RESEARCH PAPER

PERCEPTIONS OF VILLAGERS ON ENVIRONMENTAL DEVELOPMENT OF RURAL CHINA IN THE CONTEXT OF RAPID URBANIZATION

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ABSTRACT. In the context of rapid urbanization, pollution and ecological degradation problems have frequently shown up and influenced environmental sustainability of rural China in the past decades. The rural residents have begun to pay attention to local environment protection, and researchers have been taking public perceptions into regional planning. However, comprehensive studies on the perceptions of villagers on rural environment development still remain less.

This research carried out a face-to-face questionnaire investigation of 187 villages and ten residents from each village at a nationwide scale of China. The investigated village committee managers and residents were interviewed by asking the questions including the existing environmental problems, the targets of rural environment development, the ways to achieve these targets and the willingness to pay for pollution control. The results showed that household waste pollution, air pollution and pesticides pollution etc. are top concerned problems. A big proportion (65%) of the interviewed residents chose "environment with good quality for health" as their preferred living environment. While, more than half of the interviewed village managers took "green villages with sustainable agriculture" as their village development targets. And more than 50% of the interviewed residents advocated to increase the forest coverage rate to mitigate the degeneration of rural ecosystem services. As well, most residents strongly support rural green development and are willing to pay for pollution control. Our findings may provide new insights into rural environment development and rural revitalization in the context of rapid urbanization.

KEYWORDS: green development, environment sustainability, public participation, rural revitalization, urbanization

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INTRODUCTION

China is a traditional agricultural country confronting rapid urbanization. The seventh national census in 2020 showed that the rural population covered 36.11% of the total population in China. Compared with the sixth national census in 2010, the proportion of urban population has increased by 14.21 percentage points. Rural development of China matters for the prosperity of the whole country. Urban-rural integration strategy provided a potential way to narrow the development gap between urban and rural areas, therefore to change the dual structure between urban and rural areas (Jing and Zhang 2003; Shi 2013). However, at the present stage, the rural natural environment is confronting rapid changes, some of which lead to the imbalance of the existing rural natural ecosystems and serious destruction of some rural settlements locally (Zhang 2022).

Both environmental pollution and ecological degradation of rural areas in China have accumulated in the past decades. The first national pollution census report published in 2010 showed that the emissions of rural pollutants has accounted for half of the total of the whole country, in which COD (chemical oxygen demand) accounted for 43%, total nitrogen accounted for 57% and total phosphorus covered 67% (The Environmental Protection Agency 2010). The National Environmental Bulletin summary between 2010 and 2013 showed that the rural ecological and environmental problems of China mainly concentrated in water pollution, soil pollution and cultivated land degradation.

These problems are caused by livestock and poultry pollution, rural industrial pollution, rural household waste pollution, agricultural non-point source pollution and transfer of urban-rural pollution etc. (The Environmental

Protection Agency 2011; The Environmental Protection Agency 2012; The Environmental Protection Agency 2013; The Environmental Protection Agency 2014). The rural ecological and environmental deterioration has already affected the agricultural production and daily life of the rural residents seriously, even resulting in occurrence of cancer village phenomenon (Liu 2013).

The perceptions of the local residents on the environment and their behaviors might produce dramatic effects on rural environment protection (Zhang et al. 2016). Environmental behaviors of rural residents mediated by their perceptions on environmental development therefore influence the environmental protection practices (Tian et al. 2011). Scholars generally believe that the multi-governance model is the inevitable choice of rural environment pollution control, and the public should be involved in rural environment management (Xiao and Zhu 2016). Thus, to understand and mitigate degradation of the rural ecological environment in the context of urban-rural integrative development and rapid urbanization, it is crucial to make sense of the perceptions of villagers on the future of the rural environment.

Integrating public perceptions in decision making can improve the management efficiency (Donaldson-Selby et al. 2007; Kobori and Primack 2003) and provide more people with opportunities of realizing their demands (Lestrelin et al. 2011). As early as in the "Rio Declaration on Development", integrating public perceptions via public participation mechanism has been taken into account as an important prerequisite for sustainable development (The United Nations, 1992). Later, the role of integrating public perception in decision-making has been highlighted frequently (Macnaghten and Jacobs 1997; Meadowcroft 1997). Public perceptions have significant positive impacts on villagers' cooperative management of household waste, and the local governments should enhance and internalize villagers' perception (Lin et al. 2021). As well, the emerging successful models of new villages and beautiful villages guided by central and local governments and driven by communities demonstrated the importance of involving local residents during rural environment protection (Gao et al. 2020).

Recently, researchers and local officers of China have been taking public perceptions into regional planning in various ways. However, the perceptions of residents on rural development and environment planning sometimes are less considered (Gu et al. 2013). It has resulted in occurrence of some serious conflicts among rural residents, decision makers and other stakeholders (Wu and Wang 2013). Actually, the perception of villagers may provide very different perspectives on rural development and environmental protection. As well, their experiences with the living surroundings may confer them valuable wisdom to solve the conflicts between development and environment protection. Thus, it is critical to understand the perceptions of rural residents on the existing and potential environment problems under the context of rapid urbanization.

