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Article

Citizen Willingness to Pay for the Implementation of Urban Green Infrastructure in the Pilot Sponge Cities in China

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Abstract: Urban green infrastructure has been widely used to in cities to solve stormwater problems caused by extreme weather events and urbanization around the world. However, the lack of a long-term funding mechanism for performing urban green infrastructure's functions has limited wider implementation. Factors influencing citizen attitudes and willingness to pay for urban green infrastructure vary from city to city. This study estimated the public's willingness to pay for urban green infrastructure, as well as compared the selected influencing factors of willingness to pay in different Chinese pilot sponge cities. The results show that 60% to 75% of all respondents in the cities were willing to support the implementation of urban green infrastructure in sponge cities, with those most willing to pay around 0–5 RMB/month (0–0.72 USD/month). The respondents' educational level was a significant influencing factor for their willingness to pay in all six cities, but age, gender and family monthly income correlated differently with respondents' willingness to pay in different cities. Previous knowledge of the sponge city concept and sponge city construction in the community were not significantly correlated with residents' willingness to pay. We conclude that local governments in China need to provide more information to the general public about the multiple ecosystem services, e.g., educational and recreational benefits, that urban green infrastructure can provide. In doing so, it will help a shift to urban green infrastructure as the solution to dealing with urban stormwater problems.

Keywords: willingness to pay; urban green infrastructure; sponge cities; socio-demographic information

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1. Introduction

Global climate change has increased the number of extreme weather events such as heavy rains and flash flooding in cities, seriously threatening human well-being [1–4]. In addition, urbanization has led to insufficient natural permeability of rainwater, creating great challenges for piped-drainage systems [5–9]. Developed countries (e.g., in the European Union) have long recognized these urgency problems and coping with new urban water management strategies and practices based on the concepts of "urban green infrastructure" [10–12], "Ecosystem Services" [13,14], or "Ecosystem-based approaches" [15,16] and "Nature-Based Solutions" [13,17,18]. The green infrastructure concept has a broader concept inspired by and supported by nature, providing environmental, social and economic benefits [19,20]. For urban stormwater management, urban green infrastructure has been suggested as an alternative to conventional management facilities, which is the provision and maintenance of natural and semi-natural green spaces within built "gray" infrastructure [20]. Urban green infrastructure measurements include soil and vegetation, green roofs, rain gardens and wetlands, to control stormwater runoff comprehensively [21–24]. These nature-based solutions can compensate for some shortcomings of traditional grey infrastructure in engineering and provide additional ecosystem services (e.g., educational and recreational benefits) for human beings besides rainwater treatment [11,18,25]. At the same time, urban green infrastructure can also provide ecosystem services to achieve the dual goals of development and environmental protection, making it an important method of rainwater treatment around the world [26–29].

Urban green infrastructure must be regularly maintained to perform its functions after construction [30–32]. However, in many countries, construction and maintenance funding is insufficient, limiting wider implementation of urban green infrastructure [33]. To ensure the normal operations of urban green infrastructure, various developed countries (e.g., the United States, Germany, Australia and France) have established stormwater utility fees to supplement urban green infrastructure's construction and maintenance [34–37]. However, for many developing countries, such as China, questions remain about the suitability of stormwater payments as a form of funding for public support [38,39]. It is reported that many Chinese cities have suffered from pluvial flooding problems in the past two decades [40–43]. Thus, in 2014, the Chinese central government started the sponge cities initiative for managing the flood risk using urban green infrastructure [32,38,40]. Sponge city construction approaches include conserving a city's original ecosystems, recovering and restoring destroyed ecosystems, and employing urban green infrastructure [39,44,45]. In 2019, all 30 pilot sponge cities completed project construction in their demonstration zones, but continuous implementation of urban green infrastructure to manage stormwater has not manifested [31,46,47]. The Chinese central government has invested a large amount of money in the construction of sponge cities but has not provided financial support for their maintenance, which may lead to the failure of urban green infrastructure achieving their functions [32]. The absence of a long-term funding mechanism reinforces the need to investigate citizens' willingness to pay (WTP) for urban green infrastructure.

Some researchers have conducted surveys on WTP for urban green infrastructure in pilot sponge cities. These have shown that fees paid by the public can be a viable funding source to supplement urban green infrastructure's maintenance fees [27,31,38,46]. Meanwhile, a study reported that geographical differences, gender and other selected factors significantly influence citizens' WTP for urban green infrastructure in the cities of Zibo and Dongying [44]. It was found that the respondents' education level and family income had no relationship with WTP in Shenzhen, Zhenjiang and Xi'an [46]. It was also found that knowledge of the concept of sponge cities, educational level and age of the respondents were significant determinants of WTP in six pilot sponge cities in China [31].

