=3]	1.101	0.778	2.003	1	0.157	3.006	0.655	13.804
	[R's House type=4]	0b			0				
	[Whether R has a job =0]	**-1.041**	**0.244**	**18.265**	**1**	**0.000**	**0.353**	**0.219**	**0.569**

Parameter Estimates

R's special effort to sort glass, tins, plastic, or newspapers and so on for recycling	B	Std. Error	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
[Whether R has a job =1]	0[b]			0				
[General concerns for the environment=2]	-0.337	0.535	0.395	1	0.529	0.714	0.250	2.039
[General concerns for the environment=3]	0.729	0.377	3.738	1	0.053	2.073	0.990	4.340
[General concerns for the environment=4]	0.329	0.343	0.918	1	0.338	1.390	0.709	2.724
[General concerns for the environment=5]	0[b]			0				
[influence of world's climate change in Korea: bad vs. good=0]	-2.035	1.220	2.783	1	0.095	0.131	0.012	1.427
[influence of world's climate change in Korea: bad vs. good=1]	-2.855	1.220	5.476	1	**0.019**	**0.058**	**0.005**	**0.629**
[influence of world's climate change in Korea: bad vs. good=2]	-3.021	1.191	6.427	1	**0.011**	**0.049**	**0.005**	**0.504**
[influence of world's climate change in Korea: bad vs. good=3]	-2.726	1.184	5.303	1	**0.021**	**0.065**	**0.006**	**0.666**
[influence of world's climate change in Korea: bad vs. good=4]	-2.938	1.224	5.764	1	**0.016**	**0.053**	**0.005**	**0.583**
[influence of world's climate change in Korea: bad vs. good=5]	-1.848	1.194	2.396	1	0.122	0.158	0.015	1.635
[influence of world's climate change in Korea: bad vs. good=6]	-1.140	1.210	0.888	1	0.346	0.320	0.030	3.427
[influence of world's climate change in Korea: bad vs. good=7]	-1.180	1.225	0.928	1	0.335	0.307	0.028	3.389
[influence of world's climate change in Korea: bad vs. good=8]	-2.291	1.280	3.204	1	0.073	0.101	0.008	1.243
[influence of world's climate change in Korea: bad vs. good=9]	-2.290	1.786	1.643	1	0.200	0.101	0.003	3.358
[influence of world's climate change in Korea: bad vs. good=10]	0[b]			0				
[neighborhood affected by air pollution=1]	-1.033	0.489	4.459	1	**0.035**	**0.356**	**0.136**	**0.929**
[neighborhood affected by air pollution=2]	-0.369	0.301	1.503	1	0.220	0.691	0.383	1.248
[neighborhood affected by air pollution=3]	0.327	0.295	1.230	1	0.267	1.387	0.778	2.471

Parameter Estimates

R's special effort to sort glass, tins, plastic, or newspapers and so on for recycling	B	Std. Error	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
[neighborhood affected by air pollution=4]	0[b]			0				
[the world's climate change=2]	**1.268**	**0.324**	**15.324**	**1**	**0.000**	**3.553**	**1.883**	**6.704**
[the world's climate change=3]	**0.606**	**0.240**	**6.398**	**1**	**0.011**	**1.833**	**1.146**	**2.932**
[the world's climate change=4]	0[b]			0				
[R's special effort to avoid buying certain products for environmental reasons=1]	**-5.578**	**1.074**	**26.968**	**1**	**0.000**	**0.004**	**0.000**	**0.031**
[R's special effort to avoid buying certain products for environmental reasons=2]	**-1.954**	**0.413**	**22.359**	**1**	**0.000**	**0.142**	**0.063**	**0.319**
[R's special effort to avoid buying certain products for environmental reasons=3]	-0.293	0.252	1.353	1	0.245	0.746	0.455	1.222
[R's special effort to avoid buying certain products for environmental reasons=4]	0[b]			0				
[Threats to environment: air pollution caused by cars REF.EXD=1]	0.792	8128.414	0.000	1	1.000	2.208	0.000	.c
[Threats to environment: air pollution caused by cars REF.EXD=2]	1.236	0.681	3.299	1	0.069	3.442	0.907	13.066
[Threats to environment: air pollution caused by cars REF.EXD=3]	**1.180**	**0.416**	**8.026**	**1**	**0.005**	**3.253**	**1.438**	**7.357**
[Threats to environment: air pollution caused by cars REF.EXD=4]	0.799	0.415	3.703	1	0.054	2.223	0.985	5.014

Parameter Estimates

R's special effort to sort glass, tins, plastic, or newspapers and so on for recycling	B	Std. Error	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
[Threats to environment: air pollution caused by cars REF.EXD=5]	0^b			0				
[Agree or disagree: Environmental problems have a direct effect on my everyday life=1]	**-1.910**	**0.759**	**6.327**	**1**	**0.012**	**0.148**	**0.033**	**0.656**
[Agree or disagree: Environmental problems have a direct effect on my everyday life=2]	-0.528	0.375	1.984	1	0.159	0.590	0.283	1.230
[Agree or disagree: Environmental problems have a direct effect on my everyday life=3]	0.161	0.373	0.187	1	0.665	1.175	0.566	2.441
[Agree or disagree: Environmental problems have a direct effect on my everyday life=4]	0^b			0				
[Important to care for nature and environment =2]	-0.217	0.410	0.280	1	0.597	0.805	0.361	1.798
[Important to care for nature and environment =3]	0.673	0.371	3.294	1	0.070	1.960	0.948	4.054
[Important to care for nature and environment =4]	0.199	0.368	0.291	1	0.589	1.220	0.593	2.509
[Important to have a good time=1]	0.238	1.049	0.051	1	0.821	1.269	0.162	9.920
[Important to have a good time=2]	0.230	0.950	0.059	1	0.808	1.259	0.196	8.101
[Important to have a good time=3]	0.354	0.935	0.143	1	0.705	1.424	0.228	8.907
[Important to have a good time=4]	0.201	0.941	0.046	1	0.830	1.223	0.193	7.737
[Important to have a good time=5]	-0.562	0.981	0.329	1	0.566	0.570	0.083	3.898
[Important to understand different people=1]	**-3.503**	**1.384**	**6.406**	**1**	**0.011**	**0.030**	**0.002**	**0.454**
[Important to understand different people=2]	-1.678	1.134	2.188	1	0.139	0.187	0.020	1.725

Parameter Estimates

R's special effort to sort glass, tins, plastic, or newspapers and so on for recycling	B	Std. Error	Wald	df	Sig.	Exp(B)	95% CI for Exp(B) Lower	Upper
[Important to understand different people=3]	-1.704	1.115	2.335	1	0.126	0.182	0.020	1.619
[Important to understand different people=4]	-1.142	1.105	1.068	1	0.301	0.319	0.037	2.783
[Important to understand different people=5]	-0.948	1.140	0.692	1	0.406	0.387	0.041	3.620
[Important to understand different people=6]	0ᵇ			0				

a. The reference category is: Always .

b. This parameter is set to zero because it is redundant.

c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Table 5-28 Regression of Recycling in KGSS2021

		Model 1	Model 2	Model 3	Model 4
Subjective assessment on the size of the residential area	A big city	***	***	***	***
	The suburbs or outskirts of a big city	0.493***	0.546***	0.515***	0.524***
	A town or a small city	0.603***	0.581***	0.537***	0.556***
	A country village or a farm	0.590**	0.478***	0.685	0.767
R's marital status(1)	Married ref. Other	1.440***	1.531***	1.650***	1.716***
R's age		1.019***	1.020***	1.021***	1.021***
Whether r has a job (1)	Work ref. No work	0.712**	0.678***	0.683**	0.695**
Life satisfaction level	Dissatisfied		**	*	
	Neutral		1.184	1.140	0.983

		Model 1	Model 2	Model 3	Model 4
	Satisfied		1.625**	1.558**	1.286
General concerns for the environment	Unconcerned		***	***	***
	Neutral		0.484**	0.549**	0.524**
	Somewhat concerned		0.976	1.077	0.967
	Very concerned		2.647***	2.884***	2.920***
R's neighborhood: neighbors are willing to provide assistance when r is in need	Strongly agree		***	***	***
	Somewhat agree		0.493**	0.654	1.112
	Neither agree nor disagree		0.375***	0.535	0.974
	Somewhat disagree		0.618	0.908	1.913
	Strongly disagree		1.432	2.125	3.577**
How much do you enjoy nature?	I don't enjoy it at all			***	**
	I enjoy it a bit			1.029	1.113
	I tend to enjoy it			0.940	0.981
	I enjoy it a lot			1.584	1.513
	I enjoy it very, very much			5.944***	7.193***
R's house type	Detached house			***	***
	Apartment			2.417***	2.378***
	Multi-family residential			1.558	1.575
	Other			1.809	2.160
How many rooms in your house	1			***	***
	2			1.345	1.537

		Model 1	Model 2	Model 3	Model 4
	3			0.680	0.743
	4+			0.865	0.772
Neighborhood affected by air pollution	It wasn't affected at all			***	***
	It wasn't affected that much			0.380***	0.369***
	It was mostly affected			0.256***	0.230***
	It was affected a lot			0.305***	0.266***
R's special effort to avoid buying certain products for environmental reasons	Always				***
	Often				0.043***
	Sometimes				0.073***
	Never				0.062***
How much of the time r felt downhearted and depressed for the last 4 weeks	None of the time				***
	A little of the time				0.477***
	Some of the time				0.472***
	Most of the time				0.331***
	All of the time				1.060
Constant(B)		-0.833	-0.361	-0.292	2.392
	Chi-square	62.554	161.741	235.768	373.698
	df	6	15	28	35
	sig.	0.0001	0.0001	0.0001	0.0001
	Nagelkerke R Square	7.5	18.4	26.0	38.8

		Model 1	Model 2	Model 3	Model 4
	overall percentage correct	58.5	64.5	69.5	74.9

Table 5-29 Regression of Care for the Environment by Government Spending in KGSS2021

		Model 1	Model 2	Model 3	Model 4
R's age		0.986***	0.985***	0.982***	0.981***
General concerns for the environment	Unconcerned		***	***	***
	Neutral		0.721	0.748	0.716
	Somewhat concerned		1.205	1.253	1.247
	Very concerned		1.667	1.828	2.008**
R's physical condition (2021)	Excellent			**	**
	Very good			1.912***	1.899***
	Good			1.883***	1.880**
	Fair			2.521***	2.675***
	Poor			1.840	1.928**
R's house form	Own house			***	**
	Jeonse			1.432	1.431
	Monthly rent with deposit			0.601***	0.623**
	Monthly rent without deposit			0.455	0.462
	Free			1.839	1.704
Trust on most people	You can't be too careful				**
	2				2.199**

		Model 1	Model 2	Model 3	Model 4
	3				2.587***
	4				2.151**
	Most people can be trusted				1.037
Constant		1.399	1.409	0.916	0.142
	Chi-square	11.095	30.906	57.723	69.511
	df	1	4	12	16
	sig.	0.0001	0.0001	0.0001	0.0001
	Nagelkerke R Square	1.4	3.9	7.1	8.6
	overall percentage correct	66.2	65.9	66.5	66.9

5.4 Discussion

5.4.1 Return Program

Park and Yun noted that Korean electricity consumption has a similar pattern in metropolitan and adjacent areas [138], which is consistent with this study conclusion that there is no statistically significant difference in environmental awareness between people in large cities and suburbs of large cities.

Other statistics from KOSIS show the situation about return to farming. Here are some details connections to this study research.

Return to farming survey consists of two parts. One is return to farming type; another one is return to rural areas type.

Table 5-30 shows where the participants come from.

Table 5-31 and Figure 5-23 show that the primary reason for people returning to farming is their preference for a natural environment, followed by their agricultural vision and the potential for development.

Table 5-30 Return to Farming Type

Return to farming type (1)	2019	2020	2021
Number of cases (persons)	2,081	2,038	3,000
Born in a rural area and moved to a related area after living in an urban area (%)	54.4	57.6	67.6
Born in rural areas and moved to non-relative places after living in cities (%)	21.5	21.1	14.3
Born in the city and moved to their hometown (%)	7.4	6.1	8.3
Born in a city and moved to a non-relative place (%)	16.7	15.1	9.8
etc. (%)	0.0	0.0	0.0
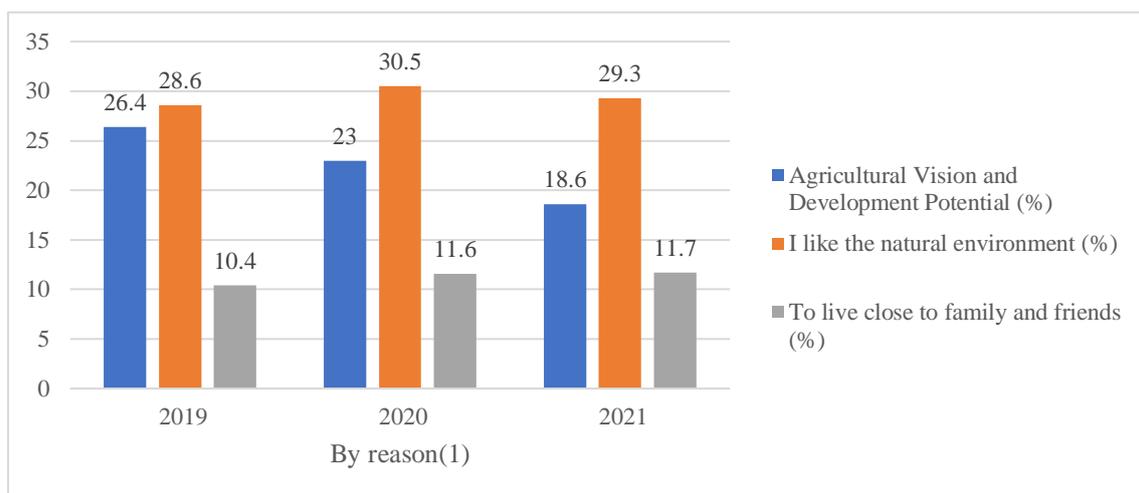
Figure 5-23 First Reasons to Returning to Farming

Table 5-31 Reason for Returning to Farming

By reason (1)	2019		2020		2021	
	1st	Rank	1st	Rank	1st	Rank

	place	1+2+3	place	1+2+3	place	1+2+3
Number of cases (persons)	2,081	2,081	2,038	2,038	3,000	3,000
Agricultural Vision and Development Potential (%)	26.4	47.4	23.0	44.4	18.6	44.6
I like the natural environment (%)	**28.6**	**67.2**	**30.5**	**69.6**	**29.3**	**67.0**
For family business succession (%)	9.9	18.3	13.1	22.4	19.5	34.9
Personal or family health reasons (%)	7.1	21.9	7.8	24.0	7.6	28.8
To live close to family and friends (%)	10.4	29.6	11.6	29.4	11.7	36.1
For children's education (%)	0.2	2.0	0.0	0.7	0.0	1.2
Because of the high cost of living in the city (%)	2.4	19.0	2.2	17.6	3.6	25.6
Feeling skeptical about city life (%)	8.5	39.8	8.5	37.8	5.2	35.9
Due to job loss or business failure (%)	4.6	11.4	2.5	8.4	4.2	11.5
etc. (%)	1.9	3.1	0.6	1.5	0.2	0.6

Table 5-32 shows the reasons for choosing current residence.

Table 5-32 Reasons for Choosing Current Residence

By reason (1)	2019		2020		2021	
	1st place	1+2 ranking	1st place	1+2 ranking	1st place	1+2 ranking
Number of cases (persons)	2,081	2,081	2,038	2,038	3,000	3,000
Because it is close to where I lived before (%)	24.2	36.0	27.9	41.1	26.8	42.6
Because it is a place where parents, children, relatives, or acquaintances live (%)	37.4	56.1	36.6	58.6	42.2	64.0
Good educational environment for children (%)	1.9	3.4	1.2	2.8	1.9	3.7
Living environment is convenient (%)	8.0	16.9	8.4	17.6	8.2	18.3
Because the return-to-farm policy is well established (%)	2.4	6.3	2.5	5.0	3.0	7.0
Because it is easy to secure a place to live (%)	7.3	24.6	6.3	22.7	5.3	24.6
Low cost of living (%)	1.1	5.8	1.3	6.5	2.6	7.6

Because the land price is low (%)	2.8	8.6	3.4	7.0	1.3	5.2
Agricultural conditions are good (%)	5.1	13.9	4.3	12.2	2.6	8.5
Compared to other regions, the natural environment is excellent (%)	8.1	15.1	7.3	14.0	5.6	12.9
There are many returnees from farming in the region (%)	0.5	2.4	0.3	1.1	0.4	2.2
etc. (%)	0.9	1.3	0.3	0.3	0.1	0.2
does not exist (%)	0.1	0.1	-	-	-	-
Do not know/no answer (%)	0.1	0.1	-	-	-	-

Table 5-33 shows when to buy a residence return to farming. Many of them buy before returning to farming.

Table 5-33 When to Buy a Residence Return to Farming

By period (1)	By period (2)	2020	2021
by period	Number of cases (persons)	1,572	2,241
	Before returning to farming (%)	81.0	87.6
	After returning to farming (%)	19.0	12.4
average (months)	before returning to farm	28.5	17.8
	after returning to farm	11.9	12.9

There is a slim difference to the return to rural areas type.

Table 5-34 Form of Hometown Return to Rural Area

By village type (1)	2019	2020	2021
Number of cases (persons)	2,086	2,028	3,000
Born in a rural area and moved to a related area after living in an urban area (%)	29.5	28.6	32.4
Born in rural areas and moved to non-relative places after living in cities (%)	27.7	28.4	21.4
Born in the city and moved to their hometown (%)	10.8	9.2	10.5
Born in a city and moved to a non-relative place (%)	31.9	33.8	35.7
etc. (%)	0.0	0.0	0.0

A tiny difference is shown in the reasons why people return to rural areas. See Table 5-35.

Table 5-35 Reason for Returning to Rural Area

By reason(1)	2019		2020		2021	
	1st place	Rank 1+2+3	1st place	Rank 1+2+3	1st place	Rank 1+2+3
Number of cases (persons)	2,086	2,086	2,028	2,028	3,000	3,000

For farming (succession or founding) (%)	4.8	8.3	5.1	9.0	2.2	4.0
Not farming, but working in agriculture (%)	5.5	9.3	1.9	3.2	1.2	2.1
For an emotionally relaxed life (%)	**21.2**	**58.8**	**15.3**	**50.8**	**15.8**	**45.0**
I like the natural environment (%)	19.3	59.1	13.7	57.8	12.7	53.1
To take over the family business (other than farming) (%)	1.9	4.3	1.0	3.0	0.9	2.2
Due to personal or family health reasons (%)	6.9	18.9	8.1	19.0	4.6	16.2
To live close to family and friends (%)	8.1	22.7	8.9	21.7	7.7	24.7
For children's education (%)	1.8	7.1	0.7	2.4	1.1	4.0
Because of low house price (housing cost) (%)	13.6	35.7	9.6	30.9	8.5	32.8
Because of the high cost of living in the city (%)	3.0	20.5	2.3	16.0	3.9	20.0
Feeling skeptical about city life (%)	6.0	24.5	6.4	22.6	7.0	26.5
Due to job loss or business failure (%)	4.2	9.1	2.6	5.8	2.4	6.1
Employment outside the agricultural sector (%)	-	-	24.1	28.1	27.2	35.9
Workplace relocation (%)	-	-	-	-	4.3	5.2
etc. (%)	3.7	4.7	0.3	0.5	0.5	0.7
does not exist (%)	-	-	0.0	0.0	0.1	0.1
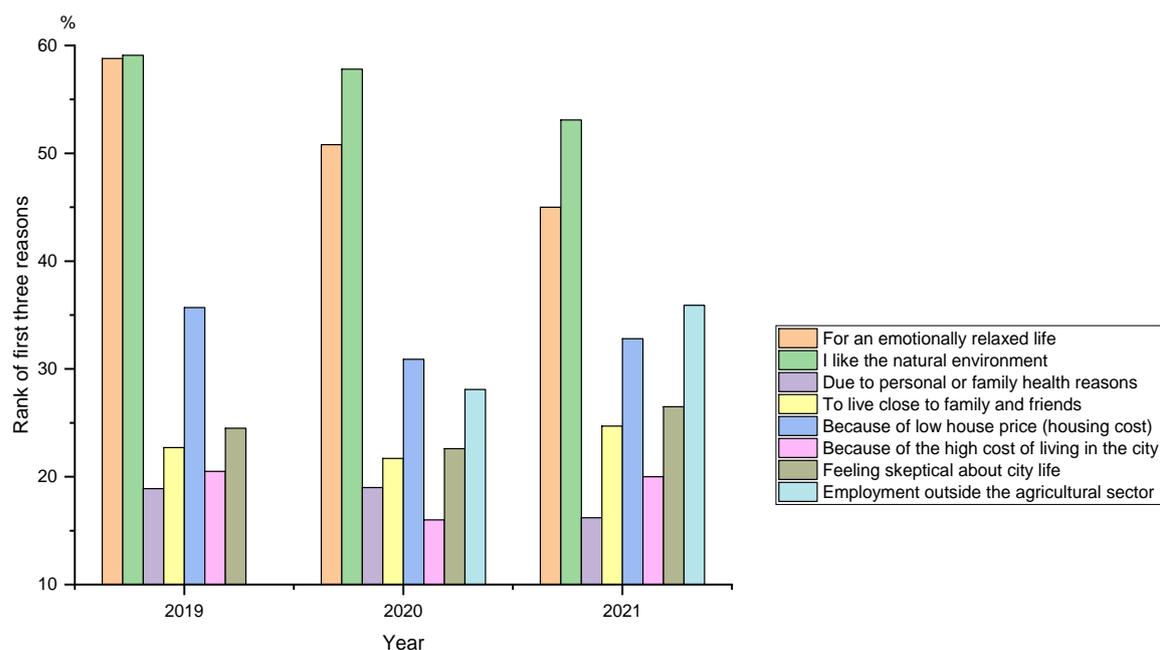
Figure 5-24 Cumulative Results of Top Three Reasons for Returning to Rural Area

Table 5-36 Reasons for Choosing Current Residence in the Type of Return to Rural Areas

By reason of choice (1)	2019		2020		2021	
	1st place	1+2 ranking	1st place	1+2 ranking	1st place	1+2 ranking
Number of cases (persons)	2,086	2,086	2,028	2,028	3,000	3,000
Because it is close to where I lived before (%)	10.5	15.2	12.8	18.0	11.6	16.2
Because it is a place where parents, children, relatives, and acquaintances live (%)	26.0	35.0	22.5	32.4	17.5	28.0
Good educational environment for children (%)	4.5	8.7	1.8	4.2	2.2	4.2
Living environment is convenient (%)	12.7	27.7	19.4	33.2	12.0	27.8
Because the returning home policy is well done (%)	3.9	7.2	2.2	4.2	1.8	5.5
Because it is easy to secure a place to live (%)	17.5	42.1	17.9	43.8	14.0	32.5
Low cost of living (%)	5.3	18.0	6.4	16.1	5.5	17.0
Because the land price is low (%)	6.3	14.2	7.0	16.8	7.6	17.7
Compared to other regions, the natural environment is excellent (%)	11.2	21.2	8.8	20.4	6.6	18.6

There are many returnees from farming in the region (%)	0.9	3.8	0.6	2.1	0.9	3.1
Because it is close to the relocated workplace (%)	-	-	-	-	19.6	24.3
etc. (%)	1.2	1.9	0.4	0.5	0.2	0.5
does not exist (%)	-	-	0.1	0.1	0.0	0.0
Do not know/no answer (%)	-	-	0.1	0.1	0.3	0.3

Return to rural area is decided before the respondents. The results in Table 5-37 Most of the people buy a house before they return to rural areas.

Table 5-37 When to Buy a Residence Return Rural Area

By period (1)	By period (2)	2020	2021
by period	Number of cases (persons)	1,265	1,695
	Returning home (%)	84.6	87.0
	After returning home (%)	15.4	13.0
average (months)	Before returning home	15.1	14.8
	after returning home	14.1	24.9

5.4.2 Years of Changes

When comparing the three sets of statistical data, it is necessary to consider the real value of household income at different time points. Referring to the data released by the Korean statistical department in May, based on the Consumer Price Index (CPI) with a reference value of 100 in 2020[6], the CPI was 104.04 in 2021, 98.988 in 2018, and 94.006 in 2014. Since the statistical data uses a span of 500,000 Korean Won as a unit, the differences caused by the Consumer Price Index are not significant when comparing household incomes. Therefore, in the analysis, there is no need to convert it into real value. The statistical data can be directly used to classify income levels and make comparisons.

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[6]https://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=INH_1J20003&vw_cd=MT_GTITLE01&list_id=105&seqNo=&lang_mode=ko&language=kor&obj_var_id=&itm_id=&conn_path=MT_GTITLE01
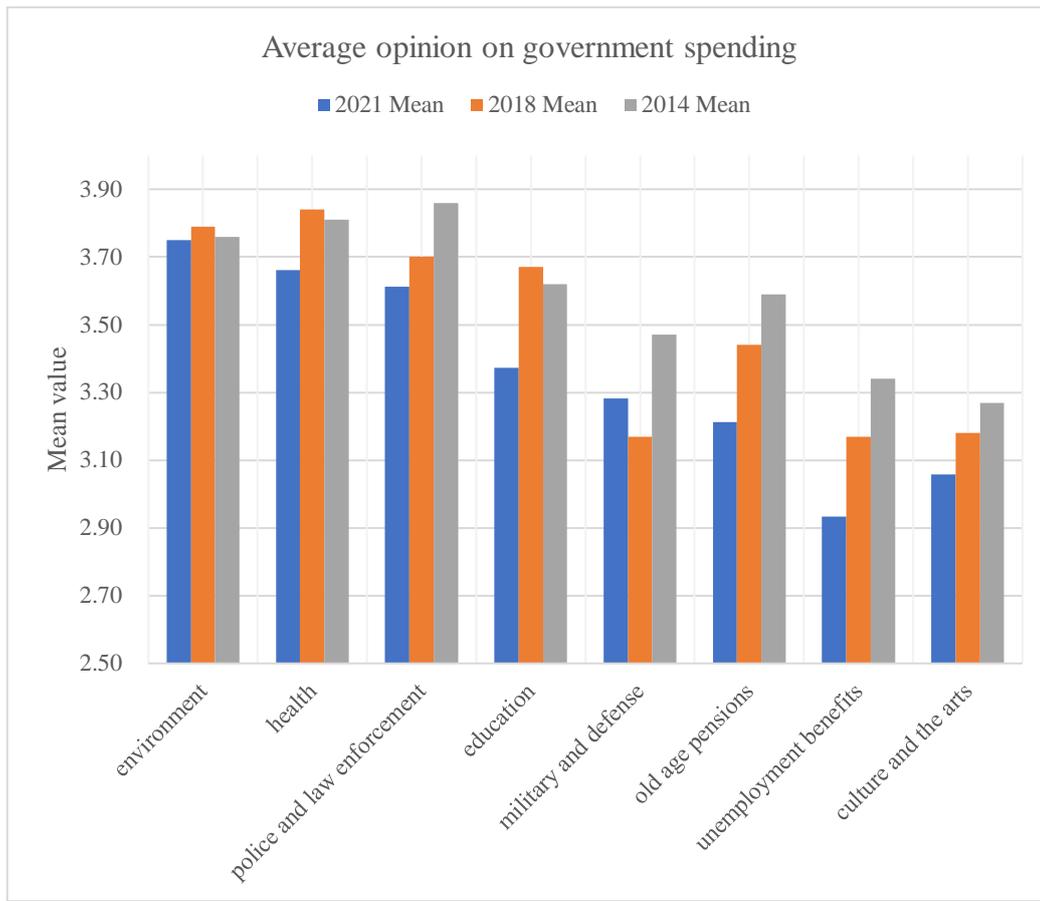
Figure 5-25 Average Opinion on Government Spending over Three Surveys

Government spending: The comparative chart in Figure 5-25 supplies insight into public opinion on government spending in South Korea. The survey results for 2014, 2018, and 2021 show similar patterns, indicating a consistent trend. A significant consensus among the population is the need for increased government expenditure on environmental matters, reflecting a growing awareness of environmental issues and the desire for stronger environmental protection measures.

However, there has been a decline in the degree of support for increased government spending in other areas, suggesting a shifting focus and potentially changing priorities among the public. It is worth noting that the trend between 2021 and 2014 stays the most consistent, highlighting the stability of public sentiment over time.