To understand the perceptions of rural residents and local managers on the existing and potential problems as well as possible solutions, we investigated 1867 residents and 187 managing committees from 187 villages by face-to-face questionnaire interviews. By analyzing the perceptions of the villagers and managers on rural development and environment protection, we try to answer the following three questions. (1) What are the existing perceptible serious environmental problems in rural areas of China? (2) From the perspectives of local villagers, what are the preferred alternative targets of rural environment development and the practical ways to achieve these targets? (3) What is the willingness of villagers to participate in the future rural environment improvement?

MATERIALS AND METHODS

Design of the interview questionnaire

In order to obtain reliable data, we used an on-site face-to-face interview questionnaire. The questionnaire included two parts and 25 questions: 15 questions for residents and 10 questions for village managers (director or vice director of the village administrative committee) (See Appendices Questionnaire).

The questionnaire consists of questions of four aspects including local existing ecological environment problems, alternative targets of rural environment development, possible ways to achieve the targets of rural environment development and the willingness of villagers to involve into rural environment improvement.

Sampling strategy of villages and residents

We chose 187 villages of 24 provinces, cities and autonomous regions from the Northeast, North, East, Central, South, Southwest and Northwest part of China for investigation during January to October of 2014 (Fig. 1). On average, six to nine villages from each province were randomly sampled for the investigation. The sampled villages included large settlements close to the near cities, large villages close to the towns and small hamlets far from the towns. One manager and five to ten randomly selected residents of each village have been interviewed and questioned. Totally 187 village managers and 1867 residents were sampled. In order to guarantee that the questionnaires can reflect the real condition of each region, the interviewees with different gender, age, career were involved (Table 1).

To control the consistency of the questionnaire process and to avoid the influences of personal differences among interviewers, a training workshop and a pilot survey has been organized in January of 2014. And an instant communication mechanism has been established and worked until the end of all surveys. The trained interviewers completed questionnaires for managers and residents by face-to-face interview and each interview lasted about ten minutes. Considering some respondents are poorly educated, part of the questions was answered by the respondents and recorded by the interviewers. At the same time, the relationships with respect and trust between interviewers and interviewees were established, to ensure the data are true and correct.

Data analysis

All the collected data were compiled using Microsoft Excel (ME). The descriptive statistics, bar plot and pie plot on categorical variables were done using Origin2016. And the distribution map of sampled villages was drawn using Geographic Information System (GIS).

RESULTS

The existing problems of rural ecological environment perceived by villagers

The results showed that household waste pollution, air pollution, water pollution, soil pollution, vegetation degradation and farmland occupation etc. are common concerns of the managers and residents in rural areas.

Table 1. The proportional composition of the interviewed residents by gender, age, education and profession

Characteristics	Categories	Proportion (%)
Gender	Female	42
	Male	58
Age	Under 18	0.3
	18-64	94
	65 and more	6
Degree of education	Under middle school	61
	High school	27
	Junior college	6
	Bachelor degree	12
	Master and Ph.D degree	0.4
Profession	Farmer	45
	Worker	27
	Village manager	9
	Teacher	5
	Doctor	2
	Priviate business owner	10
	Civil servant	2
	Others	0.7

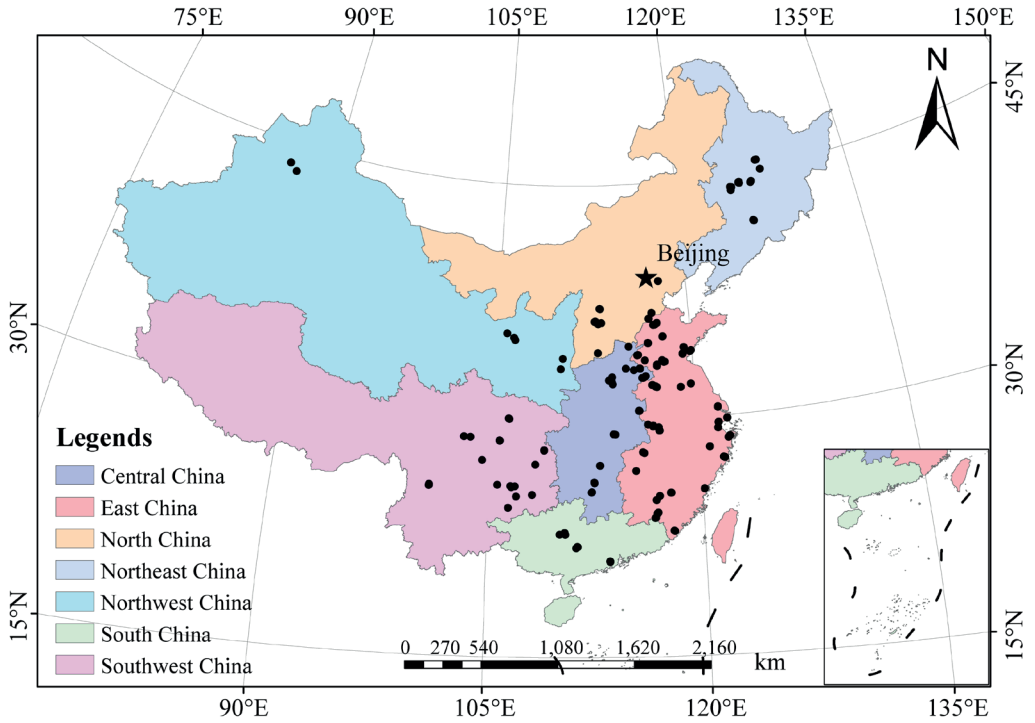

Fig. 1. The map of the locations of 187 sampled villages using solid black dots

Amongst the household waste pollution, air pollution, pesticides pollution, water pollution, straw burning and livestock and poultry manure etc. ranked in turn (Fig. 2).