Previous studies have shown that willingness to pay stormwater fees and relevant influencing factors vary between cities. This study aims to explore more deeply the public's willingness to pay for urban green infrastructure in different pilot sponge cities and to find the specific influencing factors (include socio-demographic information and related knowledge of sponge cities) for each city. This study aims to more deeply explore the residents' WTP for urban green infrastructure in different pilot sponge cities and find the specific influencing factors (include socio-demographic information and related knowledge of sponge cities) for each city. Referring to the relevant literature, we formed two hypotheses: (i) age, gender, education level and family income would affect residents' WTP for urban green infrastructure; (ii) knowledge of construction in communities and previous knowledge of the sponge city concept would affect residents' WTP. The results may provide more specific insights for local governments adopting urban green infrastructure to help the management of city planning. The findings also can help water professionals, urban planners and urban foresters use urban green infrastructure to solve urban rainwater problems more rationally.

2. Materials and Methods

2.1. Case City Selection

In this study, six pilot sponge cities, Chongqing, Nanning, Pingxiang, Qingdao, Xi'xian New City and Zhenjiang, were selected as case cities. These cities were considered to be representative for multiple reasons. Firstly, these cities belong to the national selected pilot sponge cities and have completed the construction of urban green infrastructure in their demonstration zones. Secondly, these cities represented different climatic characteristics and geographic regions in China with different annual rainfalls and socio-economic conditions and scales. Thirdly, these cities were considered as success cases for the construction of pilot sponge cities in different parts of China. For instance, Xi'xian New City was considered to be a typical representative in northwest China. Chongqing provides a reference for the construction of urban green infrastructure in a mountain city in southwest China. Zhenjiang provides reference for the construction of urban green infrastructure in old residential communities in southern China.

2.2. Data Collection

2.2.1. Questionnaire Design

The contingent valuation method was used in this study. The questionnaire was designed and consisted of the following four parts: (i) A section informing respondents of the study's purpose. (ii) Respondents' demographic and socio-economic information, including gender, age, family's monthly income, and education level. (iii) The respondents' previous knowledge about the sponge city concept and perspectives on the construction and maintenance of urban green infrastructure, and whether their communities had constructed urban green infrastructure previously. If they did not have any previous knowledge of the urban green infrastructure in sponge cities, the survey staff would explain the sponge city concept and show the urban green infrastructure pictures to help them finish the survey. (iv) The respondents' WTP and the amount they were willing to pay for urban green infrastructure.

2.2.2. Field Trip and Socio-Demographic Information of Respondents

We summarized the places having built urban green infrastructure in these six sponge cities. Then, the selected places were randomly sampled to determine where the questionnaire was distributed. In the selection of respondents, random sampling techniques were used for them. We conducted the questionnaire-based survey through face-to-face interviews to make sure all the respondents fully understood the survey. Citizens in three area types including communities with existing urban green infrastructure, shopping malls in the city center and local parks with constructed urban green infrastructure were asked to finish the survey during the summer of 2022.

The socio-demographic information of respondents is shown in Table 1. In total, there were 198 effective respondents in Nanning, 189 effective respondents in Pingxiang, 259 effective respondents in Xi'xian New City, 183 effective respondents in Zhenjiang, 171 effective respondents in Chongqing and 101 effective respondents in Qingdao.

Table 1. Profiles of respondents' demographic information in each city.

City	Total Respondents	Knowledge of Construction in Communities	Previous Knowledge of Sponge City Concept	Age	Gender	Education Level (Mode)	Family Income (Mode)
		No Yes	No Yes	Mean value	Female Male		per month/RMB
Nanning	198	129 70	108 81	46.5	89 109	Bachelor	10,000
Pingxiang	189	77 112	30 159	38.52	86 103	Bachelor	10,000
Xi'xian New City	259	136 122	120 139	35.32	149 110	Vocational-Technical College	10,000
Zhenjiang	183	119 64	101 70	39.7	98 85	Vocational-Technical College	10,000
Chongqing	171	111 60	67 104	37.4	96 75	Vocational-Technical College Bachelor	10,000
Qingdao	101	54 47	50 51	49.2	64 37	High school	10,000

The questionnaire divides the respondents' educational level into six levels: 1 = representing primary school, 2 = middle school, 3 = high school, 4 = vocational/technical college, 5 = bachelor's, master's and PhD.

2.3. Data Analysis

We used correlated analysis and a logistic model in the software SPSS 24.0 to analyze the collected data. First, a bivariate correlation analysis was conducted between the respondents' WTP for urban green infrastructure of each city and the variables including socio-demographic information of respondents, previous knowledge of the concept of the sponge city, etc. The purpose was to find the correlated factors of respondents' WTP for urban green infrastructure for each city. Furthermore, the respondents' WTP for urban green infrastructure follows a dichotomous variable form (yes = 1, no = 0), which can be solved by the cumulative probability distribution function, a binary-choice logistic model was implemented to analyze how the correlated factors found above affect the respondents' WTP for urban green infrastructure for each city. The WTP was set as the dependent variable, and the related influencing factors were set as independent variables. When carrying out the analysis, a 95% confidence interval and Hosmer–Lemeshow Goodness-of-Fit were selected in SPSS 24.0.