Regarding police and law enforcement, there is a slight deviation from the overall pattern. In 2014, there was a higher demand for increased government spending in this area, indicating a perceived need for enhanced security measures. However, the survey conducted in 2018 revealed a decline in public support for increased spending on police and law enforcement. This discrepancy may reflect changing perceptions of security needs and the allocation of resources within the country.
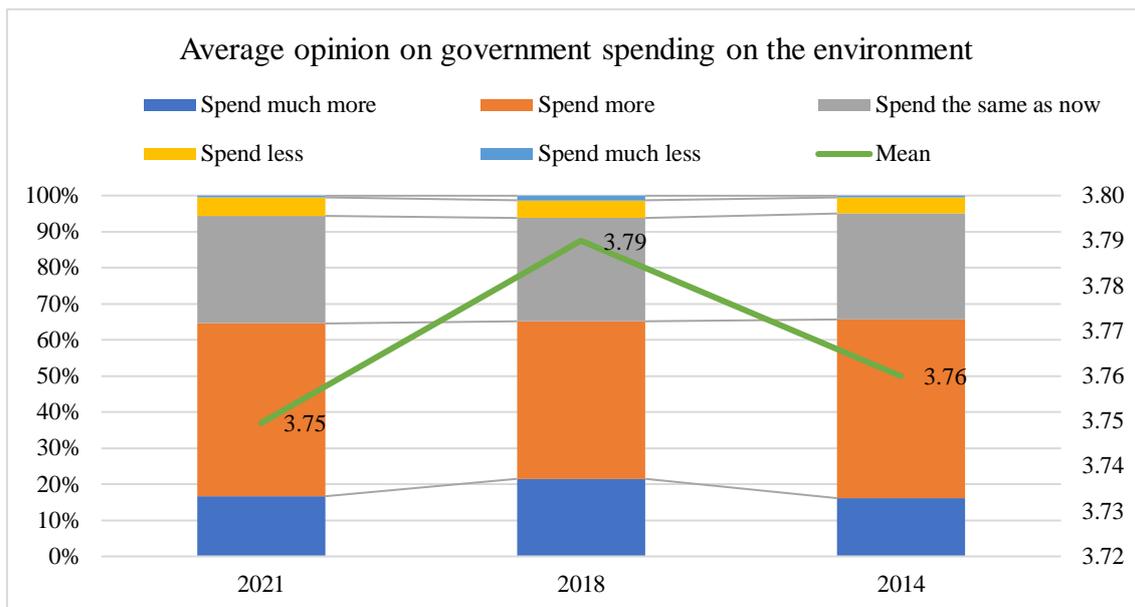
Figure 5-26 Average Opinion on Government Spending on the Environment

In Figure 5-26, it can be observed that people's attitudes towards government spending on the environment have remained relatively consistent. There was a slight increase in mean value in 2018, and the average values and the proportions of different attitudes were very similar between 2014 and 2021. Notably, over 60% of respondents expressed the belief that the government should allocate more or much more funds to the environment. In 2014, 16.64% of respondents believed that the government should spend much more money on the environment, while 47.92% of people felt that the government should spend more. In total, 64.56% of respondents expressed the view that the government should increase its expenditure on the environment.

In 2018, the percentage of people who believed that the government should spend much more increased to 21.5%, while those who thought the government should spend more accounted for 43.60%. Overall, 65.1% of respondents supported an increase in government spending on the environment.

Moving to 2021, the proportion of people advocating for much more government spending decreased to 16.14%, while those favoring more spending constituted 49.53%. Overall, 65.67% of respondents expressed the belief that the government should allocate more funds for environmental matters.

These findings highlight a consistent desire among the public for increased government investment in the environment, with fluctuations in the specific proportions of respondents favoring much more spending versus more spending over the years.

This demonstrates that comparing data from different years can be used for analysis, as even surveys conducted in different years exhibit consistency and can mutually support each other.
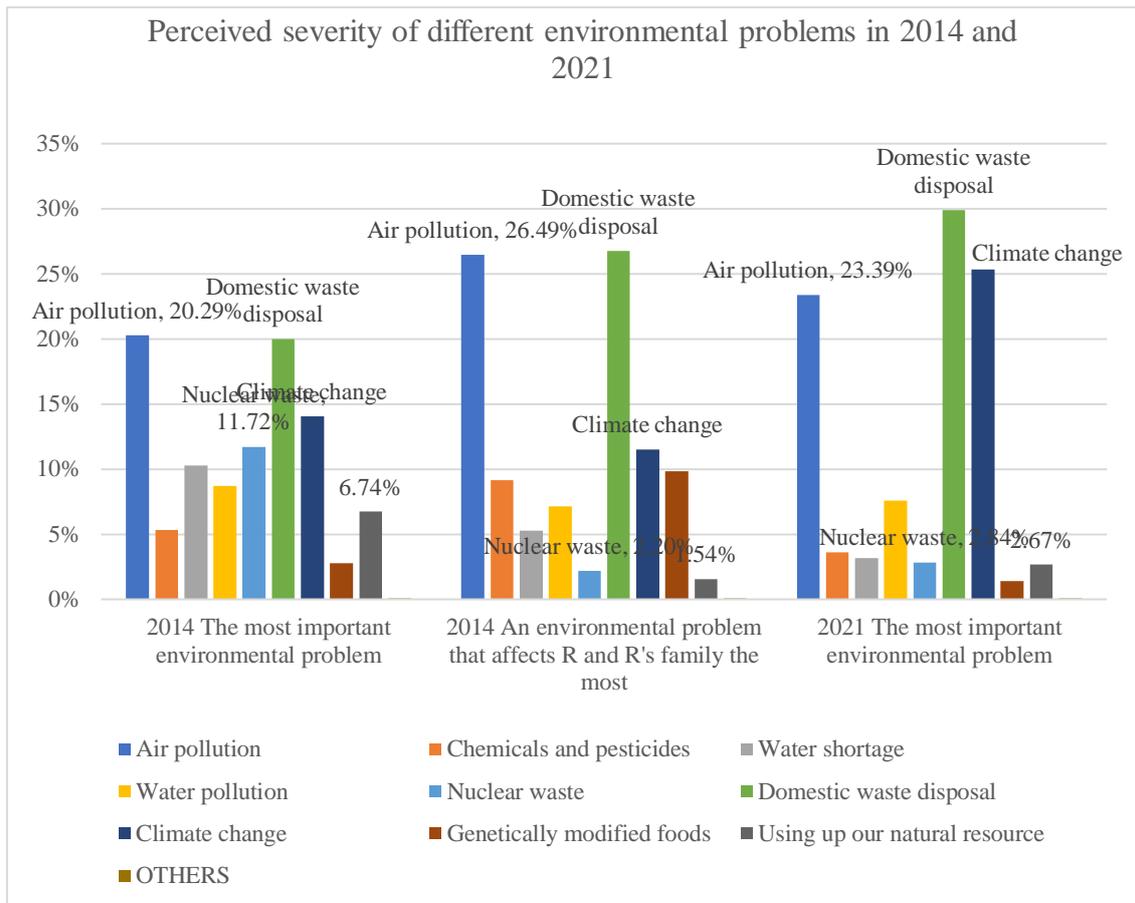
Figure 5-27 Perceived Severity of Different Environmental Problems in 2014 and 2021

The most important environment problem: The perception of the most severe environmental issues among respondents shows significant differences between 2021 and 2014, see from Figure 5-27. Firstly, in terms of the perception of the most severe problem, domestic waste disposal emerged as the top concern in 2021, with a significant increase in the proportion of people considering it a severe issue compared to 2014. The proportion of people recognizing climate change as the most severe problem also increased by over 10% in 2021, surpassing 25% compared to less than 15% in 2014. The proportion of individuals perceiving air pollution as a serious issue also increased by 3%.

In 2021, there was a notable decrease of nearly 10% in the perception of nuclear pollution as the most severe problem, reflecting the largest decline among all categories. Other issues such as water scarcity, water pollution, chemicals and pesticides, genetically modified foods, and depletion of natural resources also witnessed a decrease in their respective proportions.

Domestic waste disposal, air pollution, and climate change emerged as the top three most prominent issues. It is noteworthy that the survey was conducted in 2021 during the global COVID-19 pandemic, which may be associated with the higher proportions of concern regarding these three issues. While it is possible that the pandemic may have influenced the heightened concern for domestic waste disposal, air pollution, and climate change in 2021, it is important to note that multiple factors can contribute to shifts in public perception of environmental issues.

These findings highlight the shifting priorities and heightened awareness of environmental issues among respondents.
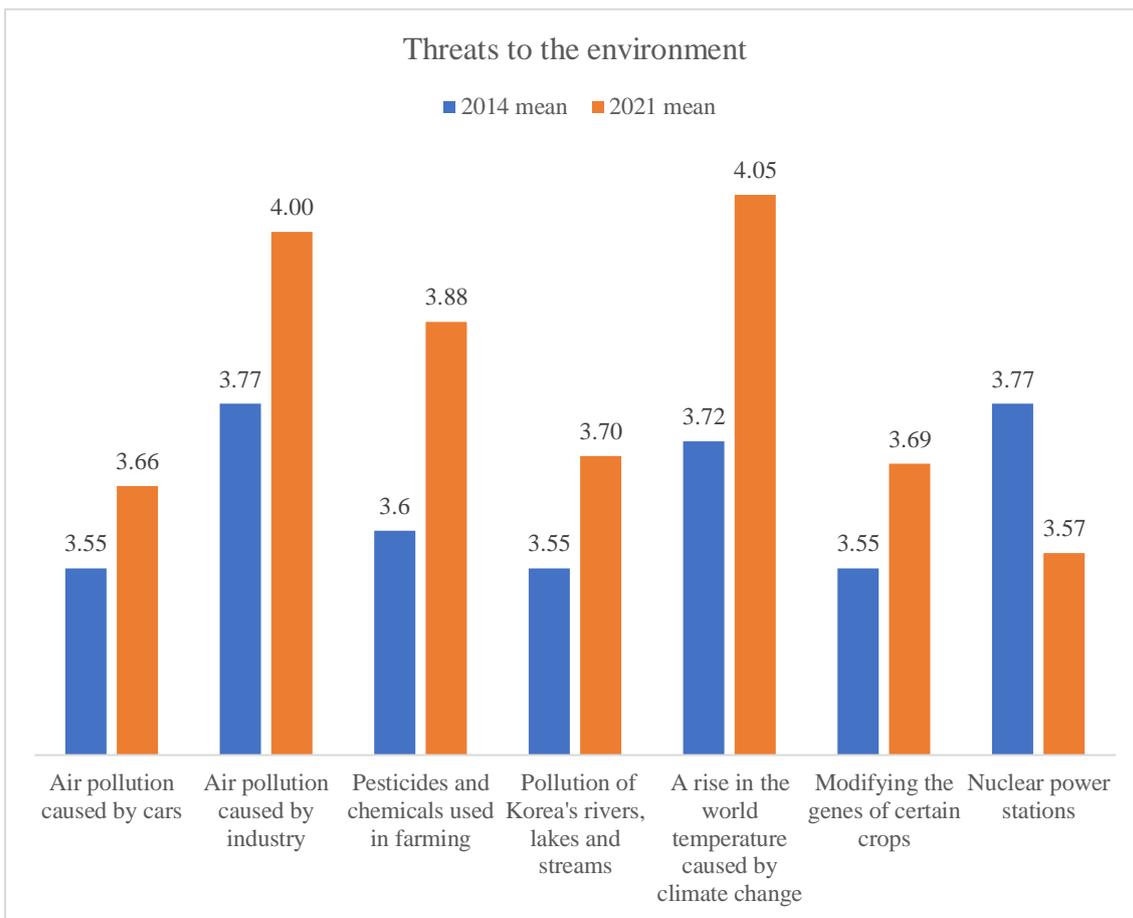
Figure 5-28 Threats to the Environment in 2014 and 2021

Threats to the environment: Figure 5-28 provides an overview of the perceived threats to the environment in 2014 and 2021, exhibiting similarities to the results presented in Figure 5-27. One notable change is that people's perception of the danger posed by nuclear power stations has decreased compared to 2014. However, it is important to note that all the other threats to the environment have remained consistent, with an overall increase in their perceived severity as indicated by higher mean values. Further details regarding the increase in perceived severity of environmental threats can be observed in Figure 5-29. Each item of environmental threats shows a notable increase in the percentage of respondents classifying them as "extremely dangerous" or "very dangerous."

This trend highlights a heightened level of concern among the public regarding the severity of these environmental threats. It indicates a growing recognition of the potential risks and negative impacts associated with these issues. The increased proportions of respondents perceiving these threats as more dangerous suggest a need for increased attention, awareness, and action to address and mitigate these environmental challenges.

The findings emphasize the importance of adopting effective measures and implementing sustainable practices to address the escalating severity of environmental threats. By addressing these concerns and taking proactive steps towards environmental conservation and protection, it is possible to minimize the potential adverse effects on ecosystems, human health, and overall well-being.

This suggests that while the perception of nuclear power stations has shifted, other environmental threats have become more concerning to the public. The higher mean values across the board indicate a heightened awareness and recognition of the potential dangers posed by various environmental issues.
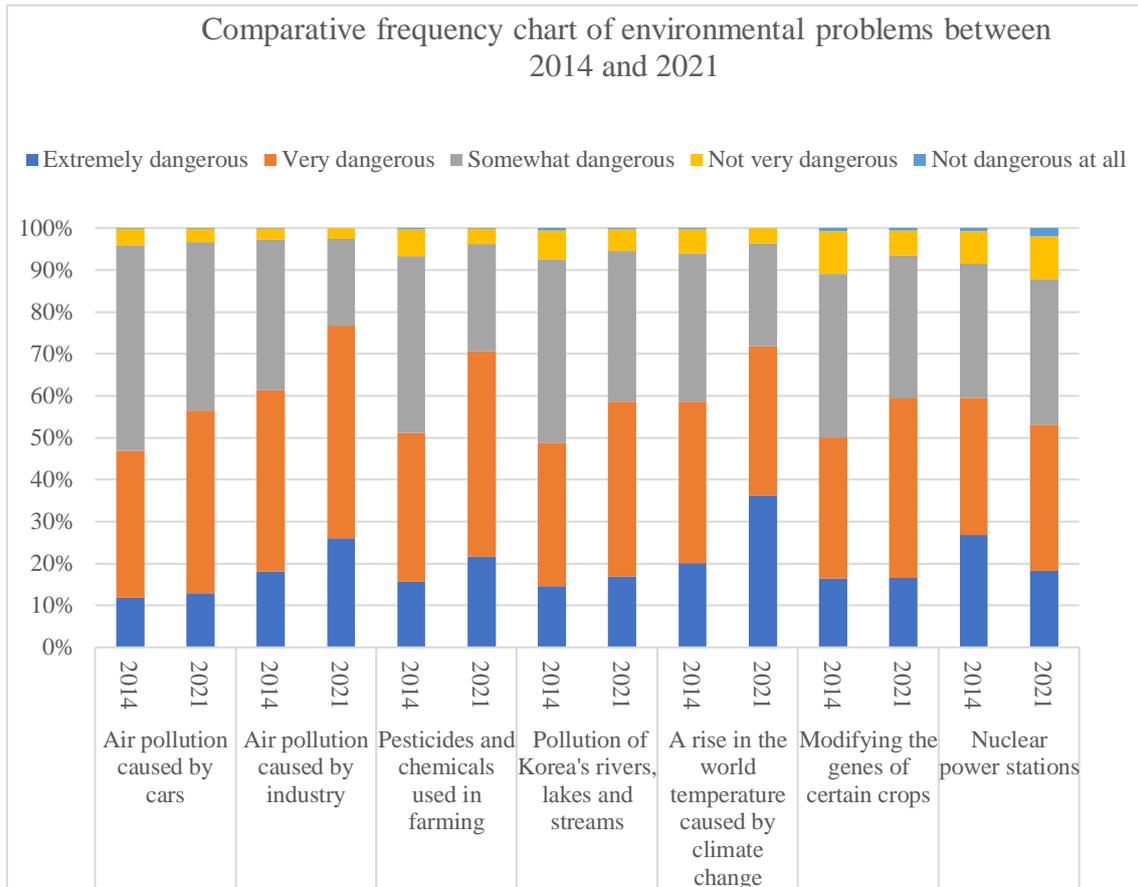
Figure 5-29 Comparative Frequency Chart of Environmental Problems between 2014 and 2021

5.4.3 Willingness and Behavior

Based on the data presented in Table 5-38, there is a positive correlation between respondents' willingness to pay higher prices or taxes, accept cuts in living standards for environmental protection, and their recycling behavior. The correlation coefficient of 0.159 indicates a weak positive correlation. Furthermore, the correlation is statistically significant, as indicated by the p-value of 0.000 (2-tailed).

Based on the information provided, here are the findings regarding the factors and their influence on respondents' willingness and behavior:

Factors with a stronger influence on willingness than behavior:

1. Government spending: The environment

2. General concerns for the environment

3. Importance of caring for nature and the environment

4. Agreement on the direct effect of environmental problems on everyday life

5. Agreement on doing what is right for the environment, even if it costs more money or time.

6. Agreement on the harmful impact of modern life on the environment

7. Importance of helping others and contributing to society

8. Importance of helping people and caring for their well-being

9. Importance of making independent decisions and being free

10. Monthly household income (categorical) 100

11. General happiness in life

12. Importance of having a good time

Factors with a stronger influence on behavior than willingness:

1. Threats to the environment: Air pollution caused by cars.

2. Threats to the environment: Air pollution caused by industry.

3. Importance of fair treatment and equal opportunities for people

4. Importance of understanding different people

5. Importance of living in secure and safe surroundings

6. Threats to the environment: A rise in the world temperature caused by climate change.

7. Influence of the world's climate change in Korea (positive vs. negative)

8. Neighborhoods affected by air pollution.

9. Subjective assessment of the size of the residential area

10. Neighborhood affected by extreme weather.

11. Perception of the world's climate change

12. Marital status of the respondents

13. Employment status of the respondents

Factors influencing willingness but not recycling behavior:

1. Agreement to reduce the size of Korean nature reserves.

2. Number of rooms in the respondent's house

3. Types of health insurance

4. Self-assessment of family income compared to general family income (2005)

5. Membership in any group aiming to preserve or protect the environment.

6. Number of family members living together

7. Frequency of outdoor leisure activities

8. Education level

9. Experience of signing a petition about an environmental issue in the last five years

10. Experience of donating money to an environmental group in the last five years

11. Respondents' house type

Factors influenced by age and gender:

1. Age and gender have an impact on recycling behavior but not willingness.

Factors with an equal influence on both willingness and behavior:

1. Agreement or disagreement on whether claims about environmental threats are exaggerated.

Residence (rural or urban) has no relation to either willingness or behavior.

These findings highlight the varying levels of influence that different factors have on respondents' willingness and behavior regarding environmental issues.

Table 5-38 Correlation Coefficient of Willingness and Recycling Behavior

Correlation Coefficient

	Willingness	recycling behavior
Willingness to protect the environment	1.000	-.159**
R's special effort to sort glass, tins, plastic, or newspapers and so on for recycling	-.159**	1.000
Government spending: The environment g	-.201**	.109**
General concerns for the environment	.295**	-.224**
Important to care for nature and environment	-.149**	.135**
Agree or disagree: Environmental problems have a direct effect on my everyday life	-.227**	.169**
Agree or disagree I do what is right for the environment, even when it costs more money or takes more time	-.207**	.106**
Agree or disagree: Almost everything we do in modern life harms the environment	-.135**	.092**
Important to help other people and do good for the society	-.171**	.104**
Important to help people and care for others well-being	-.154**	.122**
Important to make own decisions and be free	-.115**	.091**
Monthly household income (categorical) 100	.133**	.068*
Happiness in life in general	-.139**	.122**
Important to have a good time	-.134**	.088**
Agree or disagree: Many of the claims about environmental threats are exaggerated	.130**	-.130**
Threats to environment: air pollution caused by cars	.152**	-.218**
Threats to environment: Air pollution caused by industry	.136**	-.189**
Important that people are treat equally and have equal opportunities	-.145**	.147**
Important to understand different people	-.131**	.159**
Important to live in secure and safe surroundings	-.126**	.136**
Threats to environment: A rise in the world temperature caused by climate change	.151**	-.160**
influence of world's climate change in Korea: bad vs. good	-.118**	.222**
neighborhood affected by air pollution	.106**	.108**
subjective assessment on the size of the residential area	-.067*	.076**
neighborhood affected by extreme weather	.061*	.080**
the world's climate change	.066*	-.168**
R's marital status	.060*	-.089**
Whether R has a job	-.077**	-.111**

Correlation Coefficient

	Willingness	recycling behavior
agree to reduce the size of Korean's nature reserves	-.194**	-0.033
how many rooms in your house	.110**	-0.017
Kinds of health insurances	.119**	0.019
Self-assessment of R's family income compared to general family income (2005)	-.113**	-0.024
Whether R is a member of any group that aims to preserve or protect the environment	-.072*	0.025
number of family members living together g	.104**	-0.009
how many times have you enjoyed outdoor leisure activities	-.073*	0.008
education	.160**	0.030
Experience of signing a petition about an environmental issue within the last five years	-.124**	0.029
Experience of giving money to an environmental group within the last five years	-.089**	0.029
R's House type	-.078**	0.016
R's age group	-0.041	-.162**
R's sex	-0.040	-.087**
Urban area/rural area	0.015	-0.041

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In summary, the findings from the comparison of factors related to respondents' willingness and behavior regarding environmental issues are as follows:

Factors with a stronger influence on respondents' willingness to support environmental protection efforts include their concerns for the environment, agreement on the impact of environmental problems on daily life, willingness to make sacrifices (such as higher prices or taxes), and general happiness and enjoyment in life. Government spending on the environment, along with the importance of caring for nature and making independent decisions, also plays a significant role in shaping respondents' willingness.

On the other hand, factors that strongly influence respondents' actual behavior in terms of environmental conservation include threats such as air pollution caused by cars and industries, the importance of secure and safe surroundings, and the impact of climate change. Other factors influencing behavior include the size of residential areas, marital status, and employment status.

Certain factors, such as respondents' age and gender, only influence their behavior and not their willingness. On the other hand, another factor, the perception of environmental threats being exaggerated, has an impact on both willingness and behavior.

Several factors, including respondents' residence (rural or urban), membership in environmental groups, education level, and specific experiences related to environmental activities or donations, only have a notable influence on respondents' willingness but not on their actual recycling behavior.

In conclusion, the findings highlight the complex interplay between various factors and their impact on respondents' willingness and behavior concerning environmental protection. Understanding these factors can help inform strategies and policies aimed at promoting environmental consciousness and encouraging sustainable practices.

Based on the comparison of factors influencing respondents' willingness and recycling behavior, the following findings emerge:

Factors influencing willingness: General concerns for the environment, the perception that environmental problems directly impact everyday life, the commitment to doing what is right for the environment regardless of cost or effort, and government spending on the environment are the most significant factors influencing respondents' willingness to engage in environmental protection.

Factors influencing recycling behavior: General concerns for the environment, the influence of climate change on Korea (viewed as negative or positive), and the specific threat of air pollution caused by cars are the most influential factors shaping respondents' recycling behavior.

The pivotal role of environmental concern: Across both willingness and recycling behavior, the level of concern for the environment emerges as a critical factor. It consistently influences both the willingness to engage in environmental protection and the actual recycling behaviors practiced by respondents.

Different factors for willingness and behavior: Willingness appears to be more closely associated with attitudes and values, while recycling behavior is more strongly connected to the respondents' immediate living environment and daily experiences.

In summary, while respondents' willingness to participate in environmental protection is influenced by various factors such as attitudes, values, and government spending, their recycling behavior is primarily shaped by concerns for the environment and the specific threats they perceive in their daily lives.

Classification tree

By putting all these factors in classification tree model, a clearer of different influence of variables could be seen from Figure 5-30 and Figure 5-31.

Out of 1,199 respondents, 45.9% reported consistent recycling behavior, 33.9% reported frequent recycling, and 19.2% reported occasional recycling.

Among the respondents who were concerned about the environment, the proportion of those who reported consistent recycling behavior increased by 71.3%. Among this group, 83.5% of respondents living in apartments reported consistent recycling behavior. Among those who perceived industrial pollution as a severe environmental issue, 86.3% of them reported consistent recycling behavior.

Among the respondents who either cared or did not care about the environment, 47.6% reported consistent recycling behavior, and 35.1% reported frequent recycling behavior. Among those who perceived car-generated air pollution as highly dangerous, the proportion of respondents with consistent recycling behavior increased to 75.2%. Among this group, married respondents had an increased rate of consistent recycling behavior, reaching 80.3%. Among those who perceived car-generated air pollution as less dangerous, recycling behavior was relatively lower. Additionally, respondents who believed in the benefits of climate change had a lower frequency of recycling behavior. This indicates that the perception of environmental threats has a positive influence on recycling behavior.

Among the respondents who had a neutral attitude towards the environment, the frequency of recycling behavior was lower compared to those who were highly concerned about the environment and even lower compared to those who had some level of concern or were not concerned about the environment. Employment status emerged as a key influencing factor, as unemployed respondents had a higher frequency of recycling behavior compared to employed respondents. This behavior

could be driven by the need for economic savings and limited financial resources. Additionally, respondents under the age of 30 had a lower frequency of recycling. Among employed respondents, those living in suburban or rural areas had a lower frequency of recycling. This suggests that residential location partially reflects the variation in recycling behavior, but this difference is likely to be influenced by economic conditions.

Out of 1,205 respondents, 54.9% (662 people) expressed a willingness to protect the environment. The level of environmental concern was associated with differences in the willingness to pay among the respondents. Among those who were highly concerned about the environment, 91.4% of them agreed with the value of helping others and had a willingness to pay. Among this group, 94.4% of those who recycled frequently or consistently expressed a willingness to pay. On the other hand, among those who did not endorse the value of helping others, 71.4% had a willingness to pay, and among them, those who did not believe in spending money and time on the environment had a willingness to pay as low as 47.1%. This suggests that even if respondents are highly concerned about the environment, their willingness to pay decreases if they do not endorse altruism.

Among those who had some level of environmental concern, 55.9% expressed a willingness to pay. Among this group, those who acknowledged the importance of protecting the environment even if it required spending time and money had a willingness to pay that increased to 63.8%. Among these individuals, those who perceived their lives as happy had an increased willingness to pay of 80.7%. This indicates that respondents who are happy and endorse spending money and time on the environment show an increased willingness to pay.