The percentage values indicated the proportion of interviewed residents, who choose the option as the most serious existing environmental problem (Fig. 2).

Household waste pollution took the top problem the villagers claimed, particularly the kitchen organic waste. The average annual production of kitchen organic waste reaches to 27 kg per household (Fig. 3). Most kinds of household waste could be recycled and reused such as glasses, paper, metal waste, hard plastic and cans etc. However, the interviewees seriously claimed the kitchen

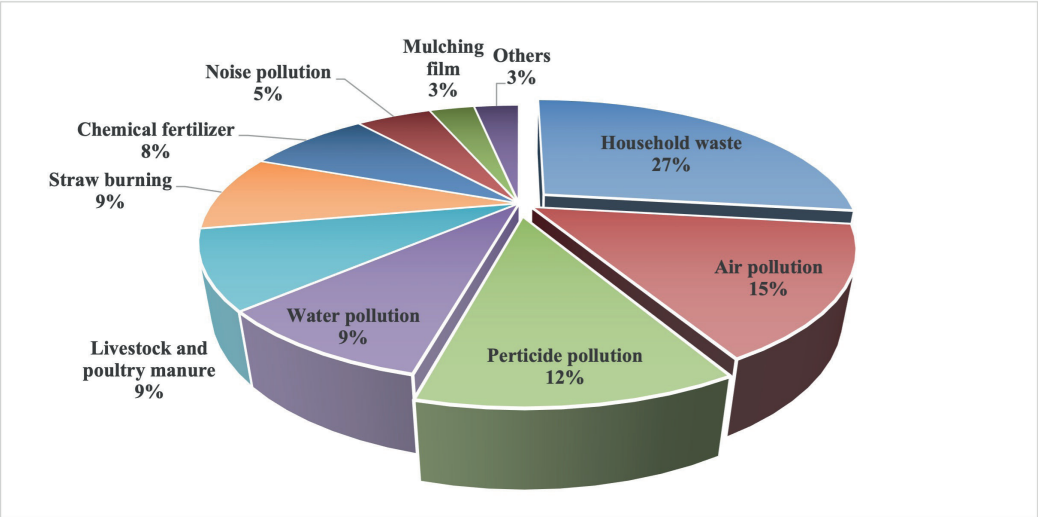

Fig. 2. The pie chart of top ten existing environmental problems from perceptions of residents

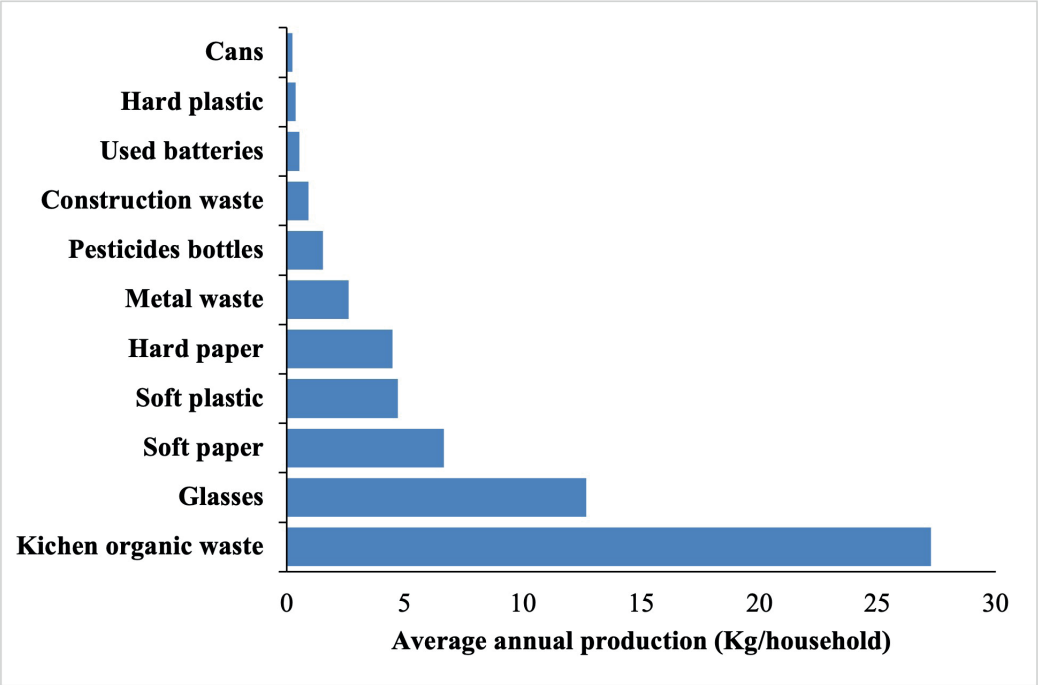

Fig. 3. The bar chart of average annual production (Kg/household) of different kinds of household wastes of the sampled villages

organic waste mixing with soft plastic bags and packages, because the organic waste is easy to get stink and the soft plastics is difficult to degrade.