3. Results

3.1. Responders' WTP and Results of Correlation Analysis

The results of the respondents' WTP and the amount they were willing to pay for urban green infrastructure are shown in Table 2. Other than in Qingdao (46.5%), the proportion of supporters was higher than those against paying. Most of the respondents in the six cities reported willingness to pay 0–5 RMB/month (about 0–0.72 USD per month). Additionally, the large majority knew about the urban green infrastructure constructed in their community. The proportion of respondents who had previous knowledge of the sponge city concept was generally high, especially in Pingxiang, where 84.1% respondents had heard of the sponge city concept before.

Table 2. The results of respondents' WTP and the amount of their WTP.

City	Amount of WTP	WTP
	per month/RMB	No Yes
Nanning	0–5	70 128
Pingxiang	0–5	50 139
Xi'xian New City	0–5	86 173
Zhenjiang	0–5	49 134
Chongqing	0–5	65 106
Qingdao	0–5	54 47

The results of the correlation analysis between WTP for urban green infrastructure and variables are shown in Table 3. For Nanning, if the respondents had previous knowledge of the sponge city concept, their WTP for urban green infrastructure was higher than those who did not know the concept. With an increase in the respondents' family monthly income, there was an increase in WTP for urban green infrastructure construction and maintenance. Educational level and age also significantly influenced the respondents' WTP. Respondents who had received higher education had higher WTP than those who had graduated from a primary school. However, WTP for urban green infrastructure was not connected to the respondents' gender and whether they knew of the urban green infrastructure constructed in the community. For Pingxiang, with the increase in respondents' age, there was a decrease in WTP for urban green infrastructure. Similar with Nanning, the educational level also influenced the respondents' WTP significantly. Meanwhile, respondents' WTP was irrelevant to the variables including gender, family monthly income, knowledge of the sponge city concept and whether they knew of urban green infrastructure constructed in their community.

Table 3. Factors influencing respondents' WTP for urban green infrastructure in six pilot sponge cities.

City			**Age**	**Gender**	**Education Level**	**Family's Monthly Income**	**Previous Knowledge of Sponge City Concept**	**Knowledge of Construction in Communities**
Nanning	WTP	related coefficient	−0.249 **	0.037	0.364 **	0.187 **	0.312 **	0.142
		Significance (double tail)	0.000	0.605	0.000	0.003	0.000	0.056
		Number of cases			197			183
Pingxiang	WTP	related coefficient	−0.157 **	−0.018	0.165 *	0.115	0.101	−0.026
		Significance (double tail)	0.031	0.805	0.023	0.114	0.169	0.720
		Number of cases			189			188
Xi'xian New City	WTP	related coefficient	−0.128 *	0.075	0.188 **	0.171 **	−0.030	0.011
		Significance (double tail)	0.013	0.228	0.001	0.002	0.626	0.860
		Number of cases			259			258
Zhenjiang	WTP	related coefficient	−0.137	0.068	0.148 *	0.142	0.049	0.159 *
		Significance (double tail)	0.065	0.358	0.045	0.056	0.514	0.032
		Number of cases				183		
Chongqing	WTP	related coefficient	−0.273 **	0.207 **	0.271 **	0.173 *	0.140	0.085
		Significance (double tail)	0.000	0.007	0.000	0.024	0.069	0.273
		Number of cases				169		
Qingdao	WTP	related coefficient	−0.0265 **	0.027	0.199 **		−0.032	−0.097
		Significance (double tail)	0.008	0.785	0.046		0.747	0.335
		Number of cases		101				101

* $p < 0.10$, ** $p < 0.05$.

For Xi'xian New City, the respondents' WTP for urban green infrastructure increased with the increase in monthly family income and educational level, while age negatively influenced the respondents' WTP. However, respondents' WTP in the city was not connected to the respondents' gender, whether respondents had previous knowledge of the sponge city concept or whether they knew of the urban green infrastructure construction in the community. For Zhenjiang, similar with Xi'xian, with the higher educational level, there was an increase in the respondents' WTP for urban green infrastructure. Gender, age and respondent monthly family income were not found to affect respondents' WTP. Regarding the previous knowledge, those who had known about the urban green infrastructure constructed in their community, the WTP was higher than those with no knowledge of the construction. However, the WTP was not connected to whether they had previous knowledge of the sponge city concept.