Among respondents who were not concerned about or had a neutral attitude towards the environment, only 39% expressed a willingness to pay. However, among those who reported being affected by environmental issues in their daily lives, the willingness to pay increased to 52.2%, and among them, individuals with a university degree or higher showed an increased willingness to pay of 74.4%. This demonstrates that education level and the impact of environmental issues can influence respondents' willingness to pay, regardless of their level of environmental concern.
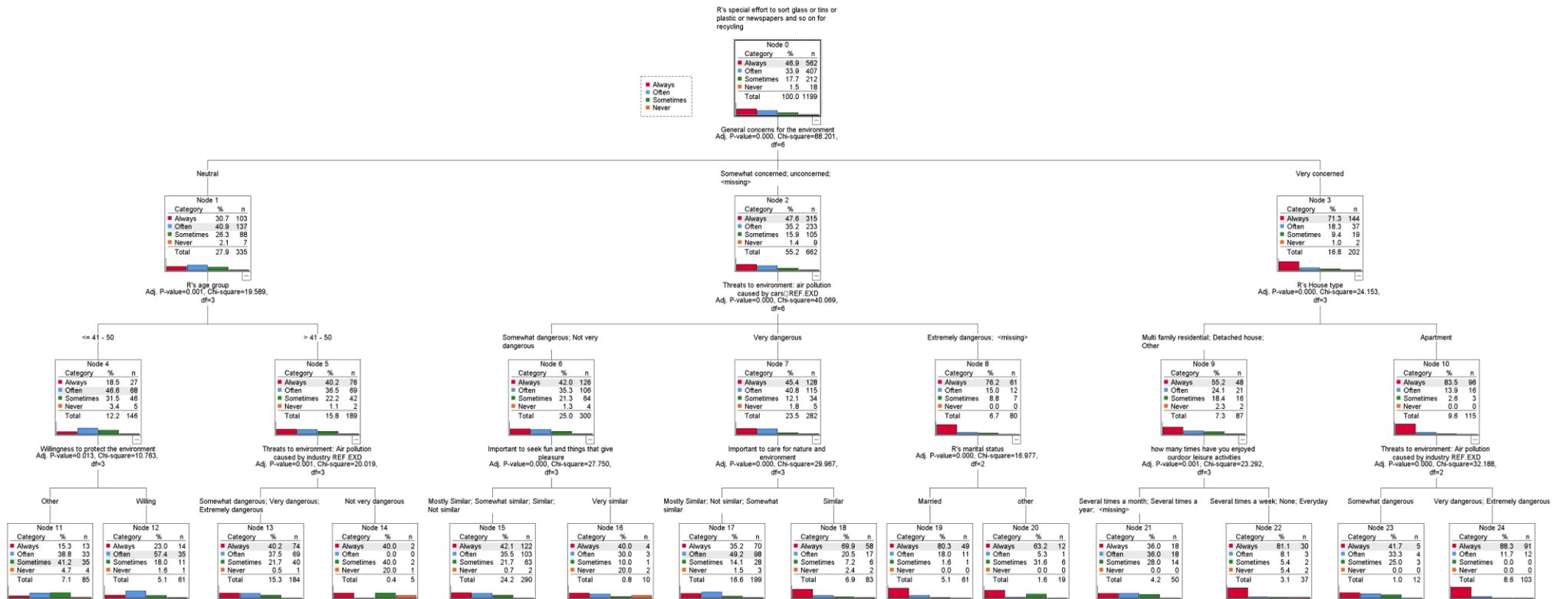
Figure 5-30 Tree Diagram of Recycling Behavior in 2021
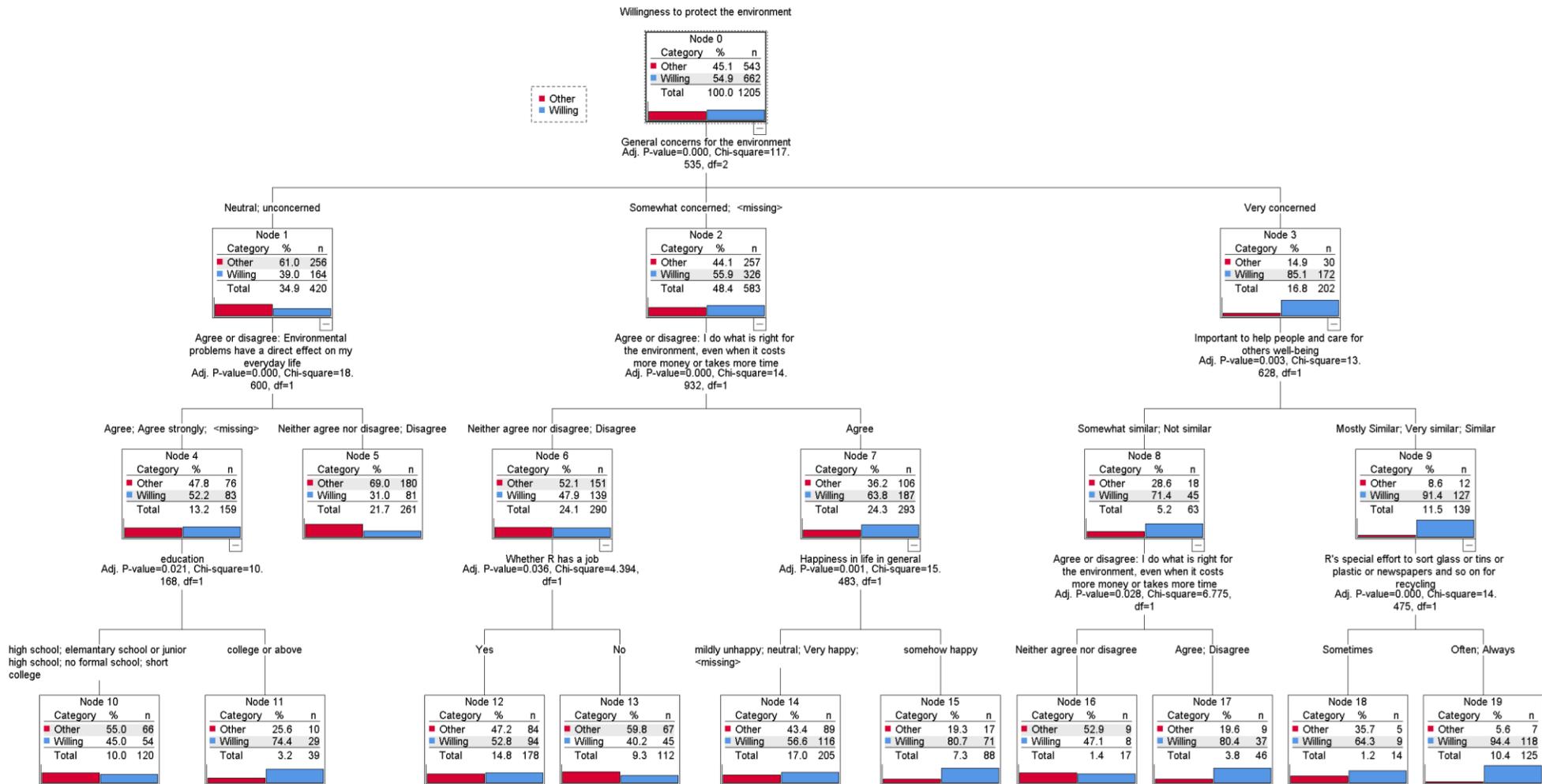
Figure 5-31 Tree Diagram of Willingness in 2021

5.5 Conclusion

The relationship between relocation intention and pro-environmental behavior was examined in Korea. The effect of returning to farming as the independent variable on environmental awareness was examined. No significant correlation was found.

Despite the limited changes in people's attitudes towards environmental protection in Korea, as evidenced by the results of KGSS2014 and KGSS2021, and the minimal shifts in their concern for the environment, it is worth considering the correlation between their support for the rural return policy and their attitude towards environmental conservation. By examining the trends observed in KGSS2014 and KGSS2021 and making an approximate inference about the situation in 2018, this study can suggest that people's endorsement of the rural return policy serves as an indicator of their environmental conservation stance.

Although a survey showed that one of the reasons people return home is to pursue better environmental quality, this study analysis of the Korean Social Survey data (KGSS) did not find a correlation between the willingness to return to farming and awareness of environmental protection. Perhaps the intention to return to farming is driven more by the consumerist ideology of enjoying life than by the awareness of environmental protection. Therefore, an important way to raise awareness of environmental protection remains through education, of which policy advocacy is an important tool. For example, the promotion of eco-friendly lifestyle innovation policies in high consumption clusters. It is worth noting that policies bring impacts with longer term effectiveness.

People's willingness to return to farming does not seem to be directly related to their level of concern about the environment. However, this study found that people's support for the homecoming policy was related to their concern for the environment. Therefore, increasing people's support for homecoming policies by promoting environmental policies may be an effective way to increase awareness of environmental protection.

In addition to this, social determinants are also important factors influencing people's willingness to return to farming, including marital status, family size, etc.

Chapter 6   Pro-Environmental Behaviors and Settlement Consciousness in Japan

Based on the JGSS survey, the analysis shows that the use of energy-efficient products in Japanese households is most closely related to the type of housing. It is also speculated that the use of energy-efficient products in Japanese households is mainly due to the difference in building types, and the most likely reason behind this is the implementation of the building standards law, which has influenced the construction equipment industry.

6.1. Introduction

6.1.1 Migration Profile in Japan

In East Asia, rapid economic growth, declining fertility, aging, and increased undocumented migration have led to serious conflicts, most notably in Japan, but also in Korea, Hong Kong China, Taiwan China, and China mainland.

Since the mid-1980s, Japan has experienced many labor migrants. The registered foreign population has increased from 817,000 in 1983 to 2.1 million (1.7% of the total population) in 2009 (OECD, 2012: Table A5).

In 2010, 27% of foreigners were considered "general permanent residents" and another 19% were considered "special permanent residents". The latter are mainly descendants of Koreans who were recruited (sometimes forcibly) as workers during the Japanese colonial rule of Korea from 1910 to 1945.

Migration characteristics in Japan

Japanese women are more likely to abandon long-distance migration than women in western industrialized countries [139]. The arrival of foreign residents in Japan has not narrowed the regional population gap in Japan, but rather has increased it [140]. There is a clear trend of distance decay in domestic migration. There is no way to reverse Japan's aging population in the coming decades by increasing fertility and improving immigration policies [141].

Japan's rapid outward migration occurred during a period of rapid economic development (1950-1970), with rapid urban industrialization as a pulling force and rural poverty as a pushing force. As early as the end of the 20th century, surveys in the Tokyo area of Japan revealed more short-distance and centrifugal relocations and a clear trend toward suburbanization [142].There are two main forms of suburbanization and reverse urbanization in Japan in recent decades, one is reverse urbanization as a solution to rapid aging and depopulation of rural areas, and the other is reverse urbanization that is not widespread as revealed by actual data[143].

Trends and processes of internal migration in Japan since the 1950s. Champion et al. in the book about internal migration in developed world [144] (p.p. 173-202) documents and explains the decline in intra-Japanese movement between 1954 and 2015. Migration increased rapidly in the early postwar period, peaked around 1970, and then declined - sharply in the early and mid-1970s, then slowly until the mid-1980s, and then slowly until 2015. the 1960s society to today's "postmodern "post-modern" low-mobility societies. It was found that population aging is far less important than commonly believed. Two other sets of reasons for the decline in migration were identified. The first involves the political economy of regional development, particularly the changing spatial division of labor. The dominant role of Tokyo in Japan's spatial economy was particularly emphasized. The second group focuses on major changes in Japanese culture and society, especially as they affect young people, who are experiencing difficulties in establishing interpersonal relationships, escaping from their parents, and obtaining stable jobs and housing, which are seen as prerequisites for marriage and family formation.

6.1.2 Urban-Rural Mobility in Japan

The Japanese government has launched a series of activities in response to the high rate of rural population loss.

Similar to the support program in South Korea, Japan has a corresponding organization for their activities called Community Cooperative Support initiative (CCS)[7], a program initiated by the Ministry of Internal Affairs and Communications (MIC) of Japan. The Ministry of Internal Affairs

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[7] https://www.chisou.go.jp/sousei/index.html. Local Creation. Regional Revitalization Website

and Communications (MIC) initiated a program to support people who wish to relocate from urban areas to rural areas. The MIC provides funds to local governments, which are then used to pay stipends to CCS members for up to three years in exchange for a series of activities aimed at promoting or preserving local culture, history, or nature. to more than 1,000, with 5,464 participants in 2020, the long-term goal of the CCS initiative has been to encourage individuals of primary working age to permanently relocate to their new host communities. Sixty-three percent of these participants stay in their adopted area after completing their CCS term, indicating some degree of success. (MIC)

In 2014 under the banner of regional revitalization the Japanese government proposed a series of goals and measures divided into four parts aimed at stimulating rural vitality based on the discussion that the population is overly concentrated in the Tokyo area with an explicit goal of promoting rural-urban linkages and mobility The Cabinet as part of the efforts to encourage rural mobility The Japanese Ministry of Health, Labor and Welfare internal affairs and communications promoted the term so-called relational population which was promoted by journalist Tanaka Promoted by Shigemi describes a group of highly mobile people who often visit rural areas for the Ministry of Internal Communications konkaa vault representatives are not permanent nor tourists but come from outside the area where they can play a role in community development also here contain the recent situation relational population is understood as a range of people from those with little to no regular volunteer service or establish a second home in rural areas. Contact with permanent settlement is understood as the final step in a process that commits the relational population to have an important emotional element.

The Regional Revitalization Policy Contest[8], on the other hand, incorporates a broader group of students.

The Regional Revitalization Policy Idea Contest is a contest to solicit ideas for regional revitalization policies based on analysis of regional topics using RESAS and V-RESAS. The call for applications is divided into two categories: high school students, junior high school students and below, and university students and above (including those working in self-governing bodies, private companies, etc.). Applicants will make presentations directly to the judges at the final judging session on Saturday, December 10. We hope you will take this opportunity to use RESAS and V-RESAS to learn about the current state of the region you are interested in and to think about how you would like to create the future of the region.

Government departments disclose various types of statistics needed, such as RESAS, V-RESAS.

Regional Economic Analysis System (RESAS)[9] is a system that aggregates and visualizes big data from the public and private sectors such as demographics, industrial structure, and people flow provided by the government. It is widely used by local government officials and people in various fields interested in regional revitalization to plan effective measures and make management decisions, and anyone can use it.

V-RESAS[10] is a system for visualizing the impact of novel coronavirus infection on regional economies and capturing the health of regional economies (economic vitals) in near real-time. An economic analysis system designed to support policy planning and management decisions of local governments. We provide a variety of big data related to the local economy (people flow, consumption, food, and drink, etc.).

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[8] https://contest.resas-portal.go.jp/2022/about.html.

[9] https://resas.go.jp/#/13/13101.

[10] https://v-resas.go.jp/.

6.1.3 Movement during the Covid-19

Japan experienced the association of covid-19 and its internal migration [145]. Did the pandemic coincide with significant changes in migration levels or/and population levels? Analysis of the prefecture-prefecture data matrix shows that the covid pandemic epidemic hit domestic migration in Japan, with Tokyo becoming less attractive to other prefectures across the country. Remote rural areas experienced a slight increase in population.

From Figure 6-1 and Figure 6-2, we can see a very visual difference. The number of people leaving Tokyo has increased very significantly under the influence of covid-19. In terms of age groups, the elderly and children moved out more. Among young people, there is also a decrease in 25–29-year-olds and a clear change in 30–34-year-olds from an inflow to a pure outflow.

However, looking at the flow in 2022, those heading to Tokyo area are still picking up.

There are a few people in Japan who have moved away from big cities for a new rural life[143].
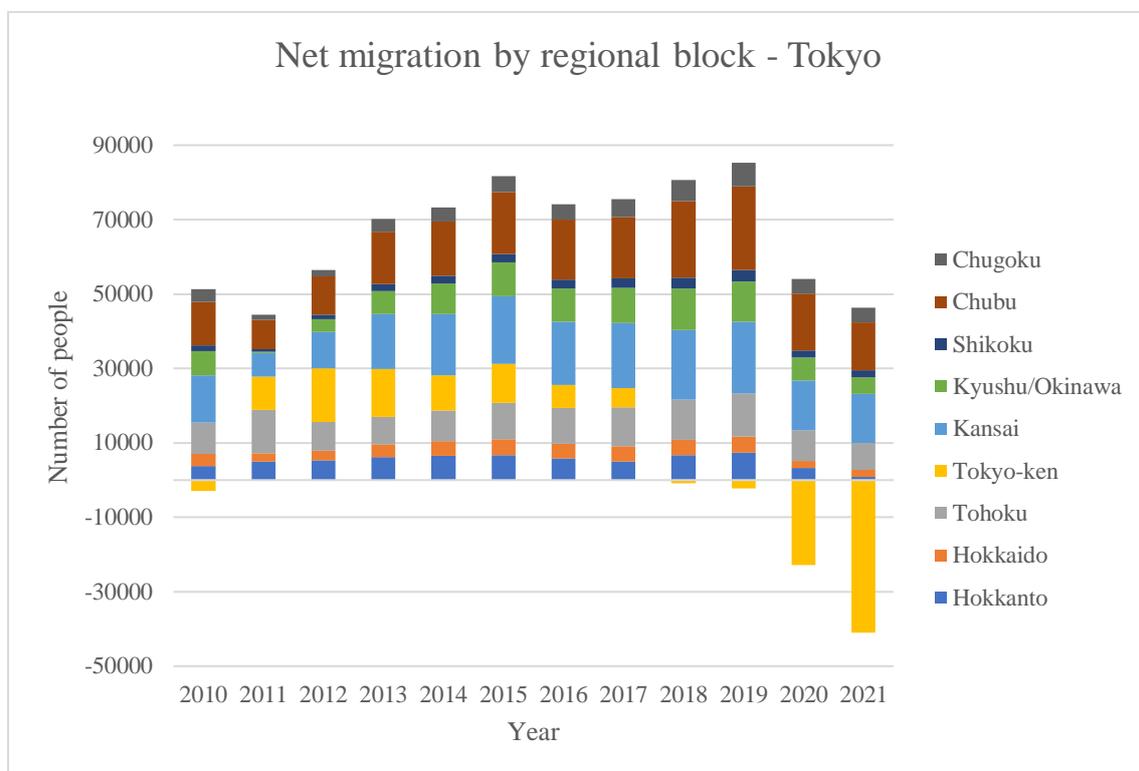
Figure 6-1 Net Migration by Regional Block in Tokyo

(Source[11] :, same as below)
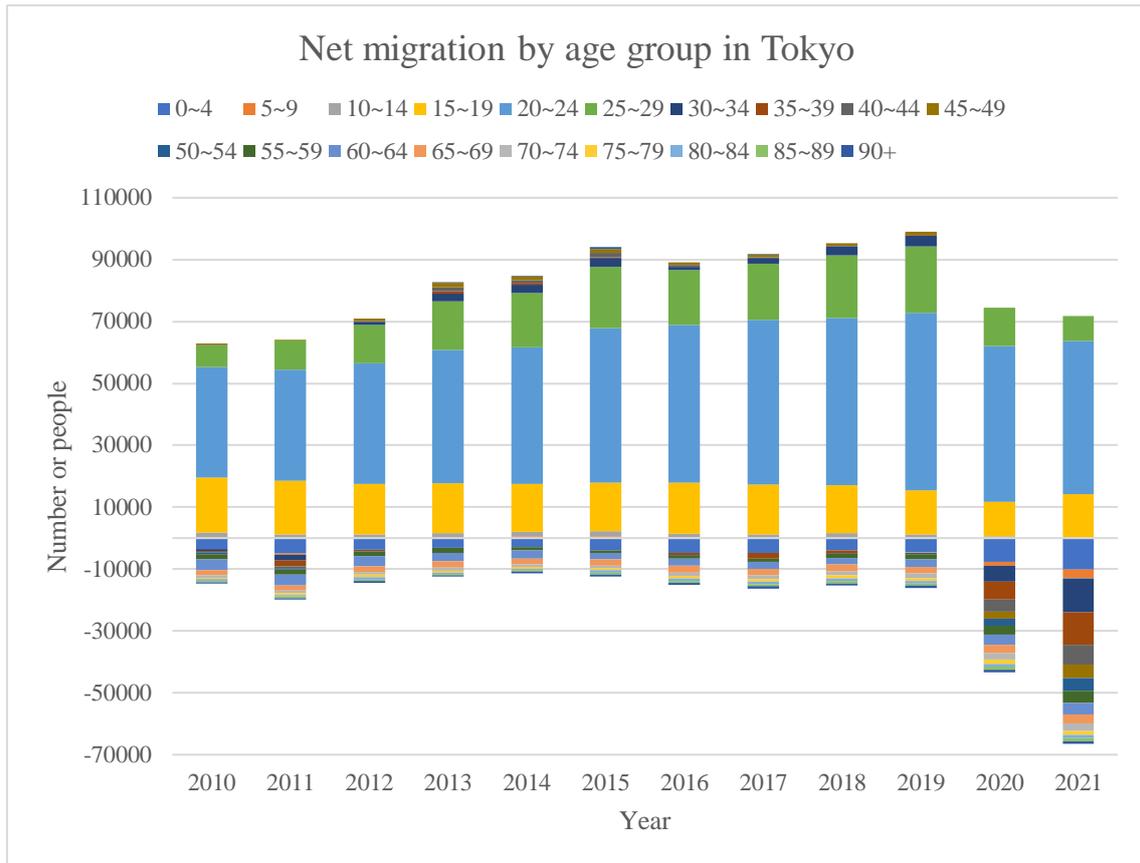
Figure 6-2 Net Migration by Age Group in Tokyo
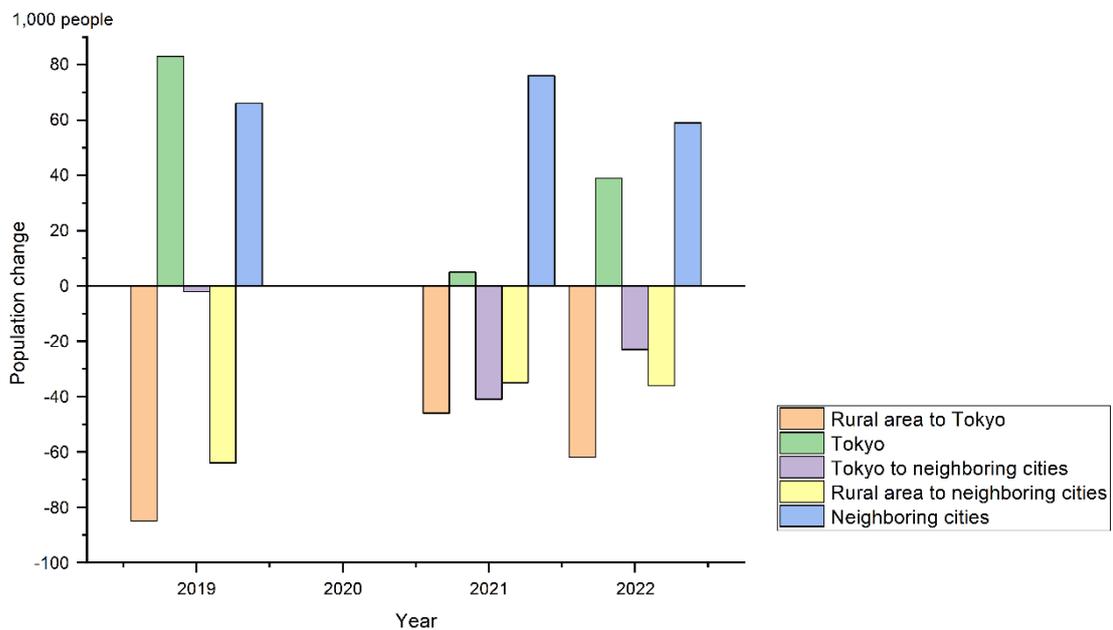
Figure 6-3 The Population Migration Situation during Covid-19 in Tokyo

(data source:地域の経済 2022　全体版[146])

From Figure 6-3 the influx of people from rural areas to the city was 149,000 before the epidemic, with the Tokyo area attracting most of the people at 85,000 and the three suburban prefectures of

Tokyo at 64,000. When the outbreak occurred, the outflow from rural areas decreased to 82,000 people, including 46,000 in Tokyo and 35,000 in the suburbs, but 41,000 people traveled from Tokyo to the suburbs. Overall, the increase in population in Tokyo plummeted to 0.5 million people, substantially lower than the 83,000 increase in population before the outbreak. As the epidemic subsides, the 2022 data show an increase in rural outflows to 99,000, with an increase in outflows to Tokyo to 62,000 and a relative flatness of 36,000 in the three suburban prefectures. Meanwhile, the population flow from Tokyo to the three suburban prefectures fell back to 23,000. This is still relatively more than the 0.2 million people before the epidemic. As can be seen, the epidemic caused a significant decrease in the population of Tokyo, the increase in population growth in the three suburban prefectures then fell back rapidly, and, moreover, there is a trend of recovery in the population increase in Tokyo.
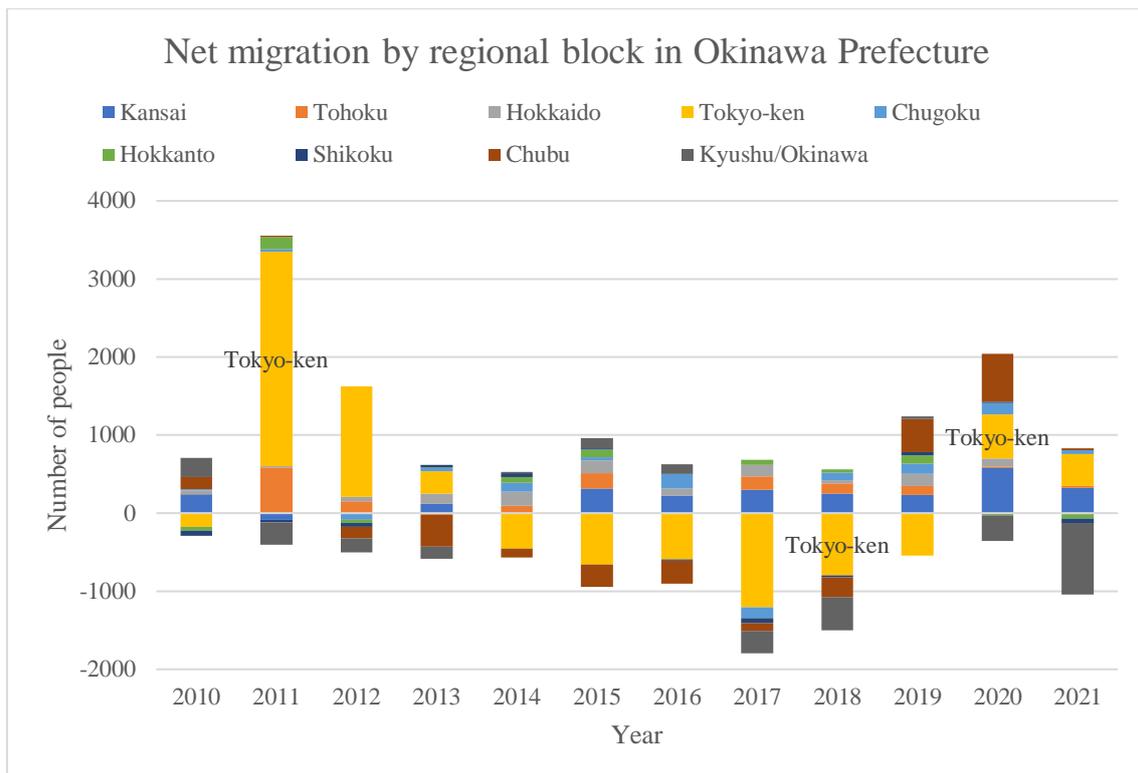
Figure 6-4 Net Migration by Regional Block of Okinawa Prefecture
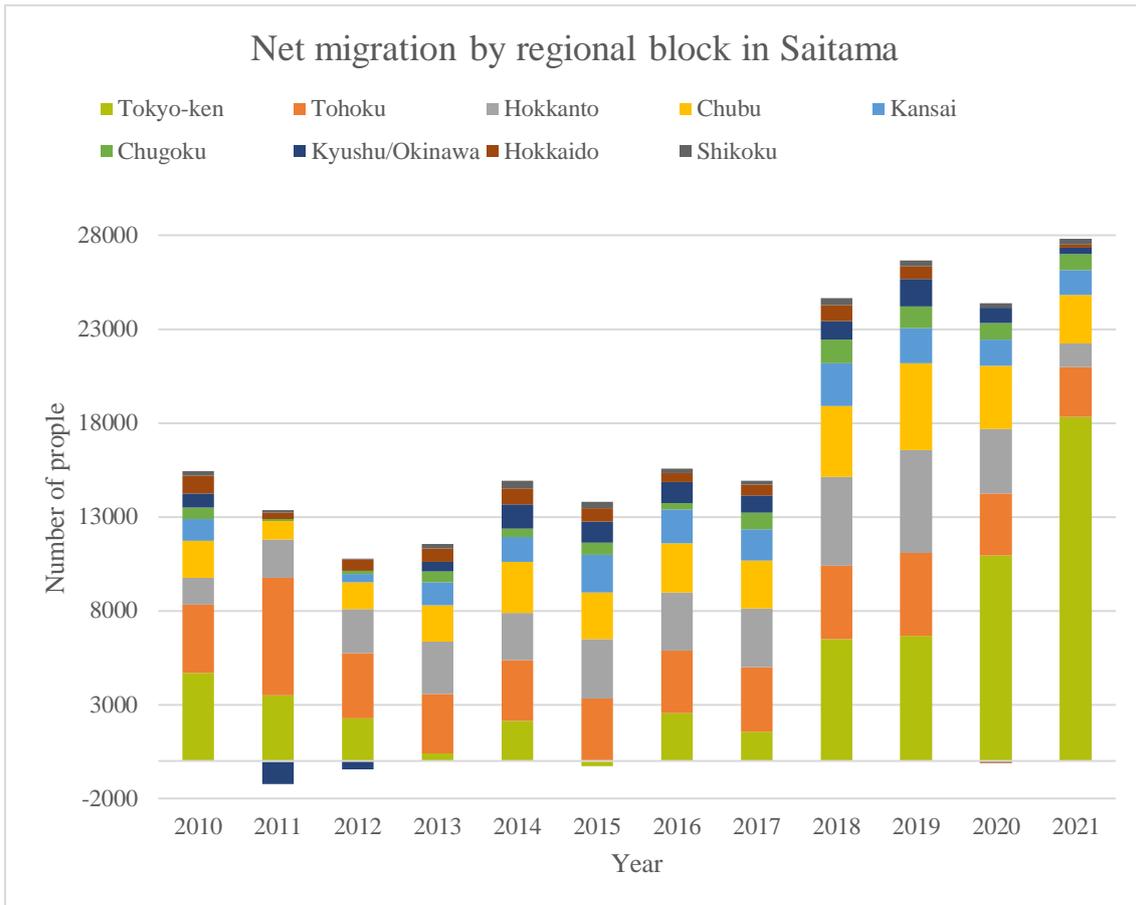
Figure 6-5 Net Migration by Regional Block in Saitama

As can be seen in Figure 6-4 and Figure 6-5, the change in population flow from the Tokyo area to the nearer Saitama Prefecture and to the farther Okinawa shows a consistent It increases in both 2020 and 2021. People are fleeing the metropolis due to the impact of the novel coronavirus and the distance does not stop at the nearby.