Amongst the household wastes, the average annual production of kitchen organic waste took first place (Fig. 3). As the second concerned environment problems, air pollution was frequently claimed by interviewees (Fig. 2). And 97% of the interviewees thought that the straw burning during harvesting seasons, coal burning for heating in winter and industrial pollution contribute much to the air pollution in the rural areas. Otherwise, water pollution took the top fourth existing environmental problems (Fig. 2). 96% of interviewees said that surface water pollution is "common". The lack of basic sewage infrastructure is one of the main reasons. 73% of the investigated villages have no sewage treatment facilities, all their sewage discharge into rivers or ponds directly without any treatments. The household sewage discharge and agricultural non-point source pollution (ANPSP) were considered to contribute much more to the surface water pollution.

From the perceptions of the interviewed village managers, the existing environmental problems are interacted with each other and the pollution sources are various. The surface water and soil share many pollution sources such as household waste, sewage and ANPSP. Amongst the interviewee, 99% of them think that pesticides, chemical fertilizer and herbicides are the main pollution sources of soil. Most of the pollutants in soils could be washed into the surface water and ground water by rain runoff.

Besides the physical environment, the degradation of ecosystem structure, function and their services are a common concern of the interviewees. The interviewees, who thought these phenomena are visible and perceptible deterioration of rural ecological environment, commonly claimed that farmland occupied by industries and urban, deforestation and species reduction.

The perceptions of villagers on the alternative targets of rural environment development

From the perceptions of the interviewed residents, their preferences on the living neighborhood environment were concentrated. A big proportion (65%) of the interviewees chose "environment with good quality for health" as their preferred living environment. The option "environment with good quality for health" means that

the environmental quality meets basic requirements of "Guidelines for the construction of beautiful village (GB/T 32000-2015)". Whereas, only 17% of the interviewees chose "convenience for employment" and 9% of them chose "big houses" or "go to school with convenience". It indicates that the value and recognition of villagers on environmental quality are increasing.

Concerning the alternative development targets of the villages, more than half of the interviewed village managers took "green villages with sustainable agriculture". As well, "ecological villages with tourism" and "rich villages with industries" also were favorite targets of more than ten percent of the village managers. A few interviewees chose villages with labor output or move to the cities nearby as their development targets (Fig. 4).

The pie chart showed that most village managers choose "Green villages with sustainable agriculture", but few village managers choose "Villages with Labor output" or "Keep the status quo" (Fig. 4).

To achieve the green targets of rural environment development, the interviewed residents and village managers have different perspectives. Overall, 51% of the interviewed residents prefer to "move to the combined new neighborhoods with apartments". The combined new neighborhoods with apartments usually are equipped similarly to urban neighborhoods but located in places near the villages. However, there was only 37% of the village managers took this option. 39% of the village managers chose to "live in the original neighborhoods with environmental improvement".

Otherwise, the preferred possible ways of residents to achieve the environmental development targets were various among sampled regions. To the option "combine villages into new neighborhoods", a regional strategy aiming at radically improving the rural living environment and enhancing rural environment infrastructure, the residents of the North and Northwest of China more like to "move to the combined new neighborhoods with apartments" than the residents do from other regions. Comparatively the residents from East and Southeast China prefer to "live in the original neighborhoods with environmental improvement" (Fig. 5).

The seven regional parts of China were referred to as the Northwest, Southwest, South, Central, East, North, and Southeast respectively. The four alternative options to achieve the rural environment targets include (A) Move to the cities nearby; (B) Move to the new combined neighborhoods with apartments; (C) Live in the original neighborhoods with environment improvement; and (D) Others (Fig. 5).