For Chongqing, age, gender, monthly family income and educational level were found to be influencing the respondents' WTP for urban green infrastructure. With the increase in respondents' age, there was a decrease in the WTP. Male respondents were more likely to pay for the construction and maintenance of urban green infrastructure. With the increase in the respondents' monthly family income and educational level, there was an increase in WTP. Meanwhile, the respondents' WTP for urban green infrastructure in Chongqing was not influenced by their previous knowledge of the sponge city concept or whether they knew of the urban green infrastructure constructed in the community. For Qingdao, only age and educational level were found to be relevant. With the increase in respondents' age, the WTP for urban green infrastructure decreased, and the higher the educational level, the higher the WTP. Other variables were not found to be connected.

3.2. Results of Binary Logistic Regression

The results of the binary logistic regression of WTP for urban green infrastructure and relevant variables are shown in Table 4. For Nanning, if the respondents had previous knowledge of the sponge city concept, their WTP for urban green infrastructure was 3.349 times higher than those who did not know of the concept. Therefore, improving respondents' knowledge of the sponge city concept had a significant, positive effect on increasing WTP for urban green infrastructure in Nanning. The promotion of sponge cities should be strengthened. For Zhenjiang, the results illustrated that WTP for urban green infrastructure was significantly related to whether the respondents knew about the urban green infrastructure constructed in their community. The WTP for urban green infrastructure of those who had the knowledge was 2.348 times higher than those who did not know the construction of urban green infrastructure in their communities. Thus, for the Zhenjiang local government, more demonstration projects constructed in communities are useful for a wider implementation of urban green infrastructure. For Chongqing, the results showed that WTP for urban green infrastructure was significantly related to age and gender. However, for Qingdao, Pingxiang and Xi'xian New City, based on the binary logistic regression test, no factors were found to have a significant influence on respondents' WTP.

Table 4. Factors influencing respondents' WTP for urban green infrastructure.

City		B	Std. Err	Wald	$p > \|z\|$	Exp (B)	[95% Conf. Interval]	
Nanning	Previous knowledge of the concept	1.209	0.393	9.467	0.002	3.349	1.551	7.233
Zhenjiang	Knowledge of construction in communities	0.854	0.421	4.112	0.043	2.348	1.029	5.359
Chongqing	Age	−0.048	0.016	8.835	0.003	0.953	0.924	0.984
	Gender	0.756	0.379	3.973	0.046	2.129	1.013	4.478

4. Discussion

4.1. Influence of Socio-Demographic Information towards WTP for Urban Green Infrastructure in Each City

As shown in the results, the influencing factors of the socio-demographic information (age, gender, educational level, income) towards WTP for urban green infrastructure in each city were different. It has been reported that age has a significant negative impact on respondents' WTP [44,46], which is in line with our study in the case city of Chongqing. Gender has also been reported to be an important factor that influences WTP. Females had a higher WTP for urban green infrastructure than males [44,48,49], which is opposite to our findings in the case city of Chongqing. Some researchers reported that gender has no influence on WTP [50], which is similar with our studies in the other five case cities. Researchers believe that educational level generally affects the public's WTP actively [44,48,51], which is similar to our study in all of the six cities. Therefore, it can be argued that it is significant to improve the education level of respondents in general. The effect of family income on WTP for urban green infrastructure varied from city to city. Some found that respondents' income had a statistically positive effect on WTP [44,51–53]; this is in line with our study in Nanning, Chongqing and Xi'xian New City. However, in the case cities of Pingxiang, Zhenjiang, and Qingdao, the family income was not significantly related to WTP, for urban green infrastructure which is in line with the results of [46].

4.2. Influence of Previous Knowledge of the Sponge City Concept on WTP for Urban Green Infrastructure

It has been reported that personal experience has a statistically positive effect on WTP [53]. Studies have shown that respondents' previous knowledge and perceptions have an important effect on their WTP [27,31,44,46]. However, in our study, there is a non-significant correlation between WTP urban green infrastructure and previous knowledge of the sponge city concept at the individual city level except for Nanning. Many respondents in the case cities had previous knowledge of the concept of sponge cities, especially in Pingxiang. In addition, whether knowing urban green infrastructure constructed in the communities did not significantly have a correlation with WTP urban green infrastructure. On one hand, it shows that activities had been adapted that promoted the sponge city concept in the pilot cities. On the other hand, it indicates that more information and promotion of the sponge city concept cannot significantly increase residents' WTP urban green infrastructure. However, researchers pointed out that individuals of the same age or education level residing in the sponge city construction areas generally knew more about sponge cities and were more willing to accept them, compared to those living in unconstructed areas [54].