6.2 Attitudes toward Agriculture and Rural Maintenance Activities

It is a part of the political comparison.
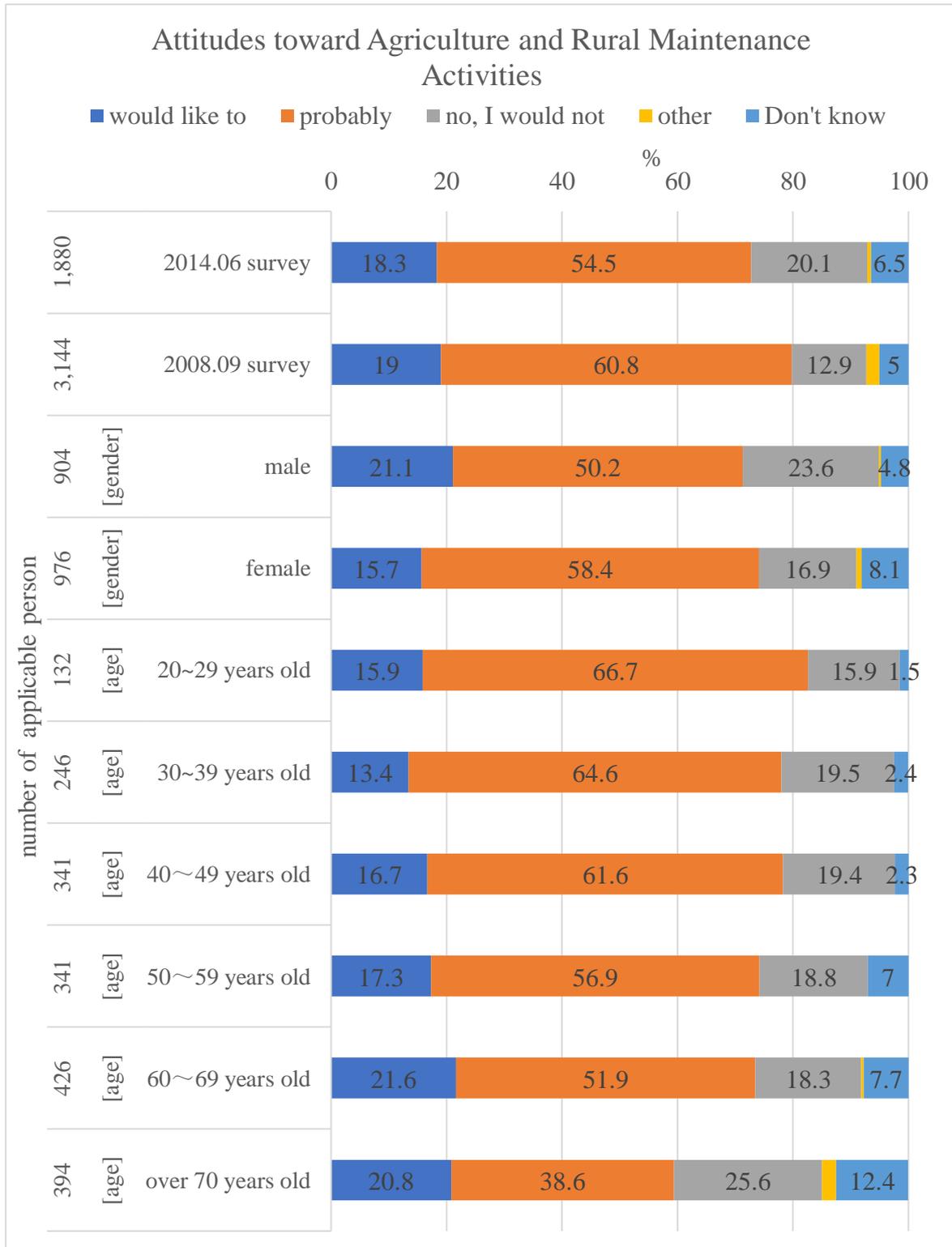
Figure 6-6 Agricultural Rural Conservation Activities Awareness

(Source[12]:)

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[12] https://survey.gov-online.go.jp/h26/h26-nousan/2-1.html

From Figure 6-6 we can see that when asked how they would like to get involved in rural areas that have lost their vitality due to stagnant agriculture, declining population, and aging, 18.3% of respondents answered, "I would like to actively go to such areas (villages), work in agriculture, and preserve the countryside. 54.5% of the respondents answered that they would like to cooperate in activities, festivals, and other traditional cultural preservation activities. 20.1% answered "No".

In comparison with the results of the previous survey (refer to the September 2008 survey), it was found that "if you have the opportunity, you should go to such areas (villages) and experience traditional culture, such as farming, environmental activities, festivals, etc. The proportion of respondents who would like to cooperate with conservation activities" (60.8% → 54.5%) has decreased, and the proportion of respondents who answered, "I would like to cooperate with local affairs" (12.9% → 20.1%) has decreased. In general, people are less enthusiastic about farming.

The proportion of respondents who answered "I would like to actively go to these areas (villages) to cooperate in agricultural, environmental activities, festivals and other activities to preserve traditional culture" by city size is as follows: The proportion of respondents who answered "If I had the opportunity, I would like to go to these areas (villages) to participate in agricultural work, environmental activities, festivals and other activities to preserve traditional culture" is higher in all cities. The percentage of respondents who answered "If I had the chance, I would like to go to these areas (villages) and participate in activities such as farming, environmental activities, festivals, etc. to preserve traditional culture" is higher in all majors.

In terms of gender, the responses were as follows: "I would like to actively go to such areas (villages) to cooperate with agricultural work, environmental activities, festivals, etc. to maintain traditional culture" and "Regional affairs should be done locally." , I do not want to cooperate with activities to maintain traditional culture, such as agricultural work, environmental conservation activities, festivals, etc. "It is male. I want to work with activities that preserve traditional culture, for example, environmental conservation activities and festivals."

By age group, the percentage of respondents in their 60s who answered "I would like to actively go to these areas (villages) to cooperate with activities that preserve traditional culture, such as agricultural work, environmental conservation activities, festivals, etc." was as follows: Respondents aged 20-40 answered "I would like to go to such areas (villages) if I have the opportunity. The percentage of respondents who answered "I would like to go to such areas (villages) if I have the opportunity to do so, and to maintain traditional culture through activities such as farming, environmental activities, and festivals. The proportion of respondents aged 70 and older who answered "I would like to do things in the local area, and I don't want to cooperate with farming, environmental activities, festivals, and other activities to maintain traditional culture" is increasing.

Teng used JGSS2015 analysis the determinants of settlement consciousness in Japan, they revealed that individuals with a spouse, homeowners, those with low satisfaction with their residential area, experiencing anxiety about the sustainability of their residential area and inconvenience in shopping, as well as individuals with a strong entrepreneurial inclination and a history of job changes, were more likely to have lower residential consciousness[147].

6.3 Methods and Data

The JGSS (Japanese General Social Surveys) project conducts ongoing social surveys that comprehensively investigate the attitudes and behaviors of Japanese people and makes the data available to researchers who wish to make secondary use of them. The project aims to promote diverse academic research. Survey items cover a wide range of topics, including actual employment and livelihood, household composition, leisure activities, health status, crime victimization, political awareness, family norms, and views on life and death. Since the project's inception, a large amount of survey data has been made public and is being used for research and education in a wide range of fields.

The JGSS project was launched in the fall of 1998, and several rounds of questionnaires and data

collection have been conducted.

The target population of the survey was adults aged 20-89, and subjects were sampled using a stratified two-stage sampling method. -Since 2006, they have been divided into metropolitan areas, metropolitan areas with a population of 200,000 or more, metropolitan areas with a population of less than 200,000, and rural areas. The sampling unit for survey points is the survey point of the national census, and survey points are drawn from each stratum.

The method of data collection was a combination of face-to-face and leave-behind methods.

In principle, the JGSS survey items are divided into core questions that are asked once per survey and topic questions that are asked only once or several times. Core questions include questions on basic attributes such as respondents' occupation and family composition, as well as questions on respondents' daily behavior, basic life awareness, political awareness, etc. Generally, the same core questions should be asked each time, but some modifications may be made each year. Topical questions include questions about events of public interest at the time of each survey, as well as questions on specific topics to facilitate focused analysis. Beginning with JGSS-2005, topical questions include questions incorporated from an open invitation to general researchers.

For the 2017-2018 questionnaire, the theme-specific questions are: people's perceptions and behaviors regarding social sustainability - income redistribution, childcare and education responsibilities, cost of living and care responsibilities for the elderly, risk perceptions of natural disasters, local coping capacity and survivability, it asks about the use of renewable energy , electricity saving behaviors and nuclear power policies. Since 2008, the JGSS has been asking about electricity saving behavior, and since 2010, the JGSS has been asking about renewable energy and environmental pollution.

This is a very appropriate source of data for this study of the overall situation in Japan.

The JGSS2017-2018 survey collected a total of 2660 questionnaires, as presented in Table 6-1. The respondents had an average age of 55 years, with 47.2% being male, 70.4% being married, and 62.8% being employed (excluding homemakers). Regarding educational background, 51.5% of the respondents had a high school education, 35.4% had education beyond high school, and 13.1% had education equivalent to junior high school or elementary school.

Table 6-1 Descriptive Statistics of Variables in JGSS

Descriptive Statistics

	N	Min	Max	Mean	Std. D
Age	2660	20	89	54.95	17.374
Sex	2660	1	2	1.53	0.499
Marital status	2660	0	1	0.70	0.457
work status	2660	0	1	0.63	0.483
education level	2649	2	5	3.48	1.008
Anxiety about the Sustainability of the Community	2655	1	4	2.09	0.783
Anxiety about Your Economic Situation in the Future	2650	1	5	3.51	1.065
Comparison of Household Income with Others	2638	1	5	2.71	0.867
Position in the Society in 5 Strata	2636	1	5	2.72	0.818
Place of Residence at Age 15: Size of Municipality	2660	1	4	2.53	0.852
it is a rural or not place of residence at age 15.no answer to not	2660	0.00	1.00	0.3816	0.48587

Years Living in the Same Place	**2613**	2.00	8.00	6.7061	1.59419
Place of Residence at Age 20: Experience of Moving	2659	1	3	1.57	0.835
full Place of Residence at Age 20: Community size	2659	1	4	2.81	0.870
Size of Hometown currently live	2660	1	5	2.86	0.881
Type of Residential Area	2651	1	5	3.66	0.928
Type of Residence: Owned or other	2660	0	1	0.84	0.366
detached house	2657	0.00	1.00	0.8190	0.38512
Wish to Continue Living in the Same Place	2652	1	4	3.37	0.718
any environmental damage	2639	0.00	1.00	0.2330	0.42285
use any of the eco-products at home	2633	0	1	0.41	0.492
Frequency of Ecological Behavior: Turn off lights not in use	2656	1	4	3.38	0.739
Frequency of Ecological Behavior: Save Electricity	2648	1	4	2.97	0.818
Valid N (listwise)	2507				

Dependent variables

Their usage of eco-products at home, taken as pro-environmental behavior.

JGSS Q18 inquired about the products utilized by respondents in their households. The research focused on eco-friendly alternatives, such as solar panels and solar energy generation, as well as cost-saving options like midnight power offered by electric power companies. The latter enables users to store electricity using electric storage batteries for later use. Other eco-friendly options discussed were gas engine heating systems with home power generation, and natural refrigerant heat pump water heaters. Furthermore, low-emission vehicles such as LP gas vehicles and hybrid cars were also included in the study. For the purposes of this research, respondents were classified as either "yes" if they used any of the products, or "no" if they did not.

Independent variables

In JGSS Q19, respondents were asked about their habits in turning off lights or appliances when not in use and their efforts to save electricity. Responses were categorized into four levels: "frequently", "sometimes", "rarely", and "never". This study has recoded it so that it scores higher to indicate more often.

In JGSS Q20, respondents were asked about their willingness to live in the same area in the future. Responses were categorized into four levels: "yes, I do forever", "yes, for the time being", "no, I want to move to another area if possible", and "no, I want to move to another area immediately". This study has recoded it so that a higher score indicates that the respondent is more willing to live in the same place.

In JGSS Q48 asked respondents about their perceptions of air, water, and soil pollution where they live, and the response options were "very severe", "somewhat severe", "not so severe", and "not severe at all". This study recoded the responses so that a higher score indicated that the more severe the respondents perceived the pollution.

Where did the respondents live like large city, small to medium sized city, town, or village, when he or she was at the age of 15 and 20, did they change place to live at the age of 20?

And their currently live place, divided into five categories as a big city, the suburbs or outskirts of a big city, a town, or a village.

Their house type as detached house or complex house, and their ownership of the house.

Covariates

Health condition, Satisfaction about life, and education.

This study has recoded it so that it scores higher to indicate better health.

How many people do you live with?
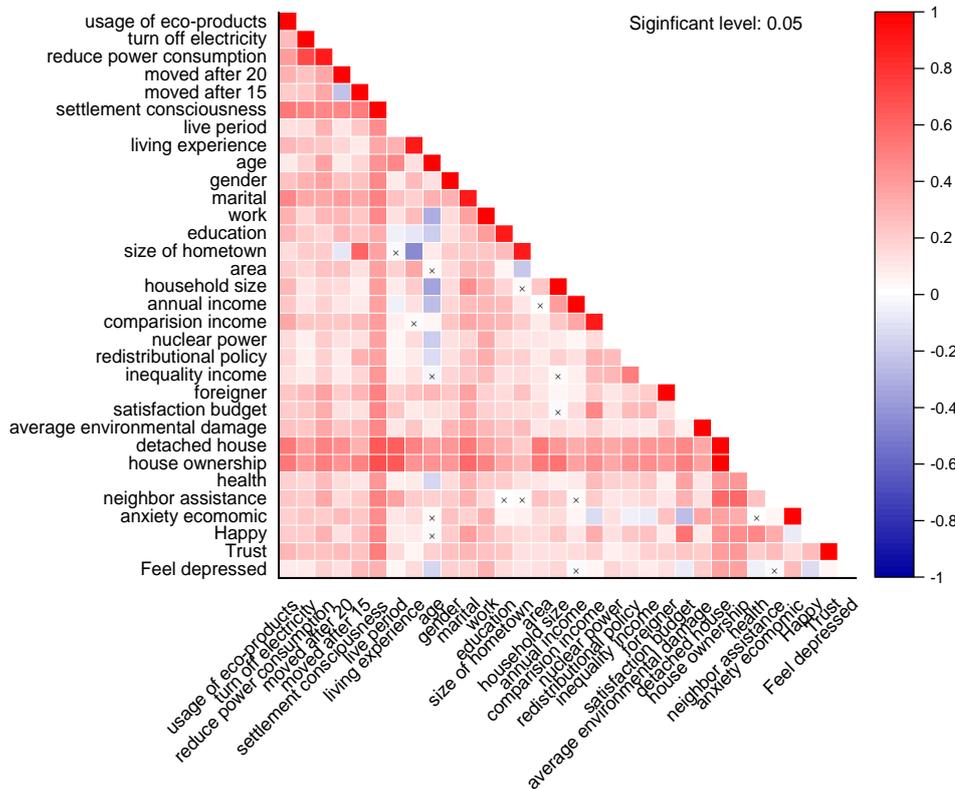
Figure 6-7 Correlation of Variables Concerning PEBs in Japan

6.4 Results

By comparing the correlation ship with the variables concerning PEBs in the survey of JGSS, the results can be gained from the correlation analysis. Movement from 15 years old to 20 years old did not connected to any of the PEBs.

6.4.1 Migration Situation

The data classification from the JGSS 2017-2018 survey was reattributed to three types, large cities, small and medium cities, and towns or villages. It shows that there is also a change in the place of residence at age 20 and the place of present-day residence, and the cross-tabulation shows no change in the size of the place of residence for 1651 (299+740+612) people. 208 people lived in large cities or suburbs of large cities, 319 people moved from large and medium cities to towns or villages, and 481 people moved to medium cities, including 209 people from large cities and 272 people from villages. From this data alone, 480 people moved from larger places to smaller places, and 528 people moved from smaller places to larger places, so the direction of population movement is to larger places. See Table 6-2.

Table 6-2 Type of Place Living at Age 20 and Now

		type of place at age 20 three types		
		large city or suburbs	small to medium city	town or village or farm in country
		Count	Count	Count
type of place now three types	large city or suburbs	299	155	53
	small to medium city	209	740	272
	town or village or farm in country	101	218	612

6.4.2 Correlation analysis

Factors corelated to ecological behaviors

People who prefer to live in the same place have more ecological behavior. The correlation between energy-saving behaviors and numerous factors is generally non-existent or insignificant. However, it is positively associated with the desire to continue living in the same place. The correlation coefficients between the desire to live in the same place and frequently turning off lights and conserving electricity are 0.113 and 0.151, respectively. These correlations are statistically significant at the 0.01 level (2-tailed), as shown in Table 6-3. Additionally, the correlation coefficient between age and electricity-saving behavior is 0.190.

Table 6-3 Correlations between Living Wish and Ecological Behavior

Correlations

			Frequency of Ecological Behavior: Turn off lights not in use	Wish to Continue Living in the Same Place	
Spearman's rho	Frequency of Ecological Behavior: Turn off lights not in use	Correlation Coefficient	1.000	.596**	.113**
		Sig. (2-tailed)	.	.000	.000
		N	2656	2647	2651
	Frequency of Ecological Behavior: Save Electricity	Correlation Coefficient	.596**	1.000	.151**
		Sig. (2-tailed)	.000	.	.000
		N	2647	2648	2643
	Wish to Continue Living in the Same Place	Correlation Coefficient	.113**	.151**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	2651	2643	2652

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6-4 shows a negative correlation between work status and ecological behavior, suggesting that individuals with jobs are less likely to engage in energy-saving behavior, possibly due to their busy schedules, lack of awareness of energy conservation, or limited time to attend to household tasks such as turning off lights and appliances. It is worth noting that the correlation coefficient is not particularly strong, and additional factors such as household size, housing type, and income level,

as well as whether individuals perform household chores, should be considered when considering these results.

Table 6-4 Correlation between Work and Ecological Behavior

Correlations

			Frequency of Ecological Behavior: Turn off lights not in use	Frequency of Ecological Behavior: Save Electricity	work status
Spearman's rho	Frequency of Ecological Behavior: Turn off lights not in use	Correlation Coefficient	1.000	.596**	-.101**
		Sig. (2-tailed)	.	.000	.000
		N	2656	2647	2656
	Frequency of Ecological Behavior: Save Electricity	Correlation Coefficient	.596**	1.000	-.106**
		Sig. (2-tailed)	.000	.	.000
		N	2647	2648	2648
	work status	Correlation Coefficient	-.101**	-.106**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	2656	2648	2660

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation between marital status and the use of environmentally friendly products was positive but not high, with a correlation coefficient of 0.175, as shown in Table 6-5. In addition, there is a weak correlation between respondents' perceived social class and their use of environmentally friendly products with a correlation coefficient of 0.103, as shown in Table 6-6. Housing type also showed a significant correlation with a correlation coefficient of 0.254 as shown in Table 6-7. It was found that respondents living in apartments were less likely to use eco-friendly products compared to those living in detached houses. After considering the economic situation, the correlation remains, but is weaker, with a correlation coefficient of 0.143, as shown in Table 6-8. Interestingly, the size of the residential area is negatively correlated with eco-friendly product use behavior, with a smaller tendency to use such products in large cities. The correlation coefficient for this relationship is 0.112, as shown in Table 6-9. In addition, the correlation between home ownership and use of environmentally friendly products is significant with a correlation coefficient of 0.245, as shown in Table 6-10.

Table 6-5 Correlations between Marital Status and Eco-Products Usage

Correlations

			Marital status	Use of Eco-products: None of the above
Spearman's rho	Marital status	Correlation Coefficient	1.000	-.175**
		Sig. (2-tailed)	.	.000
		N	2660	2633

		Correlation Coefficient	-.175**	1.000
Use of Eco-products: None of the above		Sig. (2-tailed)	.000	.
		N	2633	2633

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6-6 Correlation between Social Strata and Eco Behavior.

Correlations

			use any of the eco-products at home	Position in the Society in 5 Strata
Spearman's rho	use any of the eco-products at home	Correlation Coefficient	1.000	.103**
		Sig. (2-tailed)	.	.000
		N	2633	2612
	Position in the Society in 5 Strata	Correlation Coefficient	.103**	1.000
		Sig. (2-tailed)	.000	.
		N	2612	2636

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6-7 Correlations between Residence Type and Eco-Products Usage

Correlations

			Use of Eco-products: None of the above	Type of Residence: Detached
Spearman's rho	Use of Eco-products: None of the above	Correlation Coefficient	1.000	.254**
		Sig. (2-tailed)	.	.000
		N	2633	2630
	Type of Residence: Detached	Correlation Coefficient	.254**	1.000
		Sig. (2-tailed)	.000	.
		N	2630	2657

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6-8 Correlations between Income and Eco-Products Usage

Correlations

			Use of Eco-products: None of the above	Comparison of Household Income with Others
Spearman's rho	Use of Eco-products: None of the above	Correlation Coefficient	1.000	-.143**
		Sig. (2-tailed)	.	.000
		N	2633	2616

Comparison of Household Income with Others	Correlation Coefficient	-.143**	1.000
	Sig. (2-tailed)	.000	.
	N	2616	2638

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6-9 Correlation between Hometown Size and Eco-Products Usage

Correlations

			Use of Eco-products: None of the above	Size of Hometown
Spearman's rho	Use of Eco-products: None of the above	Correlation Coefficient	1.000	.112**
		Sig. (2-tailed)	.	.000
		N	2633	2633
	Size of Hometown	Correlation Coefficient	.112**	1.000
		Sig. (2-tailed)	.000	.
		N	2633	2660

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6-10 Correlation between Ownership and Eco Behavior

Correlations

			Use of Eco-products: None of the above	Type of Residence: Owned or other
Spearman's rho	Use of Eco-products: None of the above	Correlation Coefficient	1.000	-.245**
		Sig. (2-tailed)	.	.000
		N	2633	2633
	Type of Residence: Owned or other	Correlation Coefficient	-.245**	1.000
		Sig. (2-tailed)	.000	.
		N	2633	2660

**. Correlation is significant at the 0.01 level (2-tailed).

There was a higher correlation between area of residence, living conditions, and economic level and the use of energy-efficient products, while respondents' migration experience seemed to have little to do with this.

Differences between age groups.

According to Table 6-11, there is a correlation between the difference in location of residence at age 20 versus age 15 and the level of education received. In fact, respondents who moved to other areas were more likely to have a higher level of education.

Table 6-11 Correlations between Education and Moving Experience

Correlations

Spearman's rho			education level	Place of Residence at Age 20: Experience of Moving
Spearman's rho	education level	Correlation Coefficient	1.000	.150**
		Sig. (2-tailed)	.	.000
		N	2649	2648
	Place of Residence at Age 20: Experience of Moving	Correlation Coefficient	.150**	1.000
		Sig. (2-tailed)	.000	.
		N	2648	2659

**. Correlation is significant at the 0.01 level (2-tailed).

According to Table 6-12, there is a negative correlation between respondents who lived in rural areas at age 15 and access to higher education. Furthermore, according to Table 6-13, there is a significant correlation between respondents who live in small places being more likely to migrate.

Table 6-12 Correlations between Living in Rural Area at Age of 15 and Education

Correlations

			education level	it is a rural or not place of residence at age 15
Spearman's rho	education level	Correlation Coefficient	1.000	-.236**
		Sig. (2-tailed)	.	.000
		N	2649	2593
	it is a rural or not place of residence at age 15	Correlation Coefficient	-.236**	1.000
		Sig. (2-tailed)	.000	.
		N	2593	2603

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6-13 Correlations between Living Place at Age 15 and Moving Experience

Correlations

			Place of Residence at Age 15: Size of Municipality	Place of Residence at Age 20: Experience of Moving
Spearman's rho	Place of Residence at Age 15: Size of Municipality	Correlation Coefficient	1.000	.101**
		Sig. (2-tailed)	.	.000
		N	2660	2659
	Place of Residence at Age	Correlation Coefficient	.101**	1.000

20: Experience of Moving	Sig. (2-tailed)	.000	.
	N	2659	2659

**. Correlation is significant at the 0.01 level (2-tailed).

Of the 2,660 respondents, 1,757 lived in the same place at age 20 as at age 15. In addition, 301 respondents moved to other locations in the same county, while 601 respondents moved to a different county, one of whom was unable to provide a response. See Table 6-15. Of the respondents who moved to a different county, 294 moved to a large city, 250 to a small or medium-sized city, 51 to a town, and 6 to a village, indicating that moving to a city is the dominant trend. Among those who moved to the same county, 60 moved to large cities, 157 moved to small and medium-sized cities, 67 moved to towns, and 16 moved to villages, indicating that moving to cities is the mainstream, but respondents who moved to small and medium-sized cities in the same county are in the majority. See Table 6-14.

Table 6-14 Moving Situation at Age 20

		Place of Residence at Age 20: Experience of Moving		
		Same city, town, village, or ward	Different city, town, village, or ward in the same prefecture	Different prefecture
		Count	Count	Count
Place of Residence at Age 20: Community size	Large city	0	60	294
	Small to medium sized city	0	157	250
	Town	0	67	51
	Village	0	16	6

Table 6-15 Experience of Moving at Age of 20

Place of Residence at Age 20: Experience of Moving					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Same city, town, village, or ward	1757	66.1	66.1	66.1
	Different city, town, village, or ward in the same prefecture	301	11.3	11.3	77.4
	Different prefecture	601	22.6	22.6	100.0
	Total	2659	100.0	100.0	
Missing	No answer	1	.0		
Total		2660	100.0		

A study on migration of Japanese people [147] stated that the results of the study indicated that people who had a spouse or owned property, as well as people who were less satisfied with their

residential area and who felt inconvenienced by it for survival and shopping, and people who had a strong entrepreneurial spirit were more likely to migrate. In addition, the study found that the more experience a person has in job-hopping, the lower the probability of their willingness to settle down.

According to the analysis of the survey results, respondents between the ages of 40-49 and 60-79, as well as those with above-average incomes, are more likely to use energy-efficient products, as shown in Table 6-16

Table 6-16 Crosstab Income and Use Eco-Products across Age Groups

Comparison of household income with others 3 level * use any of the eco-products at home * Age group Crosstabulation

Count

Age group			use any of the eco-products at home		Total
			Not chosen	Chosen	
20 - 29	comparison of household income with others 3 level	below	69	19	88
		average	77	26	103
		above	16	13	29
	Total		162	58	220
30 - 39	comparison of household income with others 3 level	below	78	36	114
		average	**87**	**97**	184
		above	27	24	51
	Total		192	157	349
40 - 49	comparison of household income with others 3 level	below	88	57	145
		average	**112**	**122**	234
		above	**53**	**57**	110
	Total		253	236	489
50 - 59	comparison of household income with others 3 level	below	102	49	151
		average	95	88	183
		above	45	43	88
	Total		242	180	422
60 - 69	comparison of household income with others 3 level	below	134	73	207
		average	127	105	232
		above	**24**	**38**	62
	Total		285	216	501
70 - 79	comparison of household income with others 3 level	below	134	58	192
		average	134	87	221
		above	**18**	**23**	41
	Total		286	168	454

80+	comparison of household income with others 3 level	below	55	19	74
		average	57	28	85
		above	16	6	22
	Total		128	53	181
Total	comparison of household income with others 3 level	below	660	311	971
		average	689	553	1242
		above	199	204	403
	Total		1548	1068	2616

According to this study findings, the length of time living in a place does not necessarily predict the probability of using energy efficient products. In fact, respondents who had lived in a place for less than a year were 2.399 times more likely to use energy-efficient products than those who had lived there for more than 30 years, a noteworthy finding. Also, respondents who had lived in a location for 5-10 years and 10-20 years were more likely to use energy efficient products than those who had lived in a location for more than 30 years, by a factor of 2.089 and 1.45, respectively.