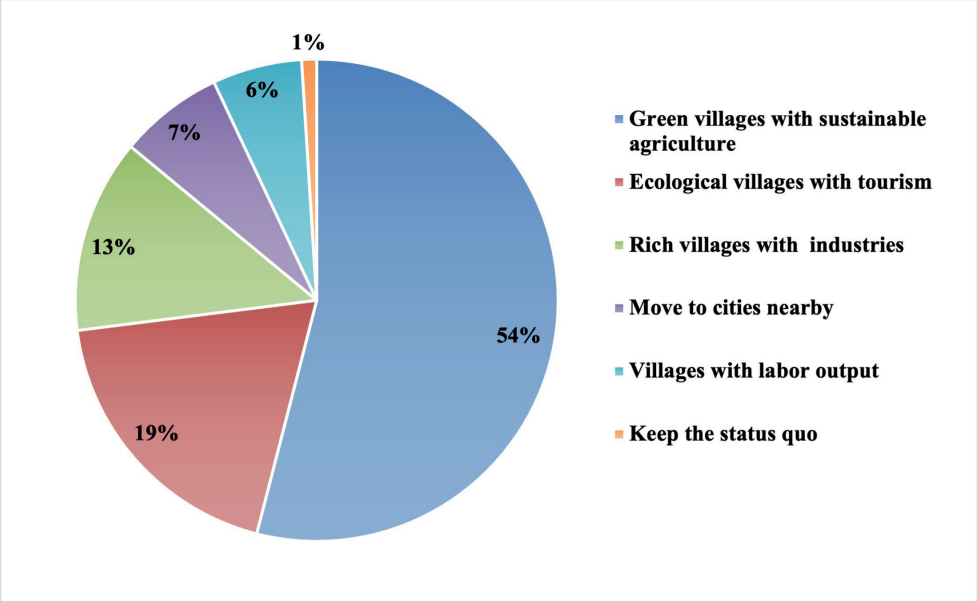

Fig. 4. The pie chart of proportions of village managers took alternative targets of rural environment development

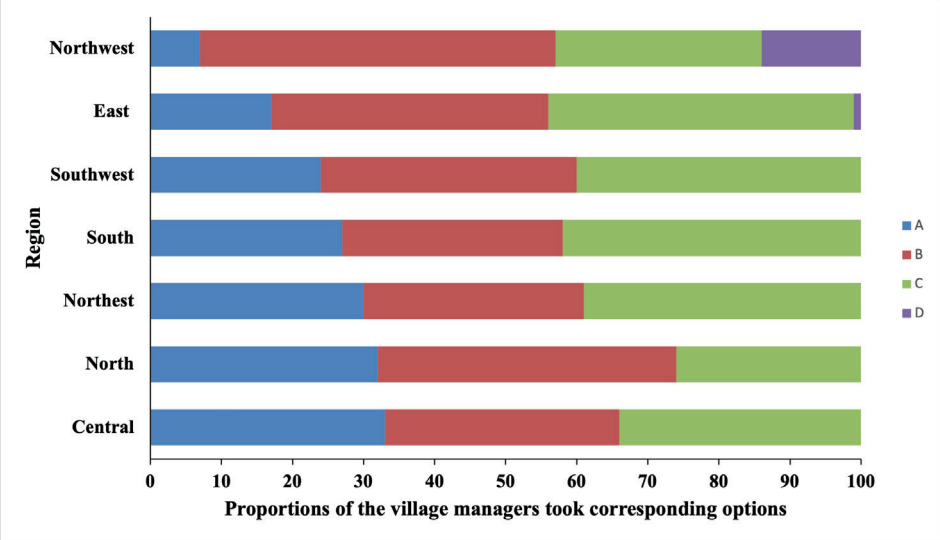

Fig. 4. The stack bar chart of the proportions of the interviewees choose respective possible ways to achieve the rural environment targets

To cope with the ecological environment degradation problems, more than 50% of the residents from all regions advocated to increase the forest coverage rate, which is expected to mitigate the degeneration of ecosystem services. However, the perceptions of the residents on other prior approaches differed among regions. The residents from Southwest China prior to restoring degraded mines, while the residents from South China thought limiting groundwater exploitation is more urgent instead. Otherwise, more than 20% of the interwiewees from Northwest, East and Central part of China highlighted the importance of choosing safe areas for construction of the combined new neighborhoods to avoid possible natural and man-made disasters.

The willingness of villagers to involve into rural environment improvement

A great proportion of villagers are willing to be involved in the related activities of rural environment improvement in various ways. Fifty percent of the residents are willing to "participate in the related activities as volunteers", 37% of them tend to "share environmental investment appropriately", and 8% of them choose to give "oral support", only 5% of them choose "no concern". Most of the residents prefer to pay for treatment of household waste and sewage according to production (Table 2). As well, the residents are willing to pay for professional environmental management firms. As well they are willing to transit to use clean energy replacing fossil fuels at a same or lower price. The monthly cost amount the residents are willing to pay for environment management and improvement is various. Most of the residents choose to calculate the payments by the amount of garbage/sewage or by the number of people per household. Some residents are willing to pay 10-30 RMB per household per month, and a small number of them choose to pay more than 30 RMB per household per month (Table 2). Otherwise, a few of the residents are not willing to be charged.

To tackle the ecological environment problems and greening the villages, most of the village managers would initiate some planning and practical projects, combining the technical assistance and money investments from various stakeholders and bodies. To greening the neighborhoods, 70% of the residents hope to select "native ornamental plants with economic value" or "local plants can easily survive" as greening plants, 23% of them choose multifunctional "crops, vegetables and fruit trees" and other 9% of them choose "exotic and rare plants". That indicated the residents have their own understanding of rural greening and hope to participate in the process of design and practice.

DISCUSSIONS

The existing problems of rural ecological environment perceived by villagers

Our results showed that the household wastes, air pollution and pesticide pollution took the top three existing environmental problems. That means these problems are raising its importance compared to water and soil pollution, which were frequently recognized as the most serious environmental problems in previous studies (Chen 2007; He et al. 2008; Wang et al. 2008) as well as the national environmental bulletins. (The Environmental Protection Agency 2011; The Environmental Protection Agency 2012; The Environmental Protection Agency 2013; The Environmental Protection Agency 2014).