4.3. Suggestions to Improve Citizens' WTP for Urban Green Infrastructure

In our study, most of the respondents were willing to pay for urban green infrastructure, which is similar to what has been reported in the literature [27,31,44]. However, most of the respondents reported willingness to pay around 0–5 RMB/month (0–0.72 USD/month) in the case cities, with the amount of WTP urban green infrastructure varying between cities. This may be because of differences in level of economic development, namely, developed and developing countries. In any case, it needs to be emphasized that the amount of WTP urban green infrastructure usually cannot fully support the implementation of urban green infrastructure construction and maintenance.

Studies have shown that, the general value of urban green infrastructure is multi-functional [55], and at best, includes numerous ecosystem services alongside the stormwater treatment function. As such, WTP studies have shown that respondents were also willing to pay for the educational and recreational benefits brought by urban green infrastructure [27,56,57]. Therefore, improving the ecosystem service level of urban green infrastructure according to residents' preferences may increase residents' WTP. In addition, improving respondents' feelings about the level of ecosystem services provided by urban green infrastructure may also improve respondents' WTP [17,42]. A survey of researchers using a virtual reality tool to present information on ecosystem service level options was shown to significantly increase respondents' WTP for projects [58].

4.4. Limitations and Perspectives

There are some limitations in this study. Some of the data were found to be significant in the correlation analysis but not in the binary logistic regression. We believe that there might be endogenous variables. During the research, independent variables should not affect each other, but when the two independent variables influence each other, endogenous variables will be generated and affect the analysis results. For example, family monthly income is likely to rise with respondents' education level. The younger the respondent is, and the higher their education level is, and the more they are likely to know about sponge cities. In the future, more studies should be conducted to elaborate on this issue.

At the same time, it would be interesting to use virtual reality tools to survey residents' WTP in cities without the sponge city construction. In the future, it may be possible to conduct a sample survey within the community which also can promote the popularization of sponge cities.

5. Conclusions

At the overall level, urban green infrastructure can reduce the risk of flooding and bring a variety of ecosystem services to human lives. In this paper, we studied citizens in pilot sponge cities in China to understand their willingness to pay for the construction and maintenance of urban green infrastructure. We found that more than 60% of respondents were willing to pay, and the influence of socio-demographic information on the WTP urban green infrastructure varied among cities. However, different to the literature, respondents' previous knowledge of the sponge city concept did not increase their WTP. This indicates that the information provided by local governments about urban green infrastructure and the sponge city concept may not be enough. We suggest that when providing information about sponge cities, there is a need to add more content about the general ecosystem services, e.g., educational and recreational benefits that urban green infrastructure can provide, than primarily that of solving the technical storm water management issues via sponge cities. In addition, most of respondents were only willing to pay less than 5 RMB/month (0.72 USD/month). This cannot provide sufficient financial support for the full life cycle of urban green infrastructure. Additional funding options should be explored by local governments to overcome these financial insufficiencies.

At the level of individual cities, for cities such as Chongqing (a negative correlation between age and WTP), we suggest that age-appropriate landscape design could be added in the construction of urban green infrastructure in sponge cities. It may enhance the participation of the elderly and increase their WTP to some extent. For cities such as Nanning (a positive correlation between WTP and previous knowledge of sponge city concept), we suggest that the local government strengthens the publicity of the sponge city and carries out science popularization activities related to the sponge city. It can improve residents' awareness of urban green infrastructure development and residents' WTP for urban green infrastructure. For cities such as Nanning Zhenjiang (a positive correlation between WTP and knowledge of construction in communities), we suggest increasing the construction of the sponge city green infrastructure within the community and vigorously publicizing it within the community. This may enhance residents' sense of identity on urban green infrastructure and their WTP. It is hoped that this study can provide reference for the urban green infrastructure construction of sponge cities in these cities.

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References

1. Schütze, A.A.; Banning, A.; Bender, S. Kartierung und Simulation von Überschwemmungsflächen in urbanen Räumen nach Starkregenereignissen. *Grundwasser* **2021**, *26*, 87–97. [CrossRef]
2. D'Aniello, A.; Cimorelli, L.; Cozzolino, L. The Influence of Soil Stochastic Heterogeneity and Facility Dimensions on Stormwater Infiltration Facilities Performance. *Water Resour. Manag.* **2019**, *33*, 2399–2415. [CrossRef]
3. Eckart, K.; McPhee, Z.; Bolisetti, T. Multiobjective optimization of low impact development stormwater controls. *J. Hydrol.* **2018**, *562*, 564–576. [CrossRef]
4. Kimambo, O.N.; Chikoore, H.; Gumbo, J.R. Understanding the Effects of Changing Weather: A Case of Flash Flood in Morogoro on January 11, 2018. *Adv. Meteorol.* **2019**, *2019*, 8505903. [CrossRef]
5. Anker, Y.; Mirlas, V.; Gimburg, A.; Zilberbrand, M.; Nakonechny, F.; Meir, I.; Inbar, M. Effect of rapid urbanization on Mediterranean karstic mountainous drainage basins. *Sustain. Cities Soc.* **2019**, *51*, 101704. [CrossRef]
6. Berndtsson, R.; Becker, P.; Persson, A.; Aspegren, H.; Haghighatafshar, S.; Jonsson, K.; Larsson, R.; Mobini, S.; Mottaghi, M.; Nilsson, J.; et al. Drivers of changing urban flood risk: A framework for action. *J Environ. Manag.* **2019**, *240*, 47–56. [CrossRef] [PubMed]