Further analysis shows that there are differences by age group, as shown in Table 6-17. Among respondents aged 30-49, those who have lived in the respondent's location for 5-10 years are more likely to use energy-efficient products. In contrast, for respondents aged 30-59, they were more likely to use energy-efficient products when they had lived in their place of residence for 10-20 years. Conversely, respondents in other age groups were more likely to not use energy efficient products. These findings suggest that time spent living in a location is not a reliable predictor of whether a person uses energy efficient products.

Table 6-17 Crosstab of Eco-Products and Living Years across Age Groups

use any of the eco-products at home * Years Living in the Same Place first 3 lit * Age group Crosstabulation

Count

Age group			Years Living in the Same Place first 3 lit							Total
			For less than a year	For 1-3 years	For 3-5 years	For 5-10 years	For 10-20 years	For 20-30 years	For 30 years or more	
20 - 29	use any of the eco-products at home	Not chosen	8	28	13	9	24	74		156
		Chosen	4	9	1	8	12	28		62
	Total		12	37	14	17	36	102		218
30 - 39	use any of the eco-products at home	Not chosen	12	28	22	**38**	**20**	26	42	188
		Chosen	7	16	17	**44**	**21**	14	38	157
	Total		19	44	39	82	41	40	80	345
40 - 49	use any of the eco-products at home	Not chosen	4	21	9	**39**	**65**	38	74	250
		Chosen	3	5	9	**43**	**76**	34	63	233
	Total		7	26	18	82	141	72	137	483

use any of the eco-products at home * Years Living in the Same Place first 3 lit * Age group Crosstabulation

Count

Age group			Years Living in the Same Place first 3 lit							Total
			For less than a year	For 1-3 years	For 3-5 years	For 5-10 years	For 10-20 years	For 20-30 years	For 30 years or more	
50 - 59	use any of the eco-products at home	Not chosen	4	7	7	15	**40**	52	111	236
		Chosen	2	2	0	9	**50**	36	80	179
	Total		6	9	7	24	90	88	191	415
60 - 69	use any of the eco-products at home	Not chosen	2	5	5	20	34	**38**	174	278
		Chosen	2	2	2	9	18	**39**	140	212
	Total		4	7	7	29	52	77	314	490
70 - 79	use any of the eco-products at home	Not chosen	1	5	6	8	20	34	211	285
		Chosen	0	2	1	7	14	17	125	166
	Total		1	7	7	15	34	51	336	451
80+	use any of the eco-products at home	Not chosen		1	2	5	10	7	107	132
		Chosen		1	1	0	2	4	46	54
	Total			2	3	5	12	11	153	186
Total	use any of the eco-products at home	Not chosen	31	95	64	134	213	269	719	1525
		Chosen	18	37	31	120	193	172	492	1063
	Total		49	132	95	254	406	441	1211	2588

This study shows that respondents' geographic location also correlates with their probability of using energy-efficient products. Respondents living in rural areas were 2.125 times more likely to use energy efficient products than respondents living in large cities. Similarly, respondents living in villages were 1.916 times more likely to use energy-efficient products. For respondents living in small cities or towns, they were 1.767 times more likely to use energy-efficient products than respondents living in large cities. Notably, there was no statistically significant difference in the use of energy efficient products for respondents living in the suburbs of large cities compared to those living in large cities.

Further analysis revealed that among respondents aged 30 years or older, those living in towns or villages were more likely to use energy-efficient products. This phenomenon may be related to the local housing construction situation. Specific differences can be found in Table 6-18.

Table 6-18 Crosstab of Eco-Products and Size of Hometown across Age Groups

use any of the eco-products at home * Size of Hometown currently live 1 5 lit * Age group Crosstabulation

Count

Age group			Size of Hometown currently live 1 5 lit					Total
			A farm or home in the country	A country village	A town or a small city	The suburbs or outskirts of a big city	A big city	
20 - 29	use any of the eco-products at home	Not chosen	3	47	77	22	13	162
		Chosen	0	23	26	9	4	62
		Total	3	70	103	31	17	224
30 - 39	use any of the eco-products at home	Not chosen	5	54	84	29	20	192
		Chosen	7	50	84	13	3	157
		Total	12	104	168	42	23	349
40 - 49	use any of the eco-products at home	Not chosen	2	74	113	43	22	254
		Chosen	6	93	105	24	10	238
		Total	8	167	218	67	32	492
50 - 59	use any of the eco-products at home	Not chosen	9	71	104	44	15	243
		Chosen	2	70	88	19	3	182
		Total	11	141	192	63	18	425
60 - 69	use any of the eco-products at home	Not chosen	7	86	124	49	19	285
		Chosen	7	81	98	22	8	216
		Total	14	167	222	71	27	501
70 - 79	use any of the eco-products at home	Not chosen	10	80	138	49	10	287
		Chosen	8	50	89	17	5	169
		Total	18	130	227	66	15	456
80+	use any of the eco-products at home	Not chosen	6	42	63	15	6	132
		Chosen	7	19	19	6	3	54
		Total	13	61	82	21	9	186
Total	use any of the eco-products at home	Not chosen	42	454	703	251	105	1555
		Chosen	37	386	509	110	36	1078
		Total	79	840	1212	361	141	2633

This study shows that respondents who own their homes are more likely to use energy efficient products, while respondents who do not own their homes are less likely to use energy efficient products, by 32.9%.

Further analysis revealed that among respondents in the 30-49 age group, those who owned their own homes were more likely to use energy efficient products compared to those who did not own their homes. The specific differences can be found in Table 6-19.

Table 6-19 Crosstab of House Ownership and Eco-Products across Age Groups

use any of the eco-products at home * Type of Residence: Owned or other * Age group Crosstabulation

Count

Age group				Type of Residence: Owned or other		Total
				others	own house	
20 - 29	use any of the eco-products at home		Not chosen	68	94	162
			Chosen	10	52	62
	Total			78	146	224
30 - 39	use any of the eco-products at home		Not chosen	91	**101**	192
			Chosen	11	**146**	157
	Total			102	247	349
40 - 49	use any of the eco-products at home		Not chosen	80	**174**	254
			Chosen	12	**226**	238
	Total			92	400	492
50 - 59	use any of the eco-products at home		Not chosen	43	200	243
			Chosen	11	171	182
	Total			54	371	425
60 - 69	use any of the eco-products at home		Not chosen	40	245	285
			Chosen	5	211	216
	Total			45	456	501
70 - 79	use any of the eco-products at home		Not chosen	30	257	287
			Chosen	4	165	169
	Total			34	422	456
80+	use any of the eco-products at home		Not chosen	11	121	132
			Chosen	2	52	54
	Total			13	173	186
Total	use any of the eco-products at home		Not chosen	363	1192	1555
			Chosen	55	1023	1078
	Total			418	2215	2633

According to this study findings, respondents in freestanding homes were more likely to use energy efficient products, while respondents living in group sites were less likely to use energy efficient products, by 32.8%.

In addition, this study also found that among respondents in the 30-49 age group, those living in detached homes were more likely to use energy efficient products. The specific differences can be found in Table 6-20.

Table 6-20 Crosstab Detached House and Eco-Products across Age Groups

use any of the eco-products at home * detached house * Age group Crosstabulation

Count

Age group			detached house		Total
			housing complex	detached house	
20 - 29 use any of the eco-products at home	Not chosen	69		93	162
	Chosen	10		52	62
	Total		79	145	224
30 - 39 use any of the eco-products at home	Not chosen	97		**95**	192
	Chosen	9		**148**	157
	Total		106	243	349
40 - 49 use any of the eco-products at home	Not chosen	84		**170**	254
	Chosen	20		**218**	238
	Total		104	388	492
50 - 59 use any of the eco-products at home	Not chosen	51		192	243
	Chosen	15		166	181
	Total		66	358	424
60 - 69 use any of the eco-products at home	Not chosen	51		234	285
	Chosen	4		212	216
	Total		55	446	501
70 - 79 use any of the eco-products at home	Not chosen	39		247	286
	Chosen	7		162	169
	Total		46	409	455
80+ use any of the eco-products at home	Not chosen	16		115	131
	Chosen	3		51	54
	Total		19	166	185
Total use any of the eco-products at home	Not chosen	407		1146	1553
	Chosen	68		1009	1077
	Total		475	2155	2630

The likelihood of using energy-saving products is higher among survey respondents who practice energy-saving behaviors. Survey respondents who never practice energy-saving behaviors are 58.3%

less likely to use energy-saving products, while those who practice energy-saving behaviors infrequently are 59.6% less likely to use energy-saving products. Survey respondents who occasionally practice energy-saving behaviors are 75.7% more likely to use energy-saving products than those who practice energy-saving behaviors frequently.

Among survey respondents aged 40-49, those who frequently practice energy-saving behaviors are more likely to use energy-saving products. This trend is also observed among survey respondents aged 60-69.

Among survey respondents aged 40-49, those who frequently turn off the lights are more likely to use energy-saving products. In general, there is greater consistency in the usage of energy-saving products among survey respondents aged 40-49, while greater disparities are observed in other age groups.

Table 6-21 shows that survey respondents aged 40-49 are more likely to use energy-saving products when they move from smaller to larger residential areas.

Table 6-21 Crosstab Eco-Products and Moving Trend across Age Groups

use any of the eco-products at home * area size change move trend after 20 - now 3 level * Age group Crosstabulation

Count

Age group			area size change move trend after 20 - now 3 level			Total
			from big to small	no change	from small to big size place	
20 - 29	use any of the eco-products at home	Not chosen	21	127	14	162
		Chosen	10	41	11	62
	Total		31	168	25	224
30 - 39	use any of the eco-products at home	Not chosen	38	119	35	192
		Chosen	19	107	31	157
	Total		57	226	66	349
40 - 49	use any of the eco-products at home	Not chosen	50	153	**51**	254
		Chosen	28	149	**61**	238
	Total		78	302	112	492
50 - 59	use any of the eco-products at home	Not chosen	49	144	50	243
		Chosen	31	113	38	182
	Total		80	257	88	425
60 - 69	use any of the eco-products at home	Not chosen	54	175	56	285
		Chosen	39	123	54	216
	Total		93	298	110	501

70 - 79	use any of the eco-products at home	Not chosen	69	167	51	287
		Chosen	27	93	49	169
	Total		96	260	100	456
80+	use any of the eco-products at home	Not chosen	31	85	15	131
		Chosen	12	36	6	54
	Total		43	121	21	185
Total	use any of the eco-products at home	Not chosen	312	970	272	1554
		Chosen	166	662	250	1078
	Total		478	1632	522	2632

For respondents in the 30-49 age group, who only have small-town living experience, the number of people using energy-efficient products is significantly higher than the number of people who do not. For respondents in the 40-49 age group, who had only small- to medium-sized city experience, the percentage of respondents who chose to use energy-efficient products was also higher than the percentage of respondents who did not. Please see Table 6-22 for specific data.

Table 6-22 Crosstab Eco-Products and Living Experience across Age Groups

use any of the eco-products at home * living experience where * Age group Crosstabulation

Count

			living experience where			
Age group			large city orsmall suburbs	to town or village or farm medium city in country		Total
20 -29	use any of the eco-products at home	Not chosen	41	83	38	162
		Chosen	18	30	14	62
	Total		59	113	52	224
30 -39	use any of the eco-products at home	Not chosen	61	99	**32**	192
		Chosen	33	89	**35**	157
	Total		94	188	67	349
40 -49	use any of the eco-products at home	Not chosen	97	**112**	**45**	254
		Chosen	57	**130**	**51**	238
	Total		154	242	96	492
50 -59	use any of the eco-products at home	Not chosen	92	99	52	243
		Chosen	49	86	47	182
	Total		141	185	99	425

60 69	-use any of the eco- products at home	Not chosen	110	115	60	285
		Chosen	68	94	54	216
	Total		178	209	114	501
70 79	-use any of the eco- products at home	Not chosen	97	124	66	287
		Chosen	58	79	32	169
	Total		155	203	98	456
80+	use any of the eco- products at home	Not chosen	36	55	41	132
		Chosen	14	18	22	54
	Total		50	73	63	186
Total	use any of the eco- products at home	Not chosen	534	687	334	1555
		Chosen	297	526	255	1078
	Total		831	1213	589	2633

6.4.3 Decision Tree Model

According to Table 6-23, the decision tree model was able to predict people's non-use of energy-efficient products more accurately with an overall accuracy of 64.6%. Also, the degree of influence of each relevant factor on people's non-application of energy-efficient products can be observed from the results of the tree model in Figure 6-8.

Table 6-23 Predicted of Model

Classification

Observed	Predicted		
	Not chosen	Chosen	Percent Correct
Not chosen	1371	184	88.2%
Chosen	749	329	30.5%
Overall Percentage	80.5%	19.5%	64.6%

Growing Method: CHAID

Dependent Variable: use any of the eco-products at home

The analysis of the classification tree model identified factors that influence people's use of energy-efficient products, including independent dwellings, marital status, age grouping, type of residence (owned or other), social status into 3 tiers, desire to continue living in the same place (binary variable), and level of concern about future economic status (into 3 tiers), as shown in Table 6-24.

Table 6-24 Model Summary of the Classification Tree

Model Summary		
Specifications	Growing Method	CHAID

	Dependent Variable	use any of the eco-products at home
	Independent Variables	living experience where, work status, education level, anxiety about your economic situation in the future , comparison of household income with others , position in the society , it is a rural or not place of residence at age 15.no answer to not, Years Living in the Same Place , Size of Hometown currently live , Type of Residential Area, Type of Residence: Owned or other, detached house, wish to continue living in the same place binary, any environmental damage, Frequency of Ecological Behavior: Turn off lights not in use, Frequency of Ecological Behavior: Save Electricity, area size change move trend after 20 - now 3 level, Age group, Marital Status, Total Number of Children, Number of Other Family Members, Number of Family Members Except Respondent, Number of Family Members Including Respondent
	Validation	None
	Maximum Tree Depth	3
	Minimum Cases in Parent Node	30
	Minimum Cases in Child Node	5
Results	Independent Variables Included	detached house, Marital Status, Age group, Type of Residence: Owned or other, position in the society, wish to continue living in the same place binary, anxiety about your economic situation in the future
	Number of Nodes	19
	Number of Terminal Nodes	11
	Depth	3

After the analysis of the classification tree model, this study found two different groups of respondents:

First, married respondents who live in detached dwellings and are under the age of 50 are the group that uses the most energy efficient products.

Second, respondents who live in a group or pool home and have a low sense of social class use very few energy-efficient products, while respondents who are in the middle of the social class and have a desire to move also use fewer energy-efficient products.
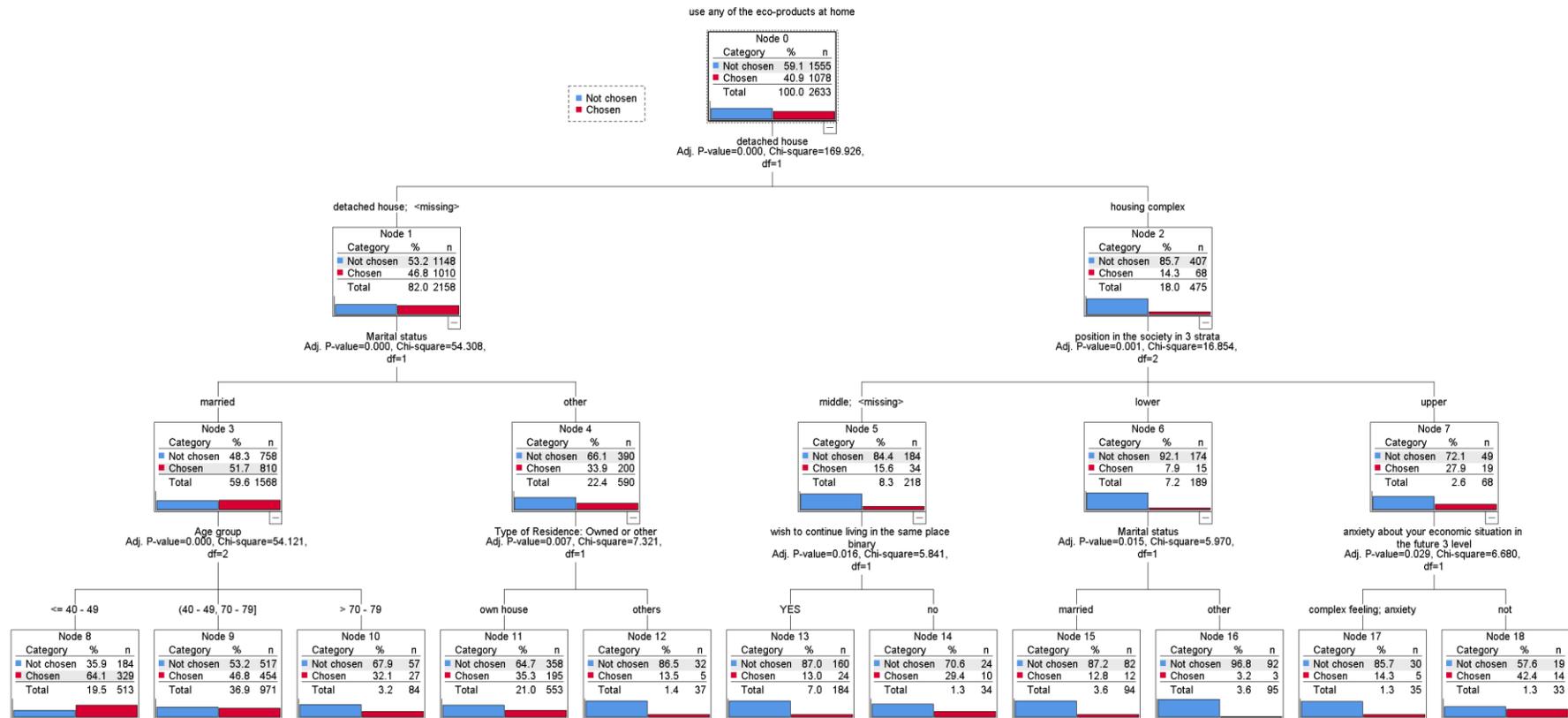
Figure 6-8 Tree Diagram of Eco-Products Use

6.4.4 Binary Logistic Regression

The omnibus tests of model coefficients demonstrate a significant result with a p-value less than 0.001. The Nagelkerke R-squared value indicates a moderate degree of explanatory power of the model, at 0.203. The Hosmer and Lemeshow test result of 0.478 suggests that the model has a good fit to the data. The accuracy of the model prediction is 67.1%, as presented in Table 6-25.

Table 6-25 Step Summary of Logistic Regression

Step Summary [a,b]								
Step	Improvement			Model			Correct Class %	Variable
	Chi-square	df	Sig.	Chi-square	df	Sig.		
1	187.143	1	0.000	187.143	1	0.000	59.0%	IN: detached house
2	60.491	1	0.000	247.634	2	0.000	61.0%	IN: Marital status
3	37.367	3	0.000	285.000	5	0.000	63.9%	IN: education level
4	23.071	1	0.000	308.071	6	0.000	64.7%	IN: Type of Residence: Owned or other
5	30.395	6	0.000	338.466	12	0.000	64.6%	IN: Years Living in the Same Place first 3 lit
6	25.958	4	0.000	364.424	16	0.000	66.5%	IN: Size of Hometown currently live 1 5 lit
7	19.686	2	0.000	384.110	18	0.000	66.5%	IN: comparison of household income with others 3 level
8	17.319	3	0.001	401.429	21	0.000	67.6%	IN: Frequency of Ecological Behavior: Save Electricity 1lit
9	8.502	1	0.004	409.931	22	0.000	67.1%	IN: work status

a. No more variables can be deleted from or added to the current model.

b. End block: 1

The analysis reveals the following findings on the factors influencing the use of energy efficient products:

Respondents living in complex houses are less likely to use eco-products, with only a 32.8% chance of having eco-products compared to those living in detached houses (0.228~0.473).

Unmarried respondents are less likely to use energy efficient products, with a 56.6% lower chance compared to married respondents.

Respondents who are not working are less likely to use energy efficient products compared to those who are working, with a 75.7% lower chance.

Respondents with primary or junior high school education are 52.6% more likely to use energy efficient products than those with college or higher education. However, there is no statistical difference between respondents with high school or short college education and those with higher education.

Respondents with below average household incomes are 57.5% more likely to use energy efficient products than those with above average household incomes, while there is no statistical difference

between respondents with moderate household incomes and those with high incomes.

Respondents who had lived in the surveyed location for more than 30 years are 2.399 times more likely to use energy efficient products than those who had lived in the surveyed location for less than one year. Respondents with 5-10 years of residence are 2.089 times more likely to use them, and respondents with 10-20 years of residence are 1.45 times more likely to use them. However, there is no statistical difference between respondents with other lengths of residence and those with more than 30 years of residence.

Respondents living in rural farmhouses are 2.125 times more likely to use energy efficient products than those living in large cities. Respondents living in rural areas are also more likely to use energy efficient products, 1.916 times more likely. Respondents in smaller cities are also 1.767 times more likely to use energy efficient products. However, there is no statistical difference in the use of energy efficient products between respondents living in the suburbs of large cities and those living in large cities.

Respondents who do not have ownership of their homes are only 32.9% more likely to use energy efficient products than those who have ownership of their homes.

Respondents who rarely save electricity are 59.6% more likely to use energy efficient products compared to those who save electricity frequently.

Table 6-26 Regression Results of Usage of Eco-Products in Japan

		Model 1	Model 2	Model 3	Model 4	Model 5
Area size change move trend after 20 to now	From big to small	***				
	No change	1.135	1.081	1.081	1.087	1.087
	From small to big size place	2.003 ***	0.941	0.941	0.918	0.918
Settlement consciousness	High compared to low	1.544 ***	1.368	1.368	1.273	1.273
Years Living in the Same Place	For 30 years or more	***	**	**	***	***
	For 20-30 years	0.973	0.870	0.870	0.947	0.947
	For 10-20 years	1.395 ***	1.186	1.186	1.491 ***	1.491 ***
	For 5-10 years	1.329 **	1.289	1.289	1.997 ***	1.997 ***
	For 3-5 years	0.688	0.619	0.619	1.328	1.328
	For 1-3 years	0.578 **	0.579 **	0.579 **	1.178	1.178
	For less than a year	0.974	1.009	1.009	2.322 **	2.322 **
Living experience where	Large city or suburbs	***				
	Small to medium city	1.621 ***	0.823	0.823	0.859	0.859
	Town or village or farm in country	1.814 ***	0.619	0.619	0.689	0.689
Marital status	Married compared to others		1.581 ***	1.581 ***	1.598 ***	1.598 ***
Education level	Elementary or junior school		***	***	***	***
	High school		2.106 ***	2.106 ***	2.034 ***	2.034 ***
	Short college		2.253 ***	2.253 ***	2.131 ***	2.131 ***
	University or above		1.937 ***	1.937 ***	2.006 ***	2.006 ***
Size of Hometown currently live	A big city		**	**	*	*
	The suburbs or outskirts of a big city		1.313	1.313	1.024	1.024

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		Mode l 1	Mode l 2	Mode l 3	Mode l 4	Mode l 5
	A town or a small city		2.978 ***	2.978 ***	2.193 **	2.193 **
	A country village		4.424 ***	4.424 ***	2.819 **	2.819 **
	A farm or home in the country		5.501 ***	5.501 ***	3.187 **	3.187 **
Household size	1		***	***	***	***
	2		1.890 ***	1.890 ***	1.458	1.458
	3		1.958 ***	1.958 ***	1.431	1.431
	4		2551 ***	2551 ***	1.744 **	1.744 **
	5		3.335 ***	3.335 ***	2.272 ***	2.272 ***
	6		3.626 ***	3.626 ***	2.344 ***	2.344 ***
	More than 6		3.514 ***	3.514 ***	2.242 **	2.242 **
Comparison of household income with others	Below		***	***	***	***
	Average		1.557 ***	1.557 ***	1.405 ***	1.405 ***
	Above		2.072 ***	2.072 ***	1.830 ***	1.830 ***
Detached house	Detached compared to others				3.003 ***	3.003 ***
Ownership	Own house compared to others				2.550 ***	2.550 ***
Constant		- 1.350	- 3.606	- 3.606	- 4.801	- 4.801
	Nagelkerke R square %	4.5	14.7	14.7	21.2	21.2
	χ^2	77.873	265.811	265.811	395.074	395.074
		df=11	df=27	df=27	df=29	df=29
		P<0.0 001	P<0.0 001	P<0.0 001	P<0.0 001	P<0.0 001
	overall percentage correct %	60.7	64.5	64.5	66.9	66.9

Table 6-27 Regression of Frequency Eco Behavior of Turning off Electricity

		Model 1	Model 2	Model 3	Model 4	Model 5
Area size change move trend 15 to now	From big to small	**	*	*	*	*
	No change	0.707**	0.747	0.738**	0.738**	0.730**
	From small to big size place	0.663**	0.679**	0.678**	0.678**	0.676**
Sex	Female compared to male		1.385***	1.420***	1.411***	1.400***
Work status	Work compared to no work		0.691***	0.694***	0.717***	0.714***
View on income inequality	Strongly agree			***	***	***
	Agree			0.770**	0.728**	0.738**
	Somewhat agree			0.680***	0.627***	0.638***
	Neither agree nor disagree			0.684**	0.617***	0.616***
	Somewhat disagree			1.226	1.083	1.067
	Disagree or strongly disagree			1.902	1.587	1.524
Satisfaction with household budget situation	Dissatisfied				***	***
	2				0.967	1.025
	3				1.158	1.208
	4				1.555**	1.532**
	Satisfied				1.817***	1.666**
Degree of happiness	Happy					**
	4					0.760**
	3					0.702***
	2					0.792
	Unhappy					1.251
Constant		0.402	0.429	0.680		0.709

	Model 1	Model 2	Model 3	Model 4	Model 5
Nagelkerke R square %	0.4	2.5	3.5	5	5.5
x2	6.759	44.366	61.327	87.673	97.779
	2	4	9	13	df=17
	P<0.0001	P<0.0001	P<0.0001	P<0.0001	P<0.0001
overall percentage correct %	51.9	56.2	56.5	57.0	57.7

Table 6-28 Regression of Frequency Eco Behavior of Reduce Power Consumption

		Model 1	Model 2	Model 3	Model 4	Model 5
Years Living in the Same Place	For 30 years or more	**				
	For 20-30 years	0.679***	0.935	0.966	0.994	1.051
	For 10-20 years	0.804	1.098	1.110	1.181	1.245
	For 5-10 years	0.623***	0.939	0.970	1.028	1.121
	For 3-5 years	0.717	1.161	1.165	1.186	1.335
	For 1-3 years	0.905	1.564	1.609	1.630**	1.734**
	For less than a year	0.741	1.308	1.340	1.422	1.540
Age			1.024***	1.024***	1.024***	1.022***
Gender	Female ref. male			1.206**	1.243**	1.205	1.144
View on Income Inequality	Strongly agree			***	***	***
	Agree			0.670***	0.639***	0.671***
	Somewhat agree			0.576***	0.536***	0.561***
	Neither agree nor disagree			0.494***	0.437***	0.444***
	Somewhat disagree			0.956	0.801	0.851

		Model 1	Model 2	Model 3	Model 4	Model 5
Satisfaction with Household Budget Situation	Disagree or strongly disagree			1.576	1.268	1.354
	Dissatisfied				***	***
	2				0.687	0.659
	3				0.933	0.874
	4				1.143	1.041
	Satisfied				1.641**	1.445
Health Condition	Good				**	*
	4				0.638***	0.708***
	3				0.787	0.812
	2				0.642**	0.676**
	Poor				0.830	0.900
Neighborhood Environment: Willing to Provide Assistance	Strongly disagree					***
	Disagree					0.695
	Neither agree nor disagree					0.977
	Agree					1.155
	Strongly agree					2.258***
Constant(B)		-0.799	-2.403	-2.049	-1.773	-1.775
	Nagelkerke R square %	0.9	4.5	6.0	8.8	10.8
	χ^2	14.686	72.925	98.378	146.210	180.751

	Model 1	Model 2	Model 3	Model 4	Model 5
df	6	8	13	21	25
	P<0.0001	P<0.0001	P<0.0001	P<0.0001	P<0.0001
overall percentage correct %	72.4	72.5	72.3	72.4	73.7

Usage of eco-products in Japan, N=2303.Among respondents who experienced changes in the size of their residential location after the age of 20, there is a correlation between the use of energy-saving products. Specifically, compared to those who relocated from a larger residential area to a smaller one, such as from a city to a rural area, respondents who relocated from a smaller to a larger residential area were twice as likely to use energy-saving products (P < 0.01), as shown in Model 1 in Table 6-26. Respondents with a strong sense of settlement were 1.5 times more likely to use energy-saving products compared to those with a low sense of settlement (P < 0.01).