There are lots of publications demonstrating the critical impacts of household waste littering on the living environment of rural residents, because the kinds and production of rural household wastes have been increasing rapidly in the past decades (Guan and Qiu 2008; Wang et al. 2012). Disorderly stacking of household wastes, open burning, surrounding villages with garbage can be seen frequently in rural areas, which not only breeds germs and spreads diseases, but also pollutes land, groundwater and surface water (Jia et al. 2019). And our survey showed a high average household waste production per year and amongst the kitchen organic waste and soft plastics are most problematic. The dropped organic wastes mixed with soft plastic packages around curbsides, roadsides and riversides can result in environmental deterioration such as smell, diseases and secondary water pollution etc. (Beylot et al. 2013; Manfredi et al. 2010; Thomsen et al. 2012).

The air pollution was emphasized by 15% of residents in the survey. Currently, air pollution is seriously harmful to the environment and people's health around the world (Chen 2021). Although urban air pollution poses a serious health problem for people, rural air pollution is higher ($PM10 \geq 20 \mu g/m^3$ annual mean, $PM2.5 \geq 10 \mu g/m^3$ annual mean) (Liu et al. 2020). The air pollution by straw burning in summer and by coal burning in winter is very common and frequently claimed (Hong et al. 2016; Jin et al. 2006; Mestl et al. 2007; Zhang et al. 2014). Even the serious smog can occur in rural areas combining with the air pollution events from industries and cities at large scales (Zhou et al. 2015). These air pollution events also lead to more attention of villagers to the problem. (Gilbert-López et al. 2012; Wang et al. 2015; Zhou et al. 2015)

The pesticide pollution was put forward by the interviewees, because they thought it is one of main pollutants remaining in food, drinking water and soil. The impacts of pesticides on food and drinking water safety have been reported by a lot of scientific and governmental reports (Gilbert-López et al. 2012; Yadav et al. 2015;

Table 2. The ways and monthly amount the rural residents are willing to pay for pollution control at neighborhood scale

Counting Approaches and monthly amount of payment for pollution control	Proportion of the residents choosing corresponding counting approach and monthly amount (%)	
	living garbage	Sewage
Calculated by the amount of garbage/sewage	39	40
Calculated by the number of people per household	34	35
10-30 RMB per household per month	25	23
More than 30 RBM per household per month	2	2
Total	100	100

Srivastava et al. 2019; Ridoutt et al. 2022). That means there is already a common view on the pesticide pollution among rural residents, academic communities and governmental agencies.

Otherwise, the interviewed villagers not only pointed out the existing serious environmental problems, but also highlighted the interactions between these problems including contaminants transportation between living environment, water and soil environments. That means the villagers are strengthening their awareness and concerns on the environmental problems (Duan et al. 2014; Li et al. 2012). It is different from a dominant point that the rural residents have poor awareness and concerns on the environmental problems (Hong 2005; Ma 2005; Zhu 2001).

The perceptions of villagers on the alternative targets of rural environment development

Our result showed that neighborhoods with good environmental quality are favorite choices rather than "big houses" and "close to workplace and/or school". That means the rural residents already have a clear recognition of the value of a healthy environment and a strong desire to improve their living environment. The recognition and desire for a healthy living environment have been reported worldwide across urban and rural areas (Lee and Kim 2015). Moreover, the village managers have a similar perspective on the environmental development targets of their villages. The "green village with sustainable agriculture" and the "ecological village with tourism" are their top preferences. The values of interviewed village managers on rural environment development are similar with the targets of some "green villages" and "eco-villages" (Hu and Wang 1998; Takeuchi et al. 1998; Wenxia 2011; Xue 2014), as well as some suburb and urban "green communities" (Zhou et al. 2011). This informs that the rural areas of China are getting ready to transit to a green future. Actually, there already is a great number of "green villages", "ecological villages" and "beautiful villages" emerging (Duan et al. 2011; Hu and Wang 1998; Li and Miao 2011; Wu and Wu 2014).

To enhance the environmental infrastructure and improve living environment, the interviewed residents showed stronger willingness to "move to the combined new neighborhoods with apartments" than the villager managers. There are some potential reasons resulting in the difference. From the residents' side, they are encouraged by more and more emerging successful combined new neighborhoods and financial compensation from local governments (Hu et al. 2015; Qian 2015). Poverty and deprivation, for example, could be tackled through encouraging community development (Dinnie and Fischer 2020). From the managers' side, they might be worried about some problems during and after moving into the new neighborhoods, such as integration of land and administrative authorities, decrease of natural resources and its impacts on long-term sustainable development (Lin 2012; Shi 2008; Zheng and Ding 2013).

Otherwise, our results showed a regional pattern of village managers' perspectives on the strategy "combine villages into the new neighborhoods". Actually, all choices of the village managers were made based on maximizing the benefits and minimizing the costs. Therefore, it is understandable that the village managers from the North and Northwest China are more willing to move to the "the combined new neighborhoods with apartments", because their villages have lower income, worse living environment and stronger motivation to change the situation (Liu and Xu 2006; Xia 2002; Yuan 1985). However, the villages from the East and South China have relatively higher income, better living environment and infrastructures (Fu and Liu 2001; Guo and Wei 2012), thus the village managers there prefer to "live in the original neighborhoods with environment improvement".