7. Kim, G.-B. A study on stormwater fee imposition for sustainable rainwater management. *J. Korean Soc. Water Wastewater* **2019**, *33*, 103–110. [CrossRef]
8. Chuang, W.K.; Lin, Z.E.; Lin, T.C.; Lo, S.L.; Chang, C.L.; Chiueh, P.T. Spatial allocation of LID practices with a water footprint approach. *Sci. Total Environ.* **2023**, *859*, 160201. [CrossRef] [PubMed]
9. Frosi, M.H.; Kargar, M.; Jutras, P.; Prasher, S.O.; Clark, O.G. Street Tree Pits as Bioretention Units: Effects of Soil Organic Matter and Area Permeability on the Volume and Quality of Urban Runoff. *Water Air Soil Pollut.* **2019**, *230*, 152. [CrossRef]
10. Sinakou, E.; Boeve-de Pauw, J.; Goossens, M.; Van Petegem, P. Academics in the field of Education for Sustainable Development: Their conceptions of sustainable development. *J. Clean. Prod.* **2018**, *184*, 321–332. [CrossRef]
11. Seddon, N.; Smith, A.; Smith, P.; Key, I.; Chausson, A.; Girardin, C.; House, J.; Srivastava, S.; Turner, B. Getting the message right on nature-based solutions to climate change. *Glob. Change Biol.* **2021**, *27*, 1518–1546. [CrossRef] [PubMed]
12. Nousheen, A.; Yousuf Zai, S.A.; Waseem, M.; Khan, S.A. Education for sustainable development (ESD): Effects of sustainability education on pre-service teachers' attitude towards sustainable development (SD). *J. Clean. Prod.* **2020**, *250*, 119537. [CrossRef]
13. Guerrero, P.; Haase, D.; Albert, C. Identifying Spatial Patterns and Ecosystem Service Delivery of Nature-Based Solutions. *Environ. Manag.* **2022**, *69*, 735–751. [CrossRef] [PubMed]
14. Van der Jagt, A.P.N.; Buijs, A.; Dobbs, C.; van Lierop, M.; Pauleit, S.; Randrup, T.B.; Wild, T. An action framework for the participatory assessment of nature-based solutions in cities. *Ambio* **2023**, *52*, 54–67. [CrossRef] [PubMed]
15. Woroniecki, S.; Wendo, H.; Brink, E.; Islar, M.; Krause, T.; Vargas, A.-M.; Mahmoud, Y. Nature unsettled: How knowledge and power shape 'nature-based' approaches to societal challenges. *Glob. Environ. Change* **2020**, *65*, 102132. [CrossRef]
16. Cohen-Shacham, E.; Andrade, A.; Dalton, J.; Dudley, N.; Jones, M.; Kumar, C.; Maginnis, S.; Maynard, S.; Nelson, C.R.; Renaud, F.G.; et al. Core principles for successfully implementing and upscaling Nature-based Solutions. *Environ. Sci. Policy* **2019**, *98*, 20–29. [CrossRef]
17. Qi, Y.; Chan, F.K.S.; Thorne, C.; O'Donnell, E.; Quagliolo, C.; Comino, E.; Pezzoli, A.; Li, L.; Griffiths, J.; Sang, Y.; et al. Addressing Challenges of Urban Water Management in Chinese Sponge Cities via Nature-Based Solutions. *Water* **2020**, *12*, 2788. [CrossRef]
18. Randrup, T.B.; Buijs, A.; Konijnendijk, C.C.; Wild, T. Moving beyond the nature-based solutions discourse: Introducing nature-based thinking. *Urban Ecosyst.* **2020**, *23*, 919–926. [CrossRef]
19. Lafortezza, R.; Chen, J.; van den Bosch, C.K.; Randrup, T.B. Nature-based solutions for resilient landscapes and cities. *Environ. Res.* **2018**, *165*, 431–441. [CrossRef]