Among respondents who have lived in the same location for 5-20 years, the probability of using energy-saving products was 1.3-1.4 times higher compared to those who have lived in the same location for over 30 years. On the other hand, respondents who have lived in the same location for 1-3 years had only 0.6 times the probability of using energy-saving products compared to those who have lived in the same location for over 30 years.

Furthermore, respondents residing in small towns or rural areas had a 1.6-1.8 times higher probability of using energy-saving products compared to those living in large cities or suburban areas. These factors related to relocation did not maintain their main effects in Model 2 and subsequent models that included additional factors. Only the duration of residence remained correlated with the usage rate of energy-saving products, even when controlling for other variables.

Residential location also exhibits a significant correlation with the usage rate of energy-saving products. Compared to respondents living in large cities, respondents residing in small towns or rural areas had a 2-3 times higher probability of using energy-saving products.

Turn off electricity, N=2316, null model overall percentage correct 51.7%.

The logistic regression results for the frequent energy-saving behavior as a binary variable show that, relative to respondents who moved from a larger residential area to a smaller one, respondents who either did not experience a change in residential size or moved from a smaller to a larger residential area had a weaker habit of turning off unused appliances, ranging from 67% to 73% compared to the former. The conclusion regarding the stability of this finding can be further observed in Table 6-27.

Reduce power consumption, N=2316, null model overall percentage correct 72.4%.

In the logistic regression model examining habitual energy-saving behavior, Model 1 reveals a correlation between the duration of residence at the same location and the behavior of habitual energy conservation. Specifically, respondents who have resided at the same location for 20-30 years or 5-10 years had a lower occurrence of habitual energy-saving behavior compared to those who have resided at the same location for over 30 years, accounting for around 60% of the latter, as shown in Model 1 in Table 6-28. However, this association disappears in subsequent models that include additional factors. Thus, no significant impact of residence or relocation on habitual energy-saving behavior was found.

Summary:

A study conducted in Japan with a sample size of 2,303 participants explored the usage of eco-products and energy-saving behaviors. The findings are as follows:

1. Relocation and Energy-Saving Products:

Among respondents who experienced changes in the size of their residential location after the age of 20, there is a correlation between the use of energy-saving products.

Respondents who relocated from a smaller to a larger residential area were twice as likely to use energy-saving products compared to those who moved from a larger to a smaller area.

Respondents with a strong sense of settlement were 1.5 times more likely to use energy-saving products compared to those with a low sense of settlement.

2. Duration of Residence and Energy-Saving Products:

Respondents who have lived in the same location for 5-20 years had a 1.3-1.4 times higher probability of using energy-saving products compared to those who have lived in the same location for over 30 years.

However, respondents who have lived in the same location for 1-3 years had only 0.6 times the probability of using energy-saving products compared to those who have lived in the same location for over 30 years.

3. Residential Location and Energy-Saving Products:

Respondents residing in small towns or rural areas had a 1.6-1.8 times higher probability of using energy-saving products compared to those living in large cities or suburban areas.

4. Habitual Energy-Saving Behavior - Turning off Electricity:

Regarding the habit of turning off unused appliances, respondents who did not experience a change in residential size or moved from a smaller to a larger residential area had a weaker habit compared to those who moved from a larger to a smaller area.

5. Habitual Energy-Saving Behavior - Reducing Power Consumption:

The duration of residence at the same location showed a correlation with habitual energy-saving behavior.

Respondents who have resided at the same location for 20-30 years or 5-10 years had a lower occurrence of habitual energy-saving behavior compared to those who have resided at the same location for over 30 years.

Overall, residential location and duration of residence are factors that influence the usage of energy-saving products and habitual energy-saving behaviors. However, some findings were not maintained when additional factors were considered in the models.

The results of the binary logistic regression and decision tree models were similar, with key correlates including housing type, marital status, age, household income, willingness to move, home ownership, social class, and concerns about future economic conditions.

6.5 Discussion and Conclusion

Residential Size Changes and Usage of Energy-Saving Products:

In the case of Japan, relocating from a smaller residential area to a larger one may be driven by a pursuit of better living conditions. Large cities offer more employment opportunities, convenient facilities, and advanced infrastructure, making residents more likely to come into contact with and embrace energy-saving products. Additionally, large cities generally prioritize environmental protection and sustainable development, making it easier to access and promote energy-saving products in these areas.

Settlement Consciousness and Usage of Energy-Saving Products:

Individuals living in housing complexes or rental properties may tend to have lower settlement consciousness compared to those with homeownership. This is because housing complexes and rental properties often come with restrictions that make it more challenging for individuals to freely choose and install energy-saving products. On the other hand, homeowners are likely to have more motivation to invest in energy-saving products as they have greater autonomy in home renovations and equipment purchases.

Duration of Residence and Usage of Energy-Saving Products:

Individuals who have resided in the same location for an extended period are more likely to live in older houses that may have fewer or outdated energy-saving features. In Japan, energy-saving initiatives introduced in the early 21st century, such as the Top Runner Program, primarily focus on energy efficiency and environmental requirements for new buildings, leading to fewer updates of energy-saving devices in older houses. As a result, long-term residents may lack the opportunities and incentives to install or upgrade energy-saving products.

Residential Location and Usage of Energy-Saving Products:

In small towns or rural areas, detached houses are more common compared to apartments or multi-story buildings in large cities. Detached houses typically offer more space and autonomy, making it easier to install and configure energy-saving products. Additionally, rural areas often have a stronger connection to the natural environment, fostering a higher awareness of environmental protection and sustainable development among residents, which increases the likelihood of adopting energy-saving products.

Considering the logistic regression models analyzing the usage of energy-saving products, it has been revealed that respondents with characteristics such as residing in independent houses, owning their homes, belonging to high-income households, having larger households, higher educational backgrounds, and being married have a higher likelihood of using energy-saving products. These conditions collectively suggest that the usage of energy-saving products is likely influenced by the supply conditions in the equipment market, where the availability of such products coincides with the demand from specific demographic groups at the opportune time, such as during new home purchases, settlement, or housing improvements. Furthermore, these coincidences often coincide with significant life events such as relocation, starting a family, or raising children. Therefore, this study partially supports the correlation between relocation, settlement, and the usage of energy-saving products, although the causal relationship remains to be determined.

Discussion on the habitual energy-saving behaviors of turning off electricity and reducing power consumption:

Turning off electricity as a habitual energy-saving behavior:

The results indicate that respondents who did not experience a change in residential size or moved from a smaller to a larger residential area had a weaker habit of turning off unused appliances compared to those who moved from a larger to a smaller area. This may be due to the fact that relocating from a larger to a smaller residential area may lead individuals to be more conscious of energy-saving measures, including the habit of turning off unused appliances. Conversely, moving from a smaller to a larger area may result in less emphasis on energy-saving practices.

Reducing power consumption as a habitual energy-saving behavior:

There is a positive correlation between the duration of residence at the same location and the habit of reducing power consumption as an energy-saving behavior. Specifically, respondents who have resided at the same location for 20-30 years or 5-10 years exhibited a lower occurrence of habitual energy-saving behavior compared to those who have resided at the same location for over 30 years. This suggests that long-term residents have already established relatively fixed lifestyles and energy

usage habits at their current location, making it less likely for them to change or adjust their behaviors, including habits of reducing power consumption.

These discussions provide explanations for the observed results regarding the habitual energy-saving behaviors of turning off electricity and reducing power consumption. However, further research is needed to gain a deeper understanding of these associations, considering other potential factors such as individual values, awareness education, socioeconomic factors, and the influence within specific cultural contexts. Encouraging and providing relevant education and policy support to promote positive energy-saving behaviors is also an important practical direction.

Based on the additional information you provided, it appears that the relationship between habitual energy-saving behavior and relocation is weak, and factors such as settlement consciousness have limited explanatory power in the models. Additionally, the models have relatively low Nagelkerke R square values, indicating that they do not capture a substantial amount of the variation in the data. Furthermore, it is important to note that many factors commonly believed to be related to energy-saving behaviors have not been included in the models, such as respondents' awareness of environmental damage. This is a very unexpected result.

Also due to the absence of data in the survey about respondents' attitude towards environmental protection.

Given these considerations, it is reasonable to conclude that the relationship between relocation and habitual energy-saving behavior is weak and does not appear to be a significant factor in explaining variations in energy-saving behaviors. However, it is important to conduct further research and consider additional factors that may be influential in understanding energy-saving behaviors.

6.5.1 Effects of Building Standards

Although the building area, or floor area of most houses or complex housing are under 300 square meters, they are not ruled by the building laws. The laws still have function in energy saving in residential sector because the equipment is of high standard.

Japan's Building Standards Law has undergone many revisions and changes, mainly including the following periods:

1. 1979-1981: The thermal insulation performance of building shells and the energy-saving performance of air conditioning equipment were included in the benchmark method. Energy conservation law was established in 1979[148].

2. 1999: The revised Benchmark Law requires the use of energy-efficient equipment and materials with low pollutant emissions in the design and construction of buildings and sets energy consumption limits for new buildings.

3. 2005: To adapt to global climate change and the requirements of energy conservation and emission reduction, the benchmark of energy saving performance of buildings was further improved, and the regulations on solar energy utilization, lighting systems and ventilation systems of buildings were strengthened.

4. 2010: New regulations for the thermal environment inside buildings, including requirements for temperature, humidity, etc., and improved the benchmark for thermal insulation performance and thermal environment systems in buildings.

5. 2018: The revised benchmark law takes the energy consumption of buildings as one of the important indicators, stipulates energy consumption limits for new buildings and significantly renovated buildings, and promotes the concept of zero-energy and low-carbon buildings.

6. The 2023 announcement does contain some changes and details in the revised version, the main ones are as follows:

The new Building Standards Act will be implemented on April 1, 2023, to replace the current "Building Province エネルギー化法".

The new benchmark law will more strictly regulate and supervise the energy efficiency requirements of new and existing buildings, including energy consumption limits and energy-saving renovations of buildings.

The new benchmarking method will introduce a new energy labelling system to provide consumers with more intuitive and easy-to-understand information on building energy consumption.

The new benchmarking law will promote more environmentally friendly and sustainable building materials and technologies to promote low-carbon, efficient and sustainable building development.

Every regulatory change has an impact on the construction industry. Effective enforcement of these regulations increases the energy efficiency of appliances and other equipment installed in buildings[149]. This study can see the impact on the construction equipment industry as follows:

Revised in 1999: It promoted technological innovation in the Japanese construction equipment industry and promoted the development and promotion of energy-efficient equipment. However, the 1999 revision of the Basic Law on Building Energy Efficiency does not clearly stipulate specific standards and requirements for the installation of energy-saving equipment. Related enterprises began to produce high-efficiency, energy-saving, and environmentally friendly construction equipment products, such as gas boilers and air conditioners. Solar water heaters, power-saving elevators, etc.

2005 Revision: An important revision in the Basic Law on Building Energy Efficiency introduced the concept of "combination of building equipment and energy conservation and environmental protection", and clearly stipulated the requirements for installing solar panels in new buildings. In addition, the 2005 revision also encouraged the construction equipment industry to pay attention to the sustainability and decarbonization of equipment and promoted technological upgrading and industrial restructuring. It has promoted the technological upgrading and industrial structure adjustment of the construction equipment industry, and launched solar water heaters, ground source heat pumps, high-efficiency air purifiers and other products. LED lighting system, fuel cell, layered refrigeration system, night refrigerant storage system, solar power generation system, building exterior wall insulation system, etc.

2010 revision: The revision emphasizes the intelligence and automation of building equipment, and related enterprises began to launch intelligent building equipment products, such as smart door locks, smart lighting, smart curtains, etc., to improve the safety, reliability, and comfort of equipment. The 2010 revision also clarifies that new buildings must use energy-efficient and high-performance equipment. This has led to the use of thermal solar power systems, miniaturized lithium-ion batteries, high-performance windows, ultra-efficient insulation, smart meters, and more.

2018 revision: The revision encourages the construction equipment industry to strengthen scientific and technological innovation, improve the intelligence and networking level of equipment, and related enterprises began to launch intelligent building equipment products interconnected with buildings, such as smart home systems[150], intelligent security systems, intelligent lighting control systems, etc. High heat insulation performance windows, intelligent air conditioning systems, DC lighting systems, etc. In addition, the 2018 revision also strengthens the requirements for building energy efficiency, clearly stipulating the energy conservation standards for new buildings and the building energy efficiency evaluation system.

With the implementation of the revision in 2023, the construction equipment industry is expected to pay more attention to the research and development and application of new technologies, and at the same time, the level of intelligence and informatization of equipment will also be improved. The 2023 revision will also strengthen the renovation of existing building energy efficiency and encourage the use of more renewable energy and energy-saving equipment to promote the

development of building energy efficiency in a more integrated, systematic, and intelligent direction.

In short, each revision of the Basic Construction Law will promote the development and progress of the construction equipment industry, promote the technological upgrading, structural adjustment, and innovative development of the industry to meet the needs of the market and society.

The results of the Japanese analysis show that people's preferences and environmental awareness are not the most important factors in influencing the use of energy-efficient products. Rather, building industry codes and building energy efficiency standards contribute more significantly to the low carbon transition. In Enker and Morrison's study of high-performance energy-efficient buildings in Australia, building energy efficiency standards were shown to play an important role in the low-carbon transition [151], and the role of government guidance in building energy policy is crucial. In fact, people use energy efficient products simply because they happen to use such houses and products. The advantage of this situation is that the spread of technology can lead to energy savings, but the disadvantage is that the lack of awareness of energy efficiency may lead to greater waste, creating a worrying attitude of indifference.

Chapman and Itoaka have identified three main reasons why Japanese consumers choose to participate in the energy market. The largest group is motivated by economic benefits, the second largest group is driven by curiosity about new technologies, and a small minority is motivated by environmental concerns [152]. Economic and environmental factors have spurred the most active consumer group in the energy market, who actively seek out and decide on their participation in new energy services and products. However, these factors are not enough to activate most consumers, who continue to use existing energy services to avoid inconvenience. This partly explains why there is no significant correlation between respondents who are concerned about environmental issues and their frequency of using energy-efficient products or practicing energy-saving behaviors, as this group represents a minority of respondents.

The mobility of housing in Japan is also influenced by the income tax system and the Japanese leasing law. The tax reduction system stimulates the mobility of larger families, while the leasing law inhibits residential mobility[153]. This may also have implications for their use of energy-efficient products.

Table 6-29 Building Rules and its Affections

	Building rules	**Affection**
1979	Establishment of Energy Conservation Guideline in the residence and building fields, and in the machinery and equipment fields.	The thermal insulation performance of building shells and the energy-saving performance of air conditioning equipment were included in the benchmark method.
1990	The Top Runner Program was introduced in a 1990 amendment, which certifies manufacturers and other entities that satisfy the 'Top Runner' criteria. The program applies to machinery, equipment, and building materials, as well as LED lamps and three phase induction motors.	The revised Benchmark Law requires the use of energy-efficient equipment and materials with low pollutant emissions in the design and construction of buildings and sets energy consumption limits for new buildings.
2005	Energy conservation act revision: introduction of unified management of heat and electricity	regulations on solar energy utilization, lighting systems and ventilation systems of buildings were

		strengthened.
2008	introduction of benchmark system in each industrial sub-sector	New regulations for the thermal environment inside buildings, including requirements for temperature, humidity, etc., and improved the benchmark for thermal insulation performance and thermal environment systems in buildings.
2013	energy conservation act revision: user electricity peak demand measures; introduction of top runner program to building materials.	promotes the concept of zero-energy and low-carbon buildings, smart home systems.
2023	the Act on Rationalizing Energy use and Shifting to Non-fossil Energy	METI increased the target standard values for sashes and insulated glass as building materials under the Top Runner Program by about 40%; it also increased the target standard values for some heat insulating materials by 5 to 6%.

6.5.2 Conclusions

The use of energy-efficient products is influenced by a range of complex and interconnected factors. Analysis of the JGSS data indicates that individuals who utilize energy-efficient products are more likely to live in detached homes, be married, have higher education levels, own their own homes, have higher household incomes, be employed, and reside in small to medium-sized cities or towns. These findings are primarily concentrated among individuals below the age of 50.

One possible explanation for these results is that individuals who have families and live in detached homes located in small or medium-sized cities or towns are more likely to have been equipped with energy-efficient products when purchasing or constructing their homes at a younger age, as these properties may have complied with building codes. Consequently, they are more inclined to use energy-efficient products, and this decision may involve a multifaceted interplay of the aforementioned factors, contributing to a complex decision-making process.

However, in relation to everyday energy-saving behaviors such as habitual energy conservation or reducing power consumption, there is a weaker correlation between relocation or settlement and these behaviors. Factors like settlement consciousness or the duration of residence at the same location may have limited influence on such energy-saving behaviors.

In summary, while there is a relationship between relocation or settlement and the usage of energy-efficient products, the correlation with everyday energy-saving behaviors is weaker. This suggests that factors beyond relocation or settlement, such as personal attitudes, awareness, and socio-economic conditions, may play a more substantial role in influencing individuals' daily energy-saving habits.

Chapter 7   Comparative Study and Classification Discussion

This chapter presents a comparative analysis of the situations in China, South Korea, and Japan. The analysis is conducted by comparing various factors such as urbanization rate, human development index, migration ranking, and policy differences among the three countries. By homogenizing the data and conducting a comprehensive assessment, the study identifies both similarities and differences in factors that influence pro-environmental behaviors among these countries.

7.1 Migration in Three Countries

7.1.1 Immigration

Although this study focuses on the relationship between movement within the country and pro-environmental behavior, international migration can reflect the acceptance of the country's people towards other countries' populations, and such attitudes can shed light on the country's overall attitudes towards the environment.

According to the immigration scores provided by MIPEX[13], which evaluates integration policies, South Korea ranks highest (56/100), followed by Japan (47/100), and China (32/100).

MIPEX measures integration policies across eight domains. Through quantitative analysis (cluster principal component analysis), the MPG research team has identified three key dimensions that constitute the basis of a country's integration policy across all domains. These three dimensions help describe an overall approach to integration in a country:

Basic rights: Do immigrants enjoy rights equal to nationals? For example, rights related to employment, training, healthcare, and non-discriminatory equality.

Equal opportunities: Do immigrants have support to access opportunities equal to nationals? For example, targeted support for education, healthcare, and political participation.

Secure future: Can immigrants settle long-term and feel secure about their future in the country? For example, family reunification, permanent residency rights, and access to citizenship.

Countries are then grouped based on their scores in these dimensions. These groups represent different integration approaches of countries. Four main approaches have been identified:

Full integration: A comprehensive approach that ensures equal rights, opportunities, and security for immigrants.

Formal equality: Implies equal rights and long-term guarantees for immigrants, but not equal opportunities.

Temporary integration: Indicates that immigrants have basic rights and equal opportunities but face obstacles to long-term settlement.

No integration (rejected integration): Implies that immigrants are deprived of basic rights and equal opportunities, even if they can settle in the country long-term.

Each of these categories has a range of policies. In other words, countries adopting the same integration approach may have more or less developed policies. Therefore, countries are divided into 10 different groups, reflecting their overall integration approaches and policy levels. The MIPEX 2020 rankings are based on the average scores of countries within each group:

4th place: Midway to full integration (average score: 50/100). These countries have made the least progress across all three dimensions, as their policies only partially provide equal rights, opportunities, and a secure future for immigrants. (South Korea - 56)

7th place: No integration midway (average score: 47/100). These countries are classified as "no integration" because their policies deny the country becoming a destination for immigrants. Immigrants may find ways for long-term settlement but do not receive full support for rights and equal opportunities to participate in society. This group of countries has made halfway progress in investing in equal opportunities. Policies may encourage the public to perceive immigrants as subordinates rather than neighbors. (Japan - 47)

10th place: No integration (most unfavorable) (average score: 28/100). These countries are

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13 MIPEX key findings (https://www.mipex.eu/key-findings)

classified as "no integration" because their policies deny the country becoming a destination for immigrants. Immigrants may find ways for long-term settlement but do not receive support for basic rights or equal opportunities to participate in society. Policies may encourage the public to perceive immigrants as subordinates and strangers. (China - 32)

7.1.2 Migration

Japan, China, and South Korea experienced different progress of urbanization. Figure 7-1 showed the urban population of these countries and the world average data. Japan, South Korea, and China have achieved high levels of urbanization, with their cities serving as centers of economic, cultural, and social activities. However, each country also faces unique urban challenges, requiring continuous efforts to improve infrastructure, sustainability, and the quality of urban life.

Japan is highly urbanized, with a majority of its population residing in cities. Tokyo, the capital, is one of the world's largest and most populous cities, known for its advanced infrastructure and vibrant urban life.

South Korea has experienced rapid urbanization since the mid-20th century, with a significant portion of the population living in cities. Seoul, the capital, is a bustling metropolis and a global city.

Urban areas in China are characterized by rapid urban development, massive infrastructure projects, and a diverse mix of traditional and modern architecture. The country has invested heavily in urban planning, transportation systems, and smart city technologies.

China, Japan, and South Korea have experienced urbanization with their own characteristics and processes. Here are some comparisons:

Historical background: Japan stands as one of the early adopters of urbanization, with its roots tracing back to the modernization period, particularly after the Meiji Restoration. On the other hand, China and South Korea embarked on their urbanization journeys later, primarily taking place in the latter half of the 20th century. Details can be seen from Figure 7-1.
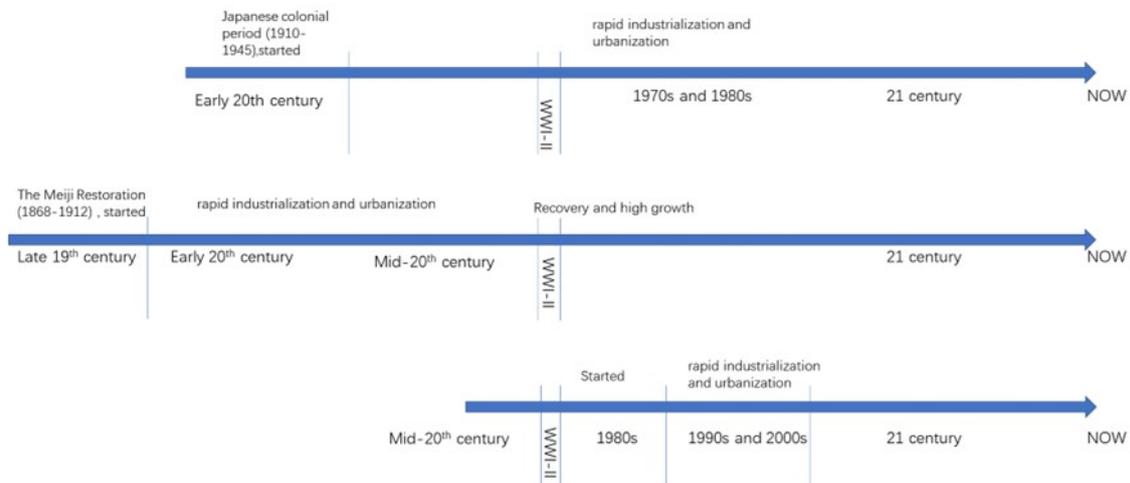

Figure 7-1 Urbanization Period

Table 7-1 Taxonomy Associations of Three Countries' Internal Migration Situation Nowadays

		China	Japan	South Korea
Migration processes	Migration drivers	Urban/Rural development and living standards.	Population dynamics	
		migration policy and other public policies[154]	labor markets and employment	
		labor markets and employment		
	Migration forms	Short-term and circular migration.	internal displacement	Internal displacement
		Internal migration.	low-skilled migration	Internal migration[155]
		Internal displacement.	labour migration	internal displacement[156]
		Lifestyle and retirement migration.	internal migration[140]	
		Health-related migration.	lifestyle and retirement migration[141]	
		labor migration.		
		irregular migration		
		high-skilled migration		
		family and marriage migration.		
		low-skilled migration.		
		return migration.		
	Migration infrastructures	Means of travel and transportation		Civil society actors in travel & migration
				economics facilitating travel & migration
Migration consequences	Socio-cultural consequences	Racism, xenophobia, and discrimination		
		Cultural identity and belonging		

		China	Japan	South Korea
		Attitudes, migration, and migrants		
		Media representations of migration		
		Interethnic contact and conflict		
		Family relations and migration		
		Intergroup relations and contact		
		[157]		
	Socio-economic consequences	Labor market participation	migrant human capital and skills	remittances
		Socio-economic inequality, mobility, and migration		
		Rural development, migration, and diversity		
	Transversal consequences	Migrant incorporation / integration	spatial consequences	Spatial consequences
		Spatial consequences	age-related migration consequences	
		Social cohesion		
		Demographic outcomes of migration	demographic outcomes of migration	
		Migrant networks		
		Migrant health and care		
		Age-related migration consequences		
	Legal-political consequences	Migrants' civic engagement and rights		Migrants in education
Migration governance	Governance actors	National governmental and state institutions	employers, labour, and trade unions	
		Private companies and business		
		Civil society		

		China	Japan	South Korea
Immigration policy and law		Employers, labor, and trade unions		
		Knowledge producers and providers		
		Antidiscrimination, 'race relations'		
		Integration policies (legal, political, socio-economic, cultural) and access to services		
Migration policy and law		Policies on mobility		
		Asylum regimes		
		Protection regimes for non-recognized refugees		
		Family reunification policies		
		border control		
		return policies		
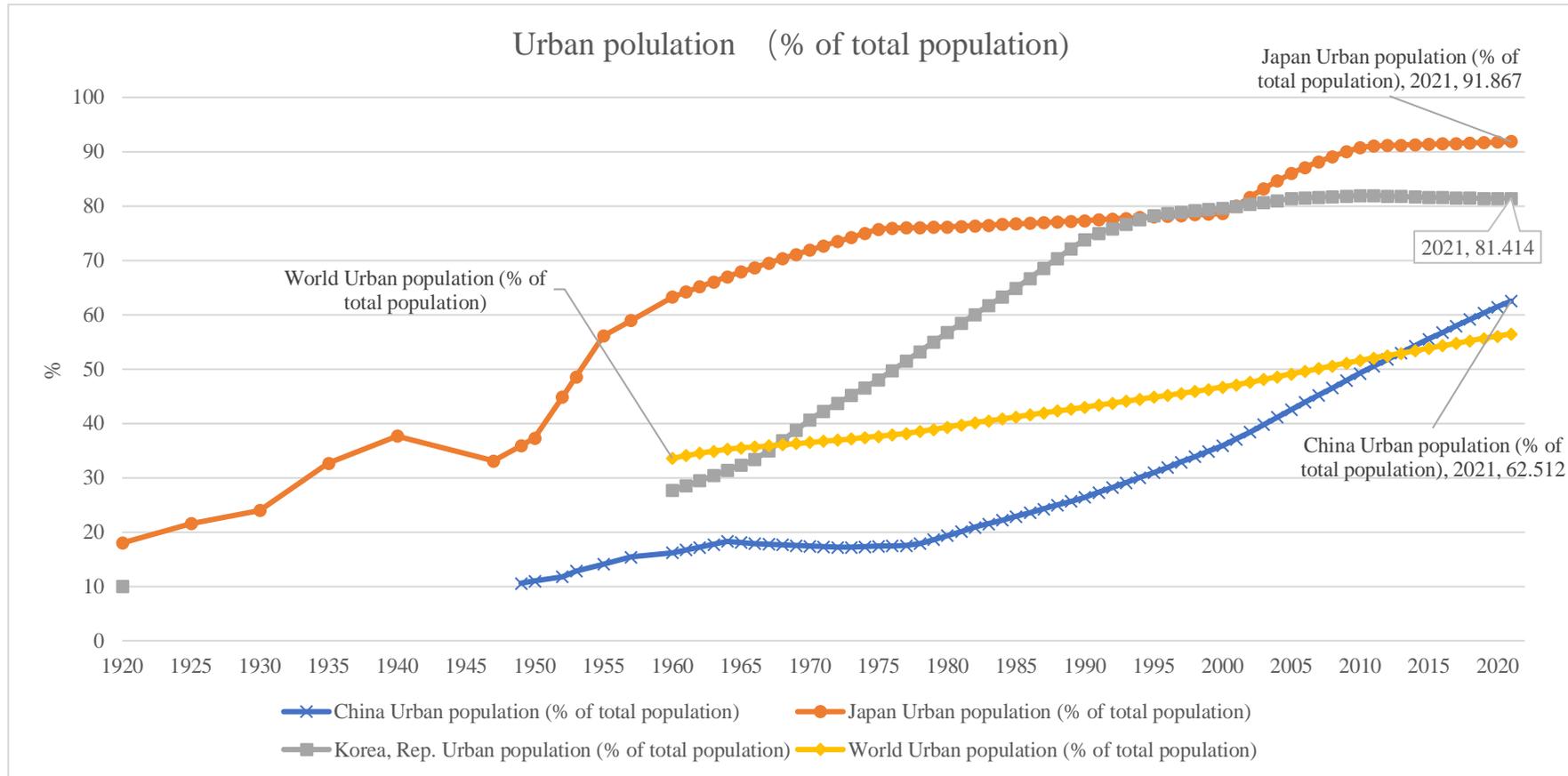
Figure 7-2 Urban Population

(Data Source: The World Bank[14])

Japan

Since the Meiji Restoration (1868-1912), Japan embarked on its urbanization journey. In the first national census conducted in 1920, the urbanization rate in Japan stood at 18%. It took about 100 years for urbanization to reach its completion, with the urbanization level doubling in the two decades following the war, by the year 1970.