The residents from different regions also showed different perceptions on how to cope with environmental degradation problems. It is consistent with the regional differences of the natural environment and its degradation. For example, the restoration of degraded mines in Southwest China was the prior problem of the interviewed residents; as well it has been highlighted frequently by local governments and existing studies (Chen et al. 2007; Hao and Jiang 2015; LEI and DUAN 2008; Wei 2002). Otherwise, many interviewed residents simultaneously took "increase forest coverage rate" as the top prior approach to restore the degraded environment. The residents are aware of the link between forest degradation and other environmental problems such as water resource shortage, air pollution, drought and flooding etc. (Zaimeche and Liu 1994; Fan et al. 2003; Zhao 1986). Definitely, forest protection and restoration should be put forward in the future rural environment improvement of China.

The willingness of villagers to involve into environment improvement

The interviewed residents showed strong motivation to participate in rural environment improvement and willingness to share environmental investment. It is a big encouragement for the local governments and some environmental enterprises. For a long time, the rural residents were considered lacking concern for their living environment and not willing to invest in environmental improvement (Yu 2014). Nowadays, the rural residents have raised their environmental awareness and desire along with advancement of their education and income (Nan et al. 2011).

Most of the interviewed residents prefer to pay for household waste and sewage treatment according to the amount of waste and sewage they produce monthly. In addition, this way is most popular worldwide, particularly in most cities and towns (Dahlén and Lagerkvist 2010). We found that some residents prefer to pay according to household size, because their village administrations charge a fee for water supply that way to avoid the cost for installing water meters. And it is practical for some remote villages' lack of technical and financial support. Whether in urban or rural areas, it is a common approach to charge a fee for household waste according to households with or without considering family size (Li 2009). Overall, the approach to charge fee according to production might be the most effective, fair and acceptable (Park 2018; Miranda and Aldy 1998; Wertz 1976).

Most residents are willing to pay 10-30 RMB per household per month for waste and sewage treatment. 92.36% of farmers are willing to pay the related expenses of household waste treatment (Chen and Qian 2022). 73.38% of farmers are willing to participate in rural household waste treatment, and the average family willingness to pay is 13.14 RMB per household per month (Jia and Zhao 2019). It is slightly higher than the average monthly fee of an urban household (Cao 2010; Li 2009). However, the majority of organic waste sewage could be reused as resources for composting, anaerobic fermentation, irrigation etc. in situ or in a short distance (Alvarenga et al. 2015; Cesaro et al. 2015). Potentially it could cut the collection and treatment cost (Ratanatamskul et al. 2015).

Both the interviewed village managers and residents are motivated to cope with environment degradation problems and greening their villages. Moreover, they showed unique

views on selection of landscape plants. Their preferences on "native ornamental plants with economic value" and "native local plants" are different from the prevalence of pure ornamental plants and introduced plants in some new urban areas (Acar et al. 2007). Along with the transition of urban green space from artificial to natural styles (Wang et al. 2004), the green spaces of rural neighborhoods should take the perceptions of local residents into account and avoid simply urbanization.

CONCLUSIONS

Overall, household waste pollution, air pollution and pesticide pollution are the most concerned problems by the villagers. A big proportion of the interviewees chose "environment with good quality for health" or "green villages with sustainable agriculture" as their desirable living environment via various ways to achieve these targets. The expected environment quality of most rural residents is consistent with the environmental targets of "Guidelines for the construction of beautiful village (GB/T 32000-2015)". Meanwhile, sustainable agriculture is a practical way to achieve the environment targets for many villages. Most of the residents strongly support rural green development and are willing to pay for rural pollution control. And the village managers and residents have many valuable views on rural environment improvement. Thus, the perceptions of rural residents on green development are accordant with the national strategies of beautiful village construction and rural revitalization of China. The main findings may shed lights on green development of the rural areas in the context of rapid urbanization. The various perceptions of the villagers on rural environment development targets across regions implies that regionally diverse and adaptive strategies should be highlighted in future research.

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APPENDICES
Questionnaire

Part A Questions for the village residents

1. What are the most serious environmental problems influencing your life in rural areas? (Tick one please)

(A) Water pollution. (B) Air pollution. (C) Household waste pollution.
(D) Noise pollution. (E) Livestock and poultry manure. (F) Straw burning.
(G) Chemical fertilizer. (H) Pesticide pollution. (I) Mulching film. (J) Others.

2. Table for classification and output of various wastes of the interviewed resident' family

Type	Annual output (Kg)
Kitchen organic waste (leftovers, ort, etc.)	
Glasses (bottles for wine, cans, medicine, sauce, etc.)	
Hard plastic (packages, bottles, barrels)	
Soft plastic (used thin film, packages)	
Used batteries	
Livestock and poultry manure	
Toilet stool	
Straws, branches, leaves, etc.	
Waste fruits and vegetables in the fields	
Cans	
Soft paper	
Hard paper	
Metal waste	
Pesticide bottles	
Construction waste	

3. What is the trend of the changes of environmental quality status in your living area?

(A) Extreme improvement. (B) Extreme degradation. (C) No changes.