20. Rodriguez-Rojas, M.I.; Grindlay Moreno, A.L. A Discussion on the Application of Terminology for Urban Soil Sealing Mitigation Practices. *Int. J. Environ. Res. Public Health* **2022**, *19*, 8713. [CrossRef]
21. Darnthamrongkul, W.; Mozingo, L.A. Toward sustainable stormwater management: Understanding public appreciation and recognition of urban Low Impact Development (LID) in the San Francisco Bay Area. *J. Environ. Manag.* **2021**, *300*, 113716. [CrossRef] [PubMed]
22. Rezaei, A.R.; Ismail, Z.; Niksokhan, M.H.; Dayarian, M.A.; Ramli, A.H.; Yusoff, S. Optimal implementation of low impact development for urban stormwater quantity and quality control using multi-objective optimization. *Environ. Monit. Assess.* **2021**, *193*, 241. [CrossRef] [PubMed]
23. Feng, M.; Jung, K.; Li, F.; Li, H.; Kim, J.-C. Evaluation of the Main Function of Low Impact Development Based on Rainfall Events. *Water* **2020**, *12*, 2231. [CrossRef]
24. Bahrami, M.; Bozorg-Haddad, O.; Loaiciga, H.A. Optimizing stormwater low-impact development strategies in an urban watershed considering sensitivity and uncertainty. *Environ. Monit. Assess.* **2019**, *191*, 340. [CrossRef] [PubMed]
25. Krauze, K.; Wagner, I. From classical water-ecosystem theories to nature-based solutions—Contextualizing nature-based solutions for sustainable city. *Sci. Total Environ.* **2019**, *655*, 697–706. [CrossRef]
26. Qiao, X.-J.; Kristoffersson, A.; Randrup, T.B. Challenges to implementing urban sustainable stormwater management from a governance perspective: A literature review. *J. Clean. Prod.* **2018**, *196*, 943–952. [CrossRef]
27. Wang, R.; Brent, D.; Wu, H. Willingness to pay for ecosystem benefits of green stormwater infrastructure in Chinese sponge cities. *J. Clean. Prod.* **2022**, *371*, 133462. [CrossRef]
28. Zalejska-Jonsson, A.; Wilkinson, S.J.; Wahlund, R. Willingness to Pay for Green Infrastructure in Residential Development-A Consumer Perspective. *Atmosphere* **2020**, *11*, 152. [CrossRef]
29. Wu, T.G.; Song, H.H.; Wang, J.B.; Friedler, E. Framework, Procedure, and Tools for Comprehensive Evaluation of Sustainable Stormwater Management: A Review. *Water* **2020**, *12*, 1231. [CrossRef]
30. Wilkerson, B.; Romanenko, E.; Barton, D.N. Modeling reverse auction-based subsidies and stormwater fee policies for Low Impact Development (LID) adoption: A system dynamics analysis. *Sustain. Cities Soc.* **2022**, *79*, 103602. [CrossRef]
31. Qiao, X.J.; Randrup, T.B. Willingness to Pay for the Maintenance of Green Infrastructure in Six Chinese Pilot Sponge Cities. *Water* **2022**, *14*, 428. [CrossRef]
32. Li, H.; Ding, L.; Ren, M.; Li, C.; Wang, H. Sponge City Construction in China: A Survey of the Challenges and Opportunities. *Water* **2017**, *9*, 594. [CrossRef]
33. Zhao, J.; Fonseca, C.; Zeerak, R. Stormwater Utility Fees and Credits: A Funding Strategy for Sustainability. *Sustainability* **2019**, *11*, 1913. [CrossRef]
34. Porse, E.; Kerner, M.; Shinneman, J.; Kaplan, J.; Stone, S.; Cadenasso, M.L. Stormwater utility fees and household affordability of urban water services. *Water Policy* **2022**, *24*, 998–1013. [CrossRef]