Phase 1: From the Meiji Restoration to the end of World War II, the urbanization rate in Japan reached 33%.

Phase 2: The post-war golden decade, in 1955, the urbanization rate in Japan reached 56%, and the urban population exceeded the rural population for the first time.

Phase 3: By 1970, the urbanization rate in Japan exceeded 70%, and urbanization was almost completed.

South Korea

As one of the Four Asian Tigers, urbanization in South Korea began to rapidly develop in 1960, with an urbanization rate of only 28% at that time. By 1990, urbanization was almost completed in just 30 to 40 years.

Phase 1: 1960-1980, the urbanization rate in South Korea reached 57%, doubling in 20 years.

Phase 2: 1980-1990, the urbanization rate in South Korea reached 74%, almost completing urbanization.

China

Urbanization in China began to rapidly develop after the reform and opening-up policy. In 1949, the urbanization rate was only 10.6%. After 70 years of development, the urbanization rate reached 61.43% in 2020.

Phase 1: Until 1957, after the completion of the First Five-Year Plan, the urbanization rate reached 15.4%.

Phase 2: From 1957 to 1978, before the reform and opening up, the urbanization rate reached 17.9%. Due to political reasons, there were significant fluctuations in development, but there was still some growth.

Phase 3: From 1978 to 2021, the urbanization rate reached 62.5%. The urbanization rate increased by 1% annually. Based on this rate, China's urbanization rate will exceed 70% by 2030, almost completing urbanization in approximately 80 years.

In Korea, since 2010, the urbanization rate decreased. Showed in Figure 7-3. Since the 1990s, the population growth rate in South Korea has slowed down, and urban populations have gradually started to move towards the suburbs. Currently, the annual growth rate of the urban population in South Korea is quite low, and urban development has entered a stagnant phase. Since 2011, the urbanization rate in South Korea even experienced a decline for the first time since 1960, primarily due to an increase in the population seeking to enjoy rural life after retirement. According to statistics from the Statistical Office, in 2012, among the population aged 40 and above, there was a net outflow of 32,000 people from the Seoul metropolitan area to live in rural areas. A trend called "returning to farming and returning to the countryside" began to form as retirees and elderly individuals left major cities and moved to rural areas.
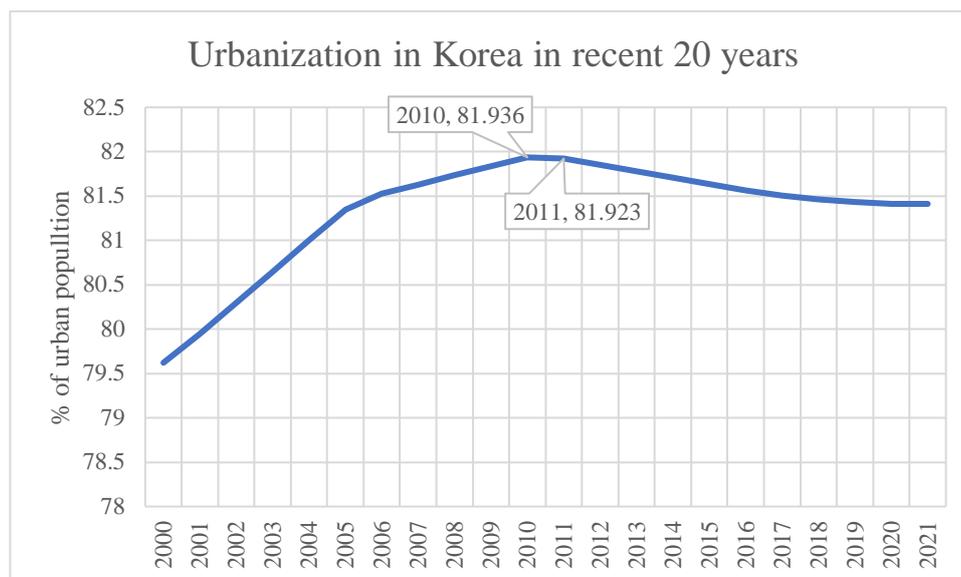
Figure 7-3 Urbanization in Korea in Recent 20 Years

City size and population: Japan's major cities like Tokyo, Osaka, and Nagoya are among the most densely populated cities in the world. China's major cities, such as Beijing, Shanghai, and Guangzhou, are also populous metropolises. Seoul, the capital of South Korea, is the most populous city, and other cities like Busan and Incheon are also significant in size.

Urban development patterns: Japan underwent early industrialization and highly concentrated urban development, forming a central agglomeration model of large cities. China experienced rapid development of major cities but also promoted the development of regional cities to alleviate the pressure on large cities. South Korea, with a shorter urbanization process, has seen more balanced urban development, resulting in a multi-center urban pattern.

Urban planning and environmental protection: All three countries recognize the importance of urban planning and environmental protection. Japan started urban planning earlier, focusing on improving living quality and developing public facilities. China has also intensified efforts in urban planning and environmental protection, emphasizing sustainable development and ecological conservation. South Korea has implemented policies and plans for urban planning and environmental concerns as well.

Social impacts: Urbanization has had profound social impacts on all three countries. Japan and South Korea have faced issues such as urban alienation, social inequality, and aging populations during their urbanization processes. China has encountered challenges related to rural labor migration and urban-rural disparities.

While there are similarities in urbanization among China, Japan, and South Korea, differences exist due to variations in history, culture, and policies. These disparities reflect each country's national conditions and development paths, contributing to unique characteristics and challenges in their urbanization processes. All three countries strive to address the challenges brought by urbanization and pursue sustainable and livable urban development.

7.1.2 Policies in Three Countries

Details on net-zero targets of Japan, China, and South Korea

Table 7-2 Details on Net-Zero Targets of Japan, South Korea, and China

	Japan	South Korea	China
Annex	Annex I	Non-Annex I	Non-Annex I

Fundamentals	Source	law	law	policy
	Target year	2050	2050	2060
	Reference to fairness	Not fulfilled	Not fulfilled	Fulfilled
Scope and coverage	covers all sectors	Fulfilled	Fulfilled	No information
	Covers all gases	Fulfilled	Fulfilled	Not fulfilled
	Covers int'l shipping and aviation	No information	No information	No information
	Excludes int'l off sets	No information	No information	No information
Carbon removal	Separate removals targets	Not fulfilled	Not fulfilled	Not fulfilled
	Removals transparency	inconclusive	Not fulfilled	inconclusive
Planning, review, reporting	Published plan	inconclusive	inconclusive	Fulfilled
	Review process	Fulfilled	No information	Partially fulfilled
	Annual reporting	Fulfilled	Fulfilled	Not fulfilled

Source: United Nations Environment Program (2022).[15]

The national social development level, known as the Human Development Index (HDI), is an indicator that assesses the level of human development in countries. The United Nations releases an annual Human Development Report, which includes the latest data on human development. According to the United Nations' latest Human Development Report for 2022[19], this study can understand the current state of human development worldwide. Figure 7-4 showed the trend of HDI during 1990 to 2021 between Japan, Korea, and China.

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[15] Emissions Gap Report 2022: The Closing Window — Climate crisis calls for rapid transformation of societies. Nairobi. https://www.unep.org/emissions-gap-report-2022
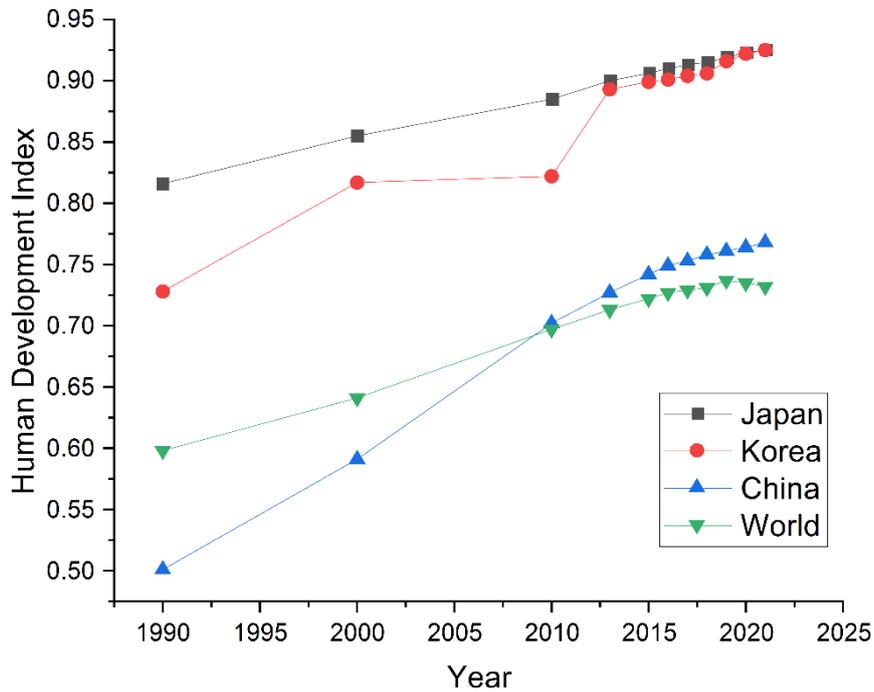
Figure 7-4 HDI of Three Countries via Years

7.2 Pro-Environmental Behaviors and Political Attitudes

There is a positive correlation between a sense of responsibility and various environmental behaviors/attitudes[158]. When it comes to attitudes towards climate change and belief differences, people can be categorized into four groups: engaged, pessimistic, indifferent, and doubtful. These groups exhibit differences in values, life satisfaction, and social trust[159]. This information can be utilized to design targeted messages for different audience segments.

The public in Europe and Russia have attitudes towards energy and climate change[160].

The public is concerned about energy security beyond affordable supply and finds dependence on fossil fuels worrisome.

There is widespread public support for electricity production from renewable energy sources. More people are concerned about climate change than those who are not.

Citizens are pessimistic about the efforts made by the government and others to mitigate climate change.

A significant majority of respondents, comprising over 70%, express support for providing subsidies to renewable energy with public resources in the surveyed countries, as depicted in Figure 7-5.
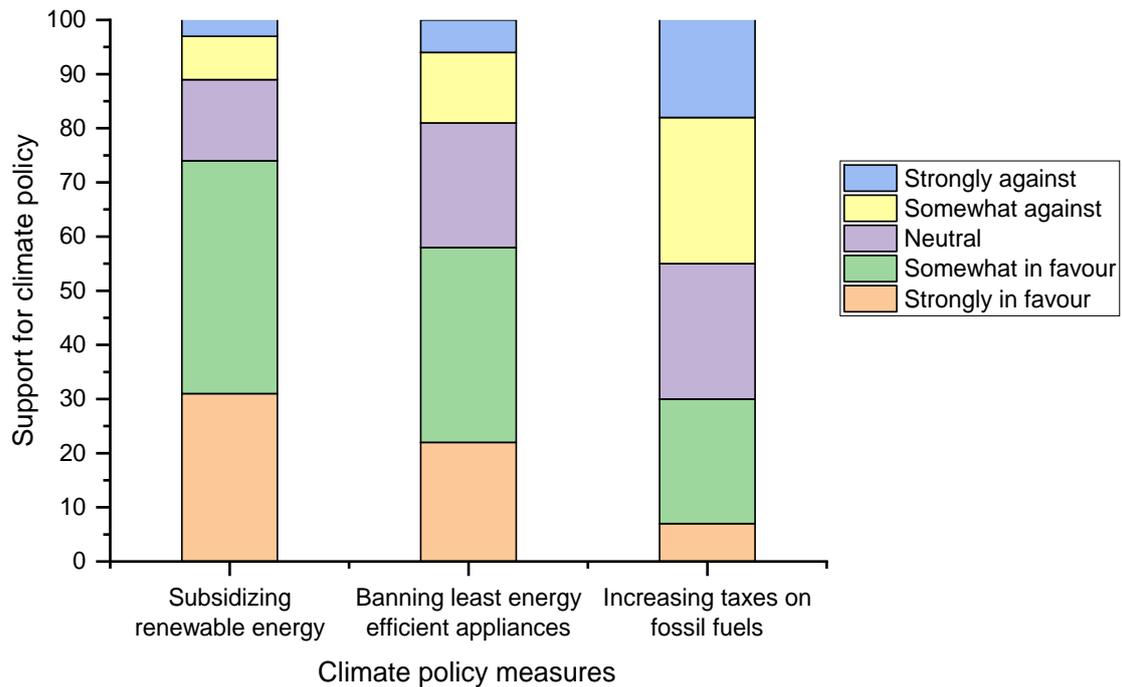
Figure 7-5 Support for Climate Policy Measures

(Data Source :European Social Survey Round 8, 2016. Analysis Was Conducted with The Full Sample of ESS Respondents. Missing And DK Responses Are Excluded. Both Post-Stratification and Population-Size Weights Have Been Applied.)

Some argue that the relationship between individuals can be reflected in the relationship between individuals and the environment, and vice versa.

Studies in Europe indicate that attitudes towards immigration [161], similar to attitudes towards refugees, are positively correlated with environmental attitudes [162]. People who support environmental parties also exhibit positive attitudes towards refugees. However, the association between these attitudes is weak, and except for highly politically engaged individuals, the predictive value of people's attitudes towards refugees for their attitudes towards environmental issues is small. European voters are more concerned about climate change than non-voters. In Western Europe, there is a correlation between self-positioning on the left-right spectrum and climate attitudes [163]. What direction will national policies take? As environmental issues become more prevalent and people's attention to them increases, especially in adverse environmental conditions, individuals, regardless of their varying attitudes towards the environment, tend to choose to protect the environment or support parties with environmental stances[164]. This leads political parties to strengthen their green attitudes in order to attract voters, and national politics will pay more comprehensive attention to environmental issues. Increased promotion and voter attraction also promote public awareness of environmental protection.

Pew Research Center's research on solar panel adoption in the US reveals a consistent trend where residents' inclination towards using or considering solar panels is influenced by their political preferences[16]. Previous surveys by the Center have consistently shown Democrats as being more likely than Republicans to have installed or consider installing solar panels. According to a January survey, Democrats and Democratic-leaning homeowners were more inclined than Republicans and Republican-leaning homeowners to install or seriously consider installing solar panels for generating

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[16] https://www.pewresearch.org/short-reads/2022/10/14/home-solar-panel-adoption-continues-to-rise-in-the-u-s/

electricity in the past year (57% vs. 36%).

In China, where multiple political parties do not exist, it is not possible to observe people's left or right political tendencies. However, surveys conducted in China have found that individuals who respond with "don't know" to questions regarding their attitude towards the government have a low willingness to pay. There could be several reasons for the low willingness to pay among individuals who respond with "don't know" regarding their attitude towards the government in China. The possible reasons can be enumerated as follows:

Lack of information: These individuals may have limited knowledge or understanding of the issues or policies related to the government, leading to uncertainty and a reluctance to make financial commitments.

Indifference or apathy: They may have a general disinterest or lack of engagement with political matters, resulting in a lack of motivation to actively support or oppose government initiatives.

Mistrust or skepticism: Some individuals may harbor doubts or skepticism about the government's intentions or effectiveness, which can lead to a lack of willingness to contribute financially.

Economic constraints: Financial constraints or limited resources could also contribute to a low willingness to pay among individuals who are unsure about their attitude towards the government.

These factors, among others, can play a role in shaping the low payment willingness observed among individuals who respond with "don't know" in China's surveys on government attitudes.

In the CGSS 2018 survey, out of 4,147 respondents, 137 individuals responded with "do not know" regarding the question of whether the government needs to do more. While this represents a small percentage, it still reveals significant differences. The "do not know" respondents tend to be older, with lower levels of education and income. They have limited knowledge about energy policies and the environmental consequences of energy use. Additionally, they generally hold a positive feeling of air quality in their locality. Details can be seen from Table 7-3 and Figure 7-6.

Table 7-3 Opinions and Associated Indicators Proportion

| Mean/ frequency	Agreement with government need to do more		
	No or neutral	Positive	Do not know
WTP-QA	42.2%	51.2%	8.8%
WTP-RE	45.7%	52.4%	10.9%
Age	51	52	63
Gender female	54.2%	52.8%	67.2%
Education years	8.57	9.00	4.31
Household income	10.22	10.45	8.94
Married	74.5%	76.4%	66.4%
Never living in urban	39.2%	36.5%	66.4%
Energy police understanding negative	88.6%	83.7%	99.2%
Agree with energy use cause pollution	56.5%	78.8%	24.8%
Air quality is good	61.9%	69.1%	89.9%
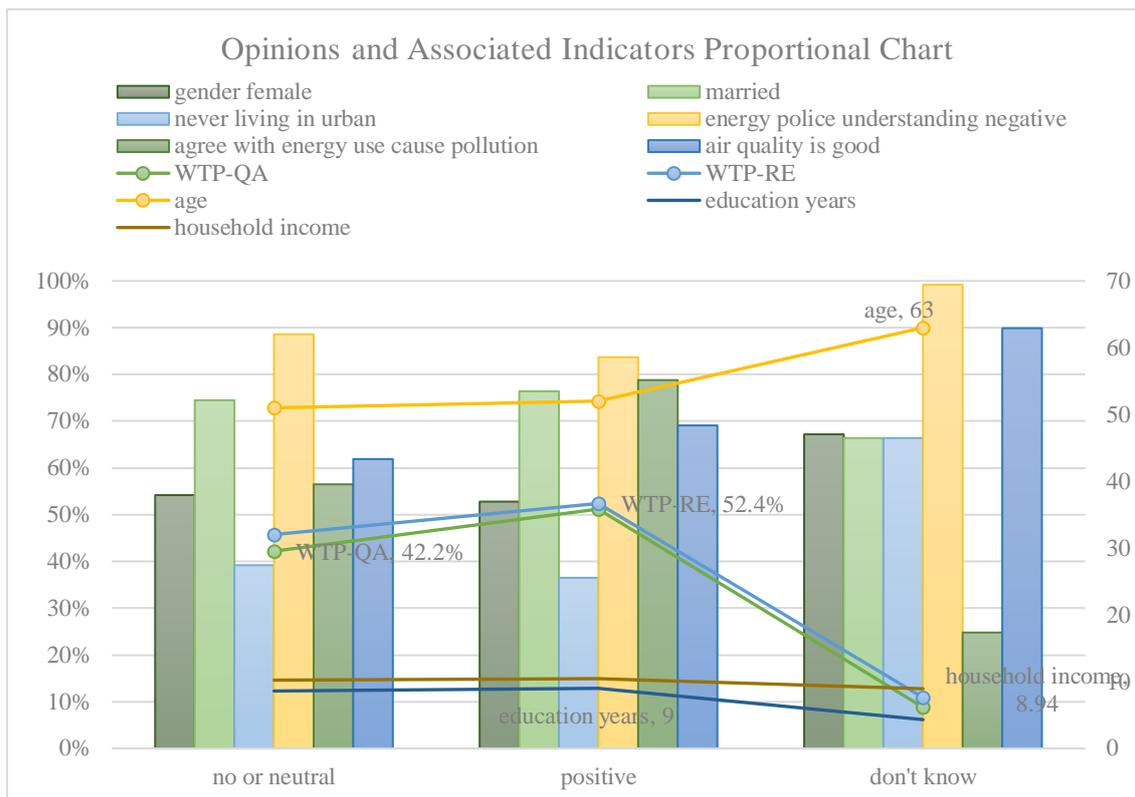
Figure 7-6 Opinions and Associated Indicators Proportional Chart

The reasons behind these observations can be multifaceted and may involve a range of factors. Here are some possible explanations:

Limited awareness or information: older individuals with lower education and income levels may have less access to information about government policies and energy-related issues. This limited awareness can contribute to their "do not know" responses and lack of knowledge about energy policies and their environmental impact.

Knowledge gaps: The lack of understanding about energy policies and the consequences of energy use may stem from a lack of educational opportunities or exposure to relevant information. This can result in a higher likelihood of "do not know" responses among individuals with lower education levels.

Perceived air quality: The agreement on good air quality among the "do not know" respondents may indicate a subjective perception or limited awareness of environmental issues. They might not be fully aware of the potential air pollution caused by energy use or may have different perceptions due to local factors.

It is important to note that these are potential explanations, and further research and analysis would be necessary to gain a more comprehensive understanding of the underlying reasons.

7.3 Sociodemographic Factors in the Role of Pro-Environmental Behavior

Gender: Women engage in pro-environmental behaviors more than men in private sphere, while in public sphere their pro-environmental behaviors mostly due to social expectations[165].

The age part discusses three countries. In China age has a negative influence on WTP, while in South Korea, older people more likely to return to rural area, people in their 50s, 80s have more WTP than the 20s, and older people recycle more. No influence has been found in Japan.

Gender: only find female have less WTP-RE than male in China.

Income: higher income increases WTP, and the chance to use eco-products, while decrease

recycling behavior.

Work: people who have work use more eco-products but less recycling than no work people.

Education: higher education increase WTP in Korea, and eco-products usage in Japan. While no connection to WTP in China was found.

Marriage: married people are less likely to return to rural areas, more likely to recycle and use eco-products.

7.4 Conclusions

Table 7-4 Summary of Regression Analysis Results

| Dependent variable	Result	Nagelkerke R square	Overall percentage correct	Data
Willingness to pay for quality air	45.2% willing	11.20%	62.00%	China
Willingness to pay for renewable energy	47.6% willing	9.90%	61.00%	China
Willingness to protect the environment	71.7% willing	24.30%	75.10%	Korea 2014
Willingness to protect the environment	54.9% willing	38.80%	75.30%	Korea 2021
Return to rural area	44.0% would like to	14.00%	62.20%	Korea 2018
Environmental concern	54.01% concern	10.5%	62.4%	Korea 2014
Environmental concern	62.30% concern	11.50%	66.80%	Korea 2018
Environmental concern	64.65% concern	8.6%	66.9%	Korea 2021
Recycling	46.9% always	34.00%	72.70%	Korea 2021
Use of eco-products	40.9% use	20.30%	67.10%	Japan
Turn off the electricity	51.8% always	5.50%	57.7%	Japan
Reduce power consumption	28.4% always	10.8%	73.7%	Japan
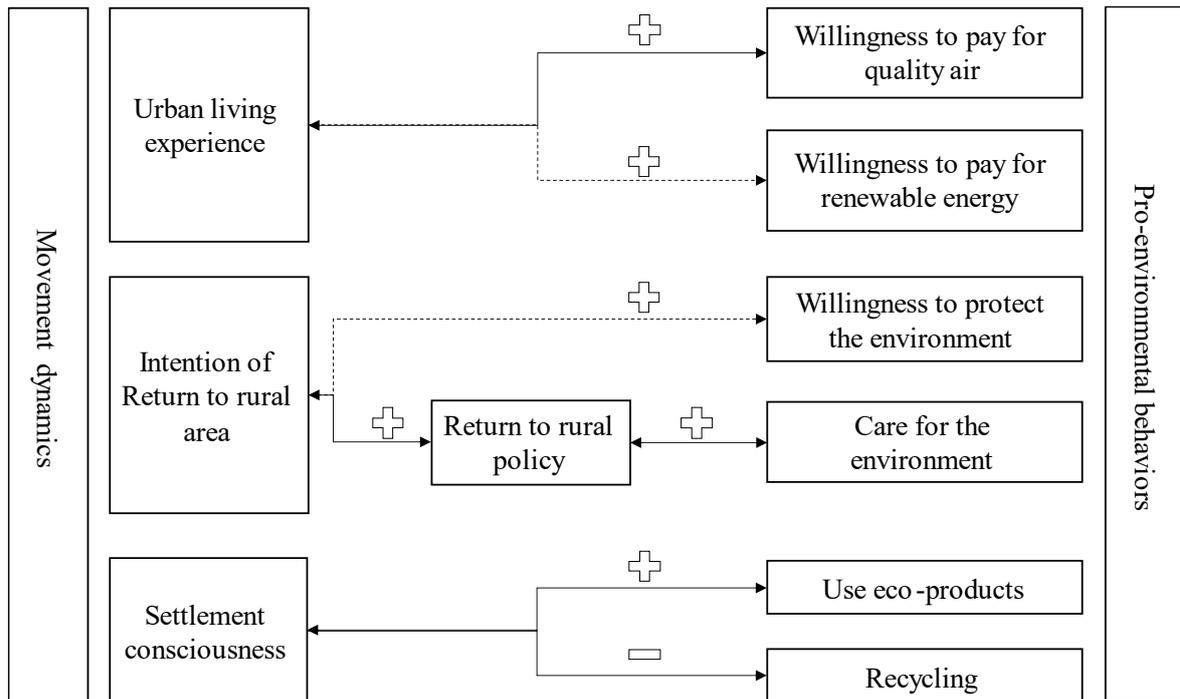
Figure 7-7 Results of Movement Dynamics and Pro-Environmental Behaviors

7.4.1 Migration Motivates Pro-Environmental Behavior

Are people with migration experiences more energy-efficient? Yes, they are.

In summary, there is evidence to suggest that individuals with migration experiences are more likely to prioritize energy conservation and environmental sustainability. Research conducted in China has shown that people with migration experiences have a higher willingness to pay for quality air compared to those without immigration experiences. However, there was no statistically significant correlation between migration experiences and willingness to pay for clean energy.

These findings indicate that migration experiences can have a positive impact on individuals' environmental awareness and behaviors. On one hand, migration experiences introduce new lifestyles and social networks, making it easier for individuals to encounter environmental concepts and practices. On the other hand, migration experiences can lead individuals to pay more attention to urban environmental pollution and sustainable development, as these issues are often closely related to urban development and immigration experiences.

These findings provide important insights for policymakers and urban planners. For example, governments can encourage people to focus on environmental issues and take action by creating livable urban environments and enhancing environmental education. Additionally, governments and businesses can consider providing more incentives and rewards for those who actively engage in environmental conservation to motivate more people to join the movement.

While individuals with migration experiences have a higher willingness to pay for both quality air and clean energy compared to those without migration experiences, there are noticeable differences between these two variables. The study on willingness to pay among Chinese respondents suggests that people's willingness to pay for quality air may be higher due to the significant impact of air quality on health and quality of life. In contrast, the influence of clean energy on people's lives may not be as pronounced. Furthermore, clean energy often comes with higher costs compared to other sources, which can also affect people's willingness to pay.

Moreover, individuals' willingness to pay for these two variables may also be influenced by their economic status and educational background. For example, individuals with higher incomes and better education are often more willing to pay higher costs for quality air and clean energy.