4. What are the serious ecological environment problems in your area? (Multiple-choice)

(A) Timber cutting. (B) Farmland occupation. (C) Disappearance of animals and plants.
(D) Other problems.

5. Where is your wastewater, such as washing and toilet water discharged to?

(A) Directly to the nearby river or ponds.
(B) To the river or ponds after being collected but without treatment.
(C) To the river or ponds after being collected and treated.

6. What are your preferences on the living neighborhood environment?

(A) Environment with good quality for health. (The environment quality meets basic requirements of basic requirements of "Guidelines for the construction of beautiful village (GB/T 32000-2015)")
(B) Big houses.
(C) Convenience for employment.
(D) Go to school with convenience.

7. If possible, what is your most preferred way to achieve the rural environment targets?

(A) Move to the cities nearby.
(B) Move to the new combined neighborhoods with apartments. (The combined new neighborhoods with apartments usually are equipped similarly to urban neighborhoods but located in places near the villages)
(C) Live in the original neighborhoods with environmental improvement.
(D) No changes.

8. What is your first option to cope with the environmental degradation problems and avoid natural disasters?
(A) increasing the forest coverage rate.
(B) Restoring degraded mines.
(C) Limiting groundwater exploitation.
(D) Choosing safe areas for construction of the combined new neighborhoods.
(E) Others.
9. What is your willingness to be involved in rural environment improvement?
(A) Share environmental investment appropriately.
(B) Participate in the related activities as volunteers.
(C) Oral support.
(D) No concern.
10. What is your preferred way to manage household waste in the rural community?
(A) Cost sharing for professional clearing.
(B) Resource utilization under classification direction.
(C) I do not care and will not do anything.
11. How much would you like to pay for treatment of household waste?
(A) Calculated by the amount of garbage.
(B) Calculated by the number of people per household.
(C) 10-30 RMB per household per month.
(D) More than 30 RBM per household per month.
12. What would you rather like for health and clean water sources?
(A) Total treatment, with proper-shared investment.
(B) Quit poison pesticides under professional direction.
(C) Decreasing sewage discharge under technical direction.
(D) Decreasing fertilizers under professional direction.
13. How much would you like to pay for community sewage treatment?
(A) Calculated by the amount of sewage.
(B) Calculated by the number of people per household.
(C) 10-30 RMB per household per month.
(D) More than 30 RBM per household per month.
14. What would you rather like to mitigate air pollution caused by coal burning?
(A) Using clean energy at the same price or a little higher price.
(B) Energy saving under technical direction.
(C) No changes.
15. What is your option on plant species for greening the rural neighborhood?
(A) Exotic and rare plants.
(B) Native ornamental plants with economic value.
(C) Local plants can easily survive.
(D) Crops, vegetables and fruit trees.

Part B Questions for the village managers

16. How serious is the air pollution in your village?
(A) Heavy pollution. (B) Pollution exists. (C) No pollution.
17. What is the main pollution source, if there is air pollution?
(A) Industrial pollution. (B) Straw burning pollution. (C) Coal burning pollution. (D) Other pollution.
18. How serious is the water pollution in your village?
(A) Heavy pollution. (B) Pollution exists. (C) No pollution.
19. What is the main pollution source, if there is pollution?
(A) Industrial pollution. (B) Straw burning. (C) Coal burning. (D) Other pollution.
20. How serious is the soil pollution in your village?
(A) Heavy pollution. (B) Pollution exists. (C) No pollution.
21. What is the main pollution source, if there is pollution?
(A) Industrial pollution.
(B) Household waste.
(C) Pesticide and other chemical pollution.
(D) Other pollution.
22. What is the status of the forest around your village?
(A) Very good. (B) Good. (C) Ordinary. (D) Bad.
(E) Very bad.
23. What is the status of the wild animal species around your village?
(A) Many species. (B) Gradually increasing. (C) Gradually decreasing.
(D) Nearly no wild animals.
24. What is the preferred environmental development target of your village?
(A) Rich village with industries.
(B) Green villages with sustainable agriculture.
(C) Ecological villages with tourism.
(D) Villages with labor output.
(E) Move to cities nearby.
(F) Keep the status quo.
25. What is your preferred way to achieve the environmental development target of your village?
(A) Move to the cities nearby.
(B) Move to the new combined neighborhoods.
(C) Live in the original neighborhoods with environmental improvement.
(D) No changes.
26. What would the village committee rather like to make the air clear?
(A) Limiting the entering of enterprises that may cause air pollution.
(B) Optimize energy structure under technical direction.
(C) Strengthening afforestation.
(D) Training the residents and proposing green living style.
27. What is your preferred way to guarantee safety of drinking water in your village?
(A) Bringing in municipal tap water.
(B) Establishing sewage treatment facilities.
(C) Limiting sewage-discharging enterprises.
(D) Training the residents to decrease the use of pesticides and fertilizers.
28. What is your preferred way to treat household waste in your village?
(A) Collecting and treating by the village committee with an arranged fund.
(B) Resource utilization under classification direction.
(C) It is a tough problem.