35. Yoo, J.; Lee, C. A New Methodology for Updating Land Cover Maps in Rapidly Urbanizing Areas of Levying Stormwater Utility Fee. *Appl. Sci.* **2022**, *12*, 3254. [CrossRef]
36. Novaes, C.; Marques, R. Stormwater Utilities: A Sustainable Answer to Many Questions. *Sustainability* **2022**, *14*, 6179. [CrossRef]
37. Yoo, J.; Park, K. Stormwater Utility Fee Estimation Method for Individual Land Use Areas. *Sustainability* **2022**, *14*, 211. [CrossRef]
38. Wang, Y.; Liu, X.; Huang, M.; Zuo, J.; Rameezdeen, R. Received vs. given: Willingness to pay for sponge city program from a perceived value perspective. *J. Clean. Prod.* **2020**, *256*, 120479. [CrossRef]
39. Griffiths, J.; Chan, F.K.S.; Shao, M.; Zhu, F.; Higgitt, D.L. Interpretation and application of Sponge City guidelines in China. *Philos. Trans. A Math. Phys. Eng. Sci.* **2020**, *378*, 20190222. [CrossRef]
40. Chen, Y.; Zhu, D.; Zhou, L. A game theory analysis of promoting the spongy city construction at the building and community scale. *Habitat Int.* **2019**, *86*, 91–100. [CrossRef]
41. Meng, M.; Dąbrowski, M.; Tai, Y.; Stead, D.; Chan, F. Collaborative spatial planning in the face of flood risk in delta cities: A policy framing perspective. *Environ. Sci. Policy* **2019**, *96*, 95–104. [CrossRef]
42. Zheng, S.; Tang, Y.T.; Chan, F.K.S.; Cao, L.Y.; Song, R.X. The Demographic Implication for Promoting Sponge City Initiatives in the Chinese Megacities: A Case of Wuhan. *Water* **2022**, *14*, 883. [CrossRef]
43. Chen, Y.; Chen, H.M. The Collective Strategies of Key Stakeholders in Sponge City Construction: A Tripartite Game Analysis of Governments, Developers, and Consumers. *Water* **2020**, *12*, 1087. [CrossRef]
44. Wang, Y.T.; Sun, M.X.; Song, B.M. Public perceptions of and willingness to pay for sponge city initiatives in China. *Resour. Conserv. Recycl.* **2017**, *122*, 11–20. [CrossRef]
45. Liang, C.; Zhang, X.; Xia, J.; Xu, J.; She, D. The Effect of Sponge City Construction for Reducing Directly Connected Impervious Areas on Hydrological Responses at the Urban Catchment Scale. *Water* **2020**, *12*, 1163. [CrossRef]
46. Ding, L.; Ren, X.Y.; Gu, R.Z.; Che, Y. Implementation of the "sponge city" development plan in China: An evaluation of public willingness to pay for the life-cycle maintenance of its facilities. *Cities* **2019**, *93*, 13–30. [CrossRef]
47. Liang, X.; Liang, Y.; Chen, C.; van Dijk, M.P. Implementing Water Policies in China: A Policy Cycle Analysis of the Sponge City Program Using Two Case Studies. *Sustainability* **2020**, *12*, 5261. [CrossRef]
48. Odonkor, S.T.; Adom, P.K. Environment and health nexus in Ghana: A study on perceived relationship and willingness-to-participate (WTP) in environmental policy design. *Urban Clim.* **2020**, *34*, 100689. [CrossRef]
49. Hwang, K.; Lee, J. Antecedents and Consequences of Ecotourism Behavior: Independent and Interdependent Self-Construals, Ecological Belief, Willingness to Pay for Ecotourism Services and Satisfaction with Life. *Sustainability* **2018**, *10*, 789. [CrossRef]
50. Naz, F.; Oláh, J.; Vasile, D.; Magda, R. Green Purchase Behavior of University Students in Hungary: An Empirical Study. *Sustainability* **2020**, *12*, 77. [CrossRef]
51. Garcia-Cuerva, L.; Berglund, E.Z.; Binder, A.R. Public perceptions of water shortages, conservation behaviors, and support for water reuse in the US. *Resour. Conserv. Recycl.* **2016**, *113*, 106–115. [CrossRef]
52. Zhao, H.; Liu, X.; Wang, Y.T. Evolutionary game analysis of opportunistic behavior of Sponge City PPP projects: A perceived value perspective. *Sci. Rep.* **2022**, *12*, 879810. [CrossRef]
53. Sato, M.; Ushimaru, A.; Minamoto, T. Effect of different personal histories on valuation for forest ecosystem services in urban areas: A case study of Mt. Rokko, Kobe, Japan. *Urban For. Urban Green.* **2017**, *28*, 110–117. [CrossRef]
54. Luo, P.P.; Zheng, Y.; Wang, Y.Y.; Zhang, S.P.; Yu, W.Q.; Zhu, X.; Huo, A.D.; Wang, Z.H.; He, B.; Nover, D. Comparative Assessment of Sponge City Constructing in Public Awareness, Xi'an, China. *Sustainability* **2022**, *14*, 11653. [CrossRef]
55. Xie, L.J.; Bulkeley, H.; Tozer, L. Mainstreaming sustainable innovation: Unlocking the potential of nature-based solutions for climate change and biodiversity. *Environ. Sci. Policy* **2022**, *132*, 119–130. [CrossRef]
56. Wang, R.; Wu, H.; Chiles, R. Ecosystem Benefits Provision of Green Stormwater Infrastructure in Chinese Sponge Cities. *Environ. Manag.* **2022**, *69*, 558–575. [CrossRef] [PubMed]
57. Toledo-Gallegos, V.M.; My, N.H.D.; Tuan, T.H.; Boerger, T. Valuing ecosystem services and disservices of blue/green infrastructure. Evidence from a choice experiment in Vietnam. *Econ. Anal. Policy* **2022**, *75*, 114–128. [CrossRef]
58. Iftekhar, M.S.; Buurman, J.; Lee, T.K.; He, Q.; Chen, E. Non-market value of Singapore 's ABC Waters Program. *Water Res.* **2019**, *157*, 310–320. [CrossRef] [PubMed]