In conclusion, the interplay of these factors may contribute to the differences in willingness to pay for quality air and clean energy among individuals with migration experiences. Further research can explore additional factors to better understand these differences and how to promote environmental behaviors effectively.

7.4.2 Desiring Rural Return does not Guarantee Environmental Consciousness

Do people with a willingness to return to their hometown place more importance on environmental protection? It is not necessarily the case.

According to surveys, the main motivations for people's willingness to return to their hometown are their love for the natural environment and their yearning for a relaxed rural life. Although these individuals have an affinity for the natural environment, it remains uncertain whether this translates into environmental awareness and protection.

To explore this issue, this study examined the data from the Korean General Social Survey (KGSS) 2018 and found that people with a willingness to return to their hometown did not exhibit significant differences in their level of environmental concern. This suggests that their level of environmental concern is comparable to that of other groups, but it does not necessarily indicate stronger environmental awareness. This situation is different but similar to existed research in China that local residents around ecotourism sites are not significantly increase their ecological behaviors[166].

It is important to note that this study data did not directly inquire about people's environmental awareness. Instead, this study used an indirect method to assess their level of environmental concern. Specifically, this study asked participants which area of government spending they believed should be increased and evaluated their response in the context of potential higher taxes for themselves. This study used above-average expenditure on the environment as a quantitative indicator of people's level of environmental concern. While this method closely approximates people's environmental concern, it may still have biases as individuals' political attitudes and trust in the government can also influence their answers.

Attitudes towards environmental issues are closely related to government fiscal policies. Studies conducted in Europe and Russia have found that people are more willing to support government subsidies for renewable energy rather than taxing fossil fuels [160]. This indicates that government fiscal policies have a significant impact on people's environmental willingness, but they cannot completely replace individuals' own environmental awareness and actions.

Regarding individuals with a willingness to return to their hometown, this study examined whether they would place greater importance on environmental issues. However, the KGSS 2018 data showed no significant differences in the level of environmental concern among this group. Nonetheless, this study still holds hope that individuals with a willingness to return to their hometown will pay more attention to environmental issues and take initiative-taking environmental actions.

7.4.3 Negligible Environmental Behavior Differences from Population Mobility in Areas with Minimal Urban-Rural Disparities

In areas with minimal urban-rural disparities, the impact of migration on environmental protection is not significant.

Studies have shown that in regions where urban and rural areas have similar levels of development and environmental conditions, the influence of migration on environmental protection is not pronounced. This suggests that when there is little disparity between urban and rural areas in terms of infrastructure, resources, and environmental quality, migration may have a limited effect on environmental issues.

In such areas, the factors driving environmental protection and sustainable practices are likely to be more influenced by local culture, education, community engagement, and government policies rather than migration. The absence of significant urban-rural disparities reduces the urgency and motivation for individuals to migrate in search of better environmental conditions or resources, which in turn lessens the potential impact of migration on environmental concerns.

It is important to note that this conclusion applies specifically to areas with minimal urban-rural disparities. In regions where there are substantial disparities in terms of economic development, infrastructure, and environmental conditions between urban and rural areas, migration can still have a notable influence on environmental issues. In these cases, migration may lead to environmental challenges in urban areas due to increased population density and resource consumption, or it may contribute to environmental degradation in rural areas due to unsustainable practices associated with economic activities.

Overall, the impact of migration on environmental protection is context-dependent, and in areas with minimal urban-rural disparities, migration is less likely to have a significant effect on environmental concerns compared to regions with substantial disparities.

According to the analysis of the Chinese context, the extent to which people's mobility influences their attitudes, behaviors, and habits is closely related to the magnitude of environmental changes before and after their mobility. Specifically, the impact of urban-rural differences on mobility is particularly evident. Even after controlling for other relevant factors such as economic status, education level, and housing conditions, a stable positive correlation between migration and willingness to pay for better air quality can still be observed. This suggests that even in relatively stable socio-economic environments, people's mobility can have a positive impact on their environmental awareness. This finding not only provides insights into policymaking but also contributes to a better understanding of the mechanisms through which mobility influences people's environmental consciousness.

In Japan, where urban-rural differences are relatively small, this is primarily due to the country's high level of urbanization and industrialization, which results in less pronounced disparities between urban and rural areas compared to other countries. Additionally, the Japanese government's policies and measures aim to reduce urban-rural gaps. For instance, the government provides various support measures for rural areas, including increased infrastructure development and access to healthcare and social welfare for rural residents.

Analyzing data from the Japanese General Social Survey (JGSS), it has been found that housing tenure is a more crucial factor determining the use of energy-efficient products compared to migration experience. This could be attributed to the strong implementation and enforcement of regulations in Japan. People's choice of housing determines the types of energy-efficient products they use. However, individuals' preferences for energy efficiency are not decisive factors in housing choices, as they are influenced by other factors.

Furthermore, some studies indicate that Japan has tight-knit community relationships, and the trust and cooperative relationships within communities may influence individuals' energy-saving behaviors. Factors such as Japanese culture, history, and religious beliefs have contributed to the formation of community bonds. Japan has a cultural phenomenon known as "chiiki ishiki" or regional consciousness, where people have a keen sense of belonging and identification with their local regions. In this cultural context, community relationships are fostered and strengthened. Community activities and organizations in Japan are advanced, allowing individuals to participate in various community events and enhance mutual understanding and trust. These community relationships play a significant role in promoting environmental actions within the community.

7.4.4 The Impacts of Mobility-Related Policies on Environmental Protection

Return to rural area.

Policy and Impacts of Returning to Rural or Countryside Life in Japan

Japan has been facing challenges such as urbanization and an aging population. To promote rural development and address population decline, the government has implemented various policies and measures to encourage people to return to rural or countryside areas. Here are some key aspects of Japan's policy and the impacts of returning to rural or countryside life:

Rural Regeneration Support System: The Japanese government provides funding and support

measures through the Rural Regeneration Support System to encourage young people, retirees, and families to return to rural areas for living and entrepreneurship. This system includes subsidies for housing construction in rural areas, job creation, agricultural management, and rural tourism.

Local Revitalization Policies: The government has implemented various local revitalization policies to promote economic development and social vitality in rural areas. These policies involve improving infrastructure, creating employment opportunities, developing agriculture, and promoting rural tourism. The government also supports community activities and cultural events organized by local residents to enhance community cohesion and attractiveness.

Rural Industry Revitalization: To promote economic diversification and industry revitalization in rural areas, the Japanese government has been driving the development of emerging industries such as agricultural processing, rural tourism, and handicraft production. The government encourages entrepreneurship and investment in rural areas by providing financial support, training, and market expansion opportunities.

Improvement of Living Environment: The government invests in infrastructure development to improve the living environment and public services in rural areas. This includes the improvement of roads, water supply, electricity, and other basic facilities. Additionally, the government provides healthcare, education, and social welfare services to meet the needs of rural residents.

Community Engagement and Exchange: To enhance community cohesion and vitality in rural areas, the Japanese government encourages active participation in community organizations and activities. The government supports the organization of community events, fostering interaction and cooperation among residents, and strengthening community development and management.

These policies and measures have had several impacts on returning to rural or countryside life in Japan:

Population Influx: The implementation of these policies has led to an increase in the number of young people, retirees, and families choosing to return to rural areas, alleviating urban population pressure and mitigating the decline of rural populations.

Economic Development: The policies have stimulated economic development in rural areas, with the emergence of diverse industries and the growth of rural tourism creating employment opportunities and contributing to economic growth.

Community Vitality: By encouraging community engagement and exchange, there has been an increase in community cohesion and vitality. Interaction and cooperation among residents have enhanced community development.

Resource Conservation and Sustainable Development: Individuals returning to rural, or countryside life show a greater concern for environmental protection and sustainable development. Their involvement in activities such as agriculture and rural tourism contributes to the preservation of natural resources and cultural heritage.

Overall, Japan's policies and measures for returning to rural or countryside life have brought opportunities and challenges, promoted rural development and improved residents' lives. However, continued attention is needed to address issues such as aging populations, infrastructure development, and public services to achieve sustainable rural development and comprehensive revitalization.

Policy and Impacts of Returning to Hometown in China

Returning to hometown refers to individuals who have lived in other places for a period and then choose to return to their hometown or place of origin. China has implemented a series of policies and measures to promote and support the return of people to their hometowns. Here are some key aspects of China's policy and its impacts:

Policy Measures: The Chinese government has implemented various policies to encourage and support the return of people to their hometowns. These policies include support for entrepreneurship, job opportunities, financial assistance, and housing arrangements. The government encourages

returnees to develop their careers in their hometowns, contributing to local economic growth and social development.

Economic Impacts: The returnees have a positive impact on the Chinese economy. Many returnees bring back skills, knowledge, and experiences acquired in other places. They start businesses, find employment, or invest in their hometowns, promoting the development of local industries and creating more job opportunities. The entrepreneurial and investment activities of returnees contribute to the prosperity of local economies and narrow the urban-rural economic gap.

Rural Development: The Chinese government is committed to promoting rural development and has taken measures to encourage returnees to start businesses, invest, or work in rural areas. These measures include providing preferential land policies, financial support, infrastructure development, and agricultural product processing. The return of individuals to rural areas promotes rural economic development, improves the income levels of farmers, and enhances social services and infrastructure in rural areas.

Social Impacts: The return of individuals to their hometowns has had a positive impact on Chinese society. They bring innovative ideas, skills, and cultures, enriching the diversity of local communities. Their participation in education, healthcare, and cultural arts elevates the social and cultural level of rural areas, promoting social progress and civilization.

Resource Return: The return of individuals brings about the return of talent and resources. They can contribute their expertise, technological knowledge, and management experience to their hometowns, driving the upgrading and transformation of local industries. Additionally, they bring more capital investment, opportunities for innovation and entrepreneurship, and social networks to their hometowns, promoting sustainable development of the local economy.

Social Security: The Chinese government provides various social security and welfare policies for returnees. These include medical insurance, social insurance, and housing security. The government aims to improve the living conditions of returnees, enhance their social security level, and strengthen their sense of belonging and well-being.

In summary, China's policies for returning to hometowns aim to promote and support the return of individuals and provide them with opportunities for entrepreneurship, employment, and development. The return of individuals has a positive impact on the Chinese economy and society, promoting the development of local economies, the coordination of urban and rural development, and social progress. The government's policies and measures provide a broad space for the development of returnees, while further support and services are needed to achieve more sustainable and inclusive development.

The Republic of Korea (South Korea) has implemented various programs, policies, and initiatives to encourage and support the return to rural areas. One notable program is the "Return to Hometown" or "Back to Farm" program. Here are some key aspects of South Korea's rural return programs, policies, and their impacts:

Return to Hometown Program: The South Korean government has launched the Return to Hometown program to encourage individuals, particularly young people, to return to rural areas and engage in farming or rural businesses. The program provides financial incentives, training, and support for aspiring farmers or entrepreneurs, including access to land, agricultural technology, and business guidance.

Financial Support: The government offers financial assistance and subsidies to those who participate in the Return to Hometown program. This includes funding for starting agricultural businesses, purchasing farming equipment, and improving infrastructure in rural areas.

Education and Training: The government provides educational and training opportunities to enhance the skills and knowledge of those returning to rural areas. This includes agricultural training programs, workshops, and vocational education to help individuals adapt to farming practices and rural life.

Infrastructure Development: The government invests in rural infrastructure development to improve living conditions and attract people back to rural areas. This includes enhancing transportation networks, upgrading water and electricity supply systems, and improving healthcare and educational facilities in rural communities.

Economic Impacts: The return to rural areas in South Korea has brought positive economic effects. It has contributed to the revitalization of rural economies by increasing agricultural production, creating employment opportunities, and promoting rural tourism and local businesses. The influx of young, educated individuals has also led to innovation and modernization in farming practices.

Social Impacts: The return to rural areas has had positive social impacts in South Korea. It has helped to address the issue of aging populations in rural communities by bringing in younger individuals and families. It has also strengthened community ties, preserved local culture and traditions, and improved the quality of life in rural areas.

Environmental Conservation: The return to rural areas in South Korea has facilitated the adoption of sustainable farming practices and environmental conservation efforts. Many returnees are enthusiastic about organic farming, eco-friendly practices, and preserving natural resources, contributing to the overall environmental sustainability of rural communities.

Government Support and Collaboration: The South Korean government collaborates with various organizations, including local governments, agricultural cooperatives, and educational institutions, to provide comprehensive support for individuals returning to rural areas. This collaborative approach ensures effective implementation of policies and maximizes the impact of rural return initiatives.

Overall, South Korea's rural return programs and policies have had significant effects in revitalizing rural communities, boosting agricultural production, and improving the quality of life for returnees and local residents. These initiatives aim to address the challenges faced by rural areas, promote sustainable development, and create a balanced socio-economic development between urban and rural regions.

There are both differences and commonalities in the policies and impacts of China, Japan, and South Korea regarding rural return.

Differences:

Policy focuses and measures: Each country may have different policy priorities and implementation measures. China's rural return policy emphasizes entrepreneurship, employment, and economic development, offering support for startups, financial assistance, and housing arrangements. Japan's policy focuses on rural infrastructure development and social welfare, encouraging individuals to settle in rural areas. South Korea emphasizes rural development and agricultural entrepreneurship, providing financial support, education, training, and infrastructure improvements.

Economic conditions and development stage: These countries differ in terms of their economic conditions and development stages. China is a developing country, with a focus on rural economic development and reducing the urban-rural gap. Japan and South Korea are developed countries, with policies that aim to improve the quality of life, social welfare, and cultural development in rural areas.

Sociocultural background: Sociocultural background may influence differences in rural return policies and impacts. For example, Japan's strong community relationships and regional identity have a considerable influence on rural development and social interactions. South Korea's rural return policy may be influenced by traditional agricultural culture and family values.

Commonalities:

Promoting rural development: All three countries have policies aimed at promoting rural development and reducing the urban-rural gap. They encourage individuals to engage in agriculture, rural enterprises, or other forms of economic activities in rural areas through measures such as providing entrepreneurial opportunities, financial support, and infrastructure improvements.

Economic impact: The return of individuals to rural areas has positive economic impacts in all three countries. They bring back skills, knowledge, and experiences acquired in other regions, which contribute to the development of local industries, job creation, and economic growth.

Social impact: The return of individuals to rural areas has positive social impacts. They enrich the diversity of local societies, contribute to cultural exchange, and promote social progress and community development.

In conclusion, the rural return policies in China, Japan, and South Korea aim to encourage and support individuals in returning to their rural hometowns. They share the common goal of promoting rural development, have positive economic and social impacts, but differ in their policy priorities, economic conditions, and sociocultural contexts.

The differences and similarities in the policies and impacts of China, Japan, and South Korea regarding rural return can be attributed to several factors:

Economic conditions and development stage: The economic conditions and development stage of each country play a significant role. China, as a developing country, has a large rural population and faces challenges such as urban-rural income disparities and rural poverty. Therefore, its rural return policies may focus more on entrepreneurship and economic development. On the other hand, Japan and South Korea, as developed countries, may prioritize improving the quality of life and social welfare in rural areas.

Policy priorities and goals: Each country may have different policy priorities and goals based on their specific social, economic, and cultural contexts. These priorities are influenced by factors such as government agendas, social needs, and public opinions. For example, Japan places importance on regional revitalization and maintaining vibrant rural communities, while South Korea emphasizes agricultural development and rural entrepreneurship.

Sociocultural factors: Sociocultural factors, including traditions, values, and community structures, can shape the policies and impacts of rural return. For instance, Japan's strong community relationships and cultural attachment to regional identity influence their approach to rural development. South Korea's agricultural heritage and emphasis on family values may influence their policies related to rural entrepreneurship.

Learning from each other: These countries may also learn from each other's experiences and best practices in rural development. They may exchange ideas, policies, and strategies through international cooperation and collaboration, leading to shared approaches and commonalities in some respects.

Overall, the differences and similarities in rural return policies and impacts are a result of a range of factors, including economic conditions, policy priorities, sociocultural influences, and the exchange of knowledge and experiences. Each country tailors its policies to address specific challenges and goals, while also drawing inspiration from successful practices in other countries.

The effects of rural return policies on environmental protection can vary based on their design and implementation. Here are some potential impacts:

Urban-rural migration and resource consumption: Rural return policies that encourage people to return to rural areas can help reduce urbanization pressures and alleviate resource consumption in cities. This can have a positive effect on environmental sustainability by reducing the strain on urban infrastructure and natural resources.

Land use and conservation: Rural return policies that focus on agricultural development and revitalization of rural areas can promote sustainable land use practices. This may include measures such as land conservation, afforestation, and protection of natural habitats, which can contribute to environmental conservation and biodiversity preservation.

Sustainable farming practices: Policies supporting rural entrepreneurship and agricultural development may encourage the adoption of sustainable farming practices. This can include organic

farming, agroecology, and conservation-oriented agricultural techniques that reduce the use of chemical inputs, preserve soil health, and minimize environmental pollution.

Environmental education and awareness: Rural return programs can provide opportunities for environmental education and awareness initiatives in rural communities. This can lead to increased understanding and appreciation of environmental issues, promoting eco-friendly behaviors, and fostering a culture of environmental stewardship.

Green infrastructure and renewable energy: Rural return policies can prioritize the development of green infrastructure and promote the use of renewable energy sources in rural areas. This can include investments in renewable energy projects, energy-efficient technologies, and the establishment of eco-friendly infrastructure like green buildings and sustainable transportation systems.

However, it is important to note that the actual environmental impacts of rural return policies will depend on several factors, including the specific measures implemented, the scale of implementation, and the level of commitment to sustainability goals. Monitoring, evaluation, and enforcement mechanisms are crucial to ensure that environmental protection is effectively integrated into rural return initiatives.

Chapter 8   Conclusions and Prospects

8.1 Achievements

This research aimed to investigate the interaction between individuals' pro-environmental behaviors and mobility, bridging the gap in understanding the relationship between urbanization and environmental protection at the micro scale. To achieve this, the study focused on China, South Korea, and Japan, representing a developing country and two developed countries in Asia. The research extensively examined population mobility from rural to urban and urban to rural areas in these countries. Additionally, pro-environmental attitudes and behaviors were compared and analyzed across different contexts. By conducting this comparative analysis, the study aimed to provide valuable insights into the interplay between population mobility and pro-environmental behaviors in diverse settings.

Chapter 1: In this chapter, the background of the research was described, emphasizing the significance of studying the interaction between mobility and pro-environmental behaviors. The research aims to fill the gap in understanding urbanization and environmental protection on the micro scale.

Chapter 2: The existing works and initiatives in the field were reviewed, and logistic regression was identified as the primary method used to uncover the connections between dependent variables and other factors in each case.

Chapter 3: Through the analysis of the general social survey data from China in 2018, the research discovered that rural-urban mobility increases people's willingness to pay for quality air. However, it does not affect their willingness to pay for renewable energy. The disparities between rural and urban areas in China were considered, and the significance of urban living experience in influencing willingness to pay for quality air was highlighted. Encouraging rural to urban movement was found to have implications for pro-environmental behaviors.

Chapter 4: In this chapter, the analysis focuses on respondents' willingness to protect the environment in 2014 and 2021. Additionally, their recycling behavior in 2021 is analyzed and compared with their willingness. The chapter also examines their willingness to return to rural areas and their favorability towards migration policies from urban to rural areas. The respondents' opinion on government spending on the environment is measured to assess their environmental concern in 2014, 2018, and 2021.

The findings reveal that the willingness to return to rural areas is not significantly connected to environmental protection attitudes. However, their support for returning to rural areas is positively related to their attitudes towards environmental protection.

The willingness to pay for environmental protection is found to be connected to individuals' recycling behavior. Different factors influence individuals' willingness, while behavior is influenced by fewer factors.

The respondents generally show a high level of support for government spending on the environment. Over the years, their concern about environmental threats has increased. However, their willingness to pay for environmental protection has not increased accordingly.

These findings provide valuable insights into the relationship between individuals' attitudes, behaviors, and policy support related to the environment. They highlight the complex dynamics at play and contribute to a deeper understanding of the factors influencing pro-environmental behaviors.

Chapter 5: This chapter focuses on examining the respondents' use of eco-products and identifying the factors that are correlated with their usage. The findings reveal that the most connected factor to eco-product usage is the type of house. Users living in detached houses are more likely to use eco-products. Additionally, being married and belonging to a high-income family are associated with higher eco-product usage. Interestingly, there is no significant difference in eco-product usage between rural and urban areas, suggesting that mobility does not have a direct impact on the results.

However, the age of individuals using eco-products does show a tendency, with those younger than 40 having a higher chance of using eco-products. This indicates a potential generational difference in eco-product adoption.

Furthermore, the study observes a trend of people migrating from urban to rural areas, particularly from megacities. This demographic shift may contribute to an overall increase in eco-product usage.

Overall, these findings shed light on the factors influencing the use of eco-products and provide insights into the potential demographic patterns and trends associated with eco-product adoption.

Chapter 6: This chapter presents a comparative analysis of the situations in China, South Korea, and Japan. The analysis is conducted by comparing various factors such as urbanization rate, human development index, migration ranking, and policy differences between the three countries. By homogenizing the data and conducting a comprehensive assessment, the study identifies both similarities and differences among the countries.

The urbanization rate provides insights into the level of urban development in each country, while the human development index reflects the overall well-being and living standards of the population. Migration ranking helps to understand the patterns and trends of population mobility, while policy differences highlight the varying approaches and measures taken by each country in relation to population mobility and environmental protection.

Through this comparative analysis, the study aims to identify commonalities and differences in the relationship between population mobility and pro-environmental behaviors among the three countries. By considering the unique characteristics and contexts of each country, the analysis contributes to a deeper understanding of how different levels of development and diverse mobility systems influence individuals' pro-environmental behaviors.

By examining these similarities and differences, policymakers can gain valuable insights for designing effective environmental protection policies that are tailored to the specific needs and challenges of each country. Ultimately, this chapter contributes to a broader understanding of the interplay between population mobility and environmental sustainability in different socio-economic contexts.

Chapter 7: In the final chapter of this study, Chapter 7 provides a comprehensive summary of the research findings and discusses the limitations encountered during the study. It also identifies areas for further research and exploration in the field.

The chapter begins with a recap of the main findings from each case study conducted in China, South Korea, and Japan. It highlights the key insights gained regarding the relationship between population mobility and pro-environmental behaviors, such as attitudes, behaviors, and policy support. The chapter emphasizes the significance of understanding the complex dynamics between mobility and environmental sustainability, particularly in different country contexts.

Next, the limitations of the study are acknowledged. These limitations may include sample size, data availability, and potential biases. The chapter discusses how these limitations may have influenced the research findings and suggests ways to address them in future studies. Additionally, any challenges or constraints faced during the research process are acknowledged and discussed.

Lastly, the chapter outlines potential avenues for further research. It identifies areas where more in-depth investigation is needed to enhance the understanding of the relationship between population mobility and pro-environmental behaviors. Suggestions may include exploring the role of cultural factors, economic considerations, or policy interventions in shaping individuals' attitudes and behaviors. The chapter encourages future researchers to build upon the findings of this study and expand the knowledge in this important area of research.

Overall, Chapter 7 serves as a conclusion and discussion of the study, summarizing the key findings, acknowledging the limitations, and providing recommendations for future research. It underscores the importance of continued exploration and understanding of the interaction between population mobility and environmental sustainability to foster effective environmental protection

policies and achieve sustainable development goals.

The significance of this study lies in its investigation of the relationship between population mobility and environmental outcomes, aiming to gain a deeper understanding of this interaction at the micro level and its implications. With the significant increase in human mobility due to factors such as immigration, urbanization, and tourism, population mobility has become a crucial phenomenon in contemporary society. However, previous research has predominantly focused on macro-level analyses, exploring the relationship between urbanization and environmental issues like carbon emissions, while studies examining the connection between individual environmental attitudes, behaviors, and policy support and population mobility remain limited.

By conducting a comprehensive analysis and comparison of China, South Korea, and Japan, this study addresses this research gap. Through case studies and comparative analyses, this study gains valuable insights into the complex interplay between population mobility and individual environmental attitudes, behaviors, and policy support. Additionally, this research reveals both commonalities and differences among the studied countries, offering valuable insights for the development of effective environmental protection policies.

The significance of this study extends to contributing to the global achievement of environmental sustainability goals. By deepening our understanding of the relationship between population mobility and individual environmental sustainability, this study can enhance environmental awareness, encourage pro-environmental behaviors, and develop relevant policy support. This is crucial for addressing current global environmental challenges and achieving sustainable development. Furthermore, this study provides a foundation for future research, guiding further exploration of the relationship between population mobility and environmental sustainability, expanding knowledge boundaries, and providing support for future decision-making and practices.

This study is significant as it explores the connection between population mobility and environmental outcomes. By examining individual environmental attitudes, behaviors, and policy support in the context of China, South Korea, and Japan, it fills a research gap at the micro level. The findings provide valuable insights for the development of effective environmental protection policies and contribute to global sustainability goals. Additionally, this study lays the groundwork for future research and decision-making in the field of population mobility and environmental sustainability.

8.2 Limitation and Further Research

Limitations: The national survey data used in this study may have missing responses, which could result in incomplete representation of the entire nation. Additionally, the absence of geographical information limits the analysis of migration patterns and their impact on the study. Moreover, the lack of data harmonization poses a challenge in comparing and integrating different datasets.

Future work: To overcome these limitations, future research should address the aforementioned issues. This can be achieved by implementing targeted questionnaires and conducting longitudinal surveys to capture changes in attitudes and behaviors over time. It is also essential to evaluate the effectiveness of interventions and policies aimed at promoting sustainability. Furthermore, exploring the dynamic nature of urbanization, environmental attitudes, and sustainable practices will provide valuable insights for guiding decision-making processes in the future.

There are several limitations regarding the statistical data used in this study. Firstly, the data utilized in this research is derived from a national comprehensive survey. While this survey is advanced and employs sampling techniques to represent the perspectives of a large portion of the population, it is important to note that questionnaires do not achieve a 100% response rate. This means that there is a portion of the population who did not complete the questionnaire, potentially representing a specific demographic or characteristic. As a result, the overall questionnaire may have missing data, which may not fully reflect the national level.

Secondly, the data from various countries lack information regarding the geographical location of the respondents, as this information is often omitted in publicly available data. When analyzing

migration patterns, the absence of specific location data for respondents can slightly impact the overall results. Similarly, some textual information or response options may be missing from the publicly available data, leading to incomplete analysis.

Although the study addresses changes occurring after the pandemic, it primarily relies on statistical data from 2018. Consequently, the statistical results only reveal the situation at that particular time and can provide insights into the current circumstances but may not entirely reflect the present context.

It is crucial to acknowledge these limitations when interpreting the findings and to recognize the need for more up-to-date and comprehensive data to capture the dynamic nature of the phenomenon under investigation. Further research should strive to address these limitations and incorporate more recent and diverse data sources to obtain a more accurate understanding of the topic.

In future research, it is essential to address the limitations mentioned earlier and overcome them. One potential approach is to develop more targeted questionnaires and conduct longitudinal surveys. This would allow researchers to track changes over time and capture the evolving perspectives of individuals.

Particularly, in light of the global pandemic that has swept across the world, it is important to investigate how people's awareness of the environment, climate, and shared habitat may have been further enhanced. It is possible that the experience of temporary lockdowns in different countries has influenced individuals' perceptions and behaviors, leading to the adoption of new adaptive strategies or even setbacks in environmental consciousness.

Additionally, future research can explore the impact of various interventions and policies aimed at promoting sustainable practices and mitigating the adverse effects of urbanization. This could involve analyzing the effectiveness of initiatives such as renewable energy incentives, green infrastructure development, and public awareness campaigns. By evaluating the outcomes of these interventions, policymakers and stakeholders can make informed decisions to guide sustainable urban development.

Furthermore, integrating qualitative research methods, such as in-depth interviews and focus groups, can provide a deeper understanding of individuals' motivations, attitudes, and experiences related to urbanization and its environmental implications. Such qualitative insights can complement quantitative data and offer rich contextual information that enhances the overall understanding of the subject.

Reasons for relocation and its influence should be further researched.

In conclusion, future research should strive to address the identified research gaps and further explore the dynamic nature of urbanization and its impacts. By employing diverse research methodologies and considering the influence of global events, researchers can gain valuable insights into the evolving relationship between urbanization, environmental attitudes, and sustainable practices. This knowledge can inform policies, interventions, and decision-making processes aimed at fostering more sustainable and resilient urban environments.

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