

Article

How to Shape Local Public Acceptance of Not-in-My-Backyard Infrastructures? A Social Cognitive Theory Perspective

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Abstract: Acceptance by the local public is the key determinant for the successful implementation of NIMBY (Not-In-My-Backyard) infrastructures and may be shaped in different ways among different infrastructure types. Based on social cognitive theory (SCT), this study clarifies the specific mechanism shaping local public acceptance of NIMBY facilities with two types of hazardous effects (i.e., pollution and psychological exclusion) using a large-scale questionnaire survey and structural equation model. The results reveal that, firstly, SCT provides a solid theoretical basis for exploring the mechanism under the joint action of environmental and personal factors. Secondly, it is verified that self-efficacy indirectly predicts local public acceptance by influencing perceived risk. The effect of the positive affect tag is mediated by perceived risk in shaping acceptance of polluting facilities but not of psychologically excluded facilities. In general, people tend to have a lower perceived risk, higher perceived benefit, stronger sense of self-efficacy, and more positive attitude when faced with the siting of psychologically excluded NIMBY facilities over polluting ones. These findings are helpful for planning and decision-making of NIMBY facilities with different types of hazardous impacts, reducing NIMBY conflicts and promoting the construction of NIMBY infrastructures. Furthermore, it contributes to the achievement of Sustainable Development Goal (SDG) 16 (promoting peaceful and inclusive societies for sustainable development) and (SDG) 11 (building inclusive, safe, resilient and sustainable cities and human settlements).

Keywords: NIMBY facilities; public acceptance; social cognitive theory; polluting; psychologically excluded



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1. Introduction

The editorial in the Sustainable Development Goals states that “Inclusive and participatory governance is a cornerstone of sustainable development, ensuring that decision-making processes are transparent, accountable, and responsive to the needs of all stakeholders” [1]. The siting, construction, and operation of NIMBY facilities are a complex process involving multiple stakeholders, including the government, the local public and relevant experts. Therefore, based on the specific mechanism in shaping local residents’ acceptance towards NIMBY facilities, the corresponding governance methods are discussed to ensure a transparent decision-making process in the site selection, construction, and operation of NIMBY facilities, enhance public participation and responsive to the needs of all stakeholders. This is a concrete response to the idea of achieving sustainability presented in the editorial.

Local residents are worried that the construction of some high-pollution and high-energy projects will bring great pressure on the local environment, leading to the deterioration of air, water, soil, and other environmental qualities, as well as potential health risks, so they take a highly emotional and collective opposition or even resistance behavior, which is called the NIMBY phenomenon [2]. As SDG 16 refers to “promoting peaceful and inclusive societies for sustainable development” and SDG 11 refers to “building inclusive, safe, resilient and sustainable cities and human settlements”, NIMBY conflicts can lead to social discord and hinder the construction of NIMBY facilities, which is not conducive to the achievement of the SDGs. Therefore, exploring the specific mechanism in shaping local residents’ acceptance towards NIMBY infrastructures, enhancing public acceptance, and reducing NIMBY conflicts will help achieve SDG 16 and SDG 11.

NIMBY (Not-In-My-Backyard) facilities (e.g., nuclear power plants, waste-to-energy facilities, etc.) face considerable and strong opposition from the local communities in which they are situated [3,4] because they have a potentially negative impact (e.g., smell and illness) on the local environment and health of the public, even though their development can enhance the comprehensive carrying capacity of cities. NIMBY infrastructures can be divided into polluting facilities and psychologically excluded facilities, the former impacting human physiological health (e.g., waste incineration power plants and sewage treatment plants). Polluting facilities will produce a lot of harmful gases during operation, affecting carbon emissions. According to existing research, the increase in carbon emissions is a threat to human health and safety [5]. And the latter concerns human mental health (e.g., funeral homes and prisons) [6,7]. NIMBY facilities with different types of hazardous effects have different public acceptability [8,9].

Previous studies show that the mechanism shaping local public acceptance of NIMBY facilities (hereinafter termed “the mechanism”) is related to many factors, including perceived risk, perceived income, social trust, fairness/justice, and transparency in decision-making [10,11]. For example, [12,13] show public acceptance of nuclear energy to be positively correlated with perceived benefits and [14] finds the public acceptance of waste-to-energy (WTE) projects depends on the perceived potential danger. Other studies show public acceptance of nuclear power plants to be significantly influenced by ecological problems, geographical location, and the perceived benefits involved [3], while Li et al., (2019) indicate that the three main aspects affecting public acceptance of dangerous chemical factories to be perceived risk, distrust of the government, and the “positive affect tag” of social cognitive theory (SCT) [15]. More recently, other researchers have also established an extended SCT model based on the benefit-risk perception trade-off of public acceptance of electric power NIMBY facilities [16]. Emotional dependence (e.g., local dependence, place identification, and place dependence) on the local area also seriously affects public acceptance [17,18]. The detailed influencing factors and related conclusions are shown in Table 1.

Table 1. Brief summary of factors affecting public acceptance towards NIMBY facilities.

Factors	Findings	Literature
Perceived risk	Higher level of perceived risk leads to lower level of acceptance	Liu et al., 2018 [4] Wang et al., 2021a [16]
Perceived benefit	Higher level of perceived benefit leads to higher level of acceptance	Chung and Kim, 2009 [2] Ong et al., 2022 [19]
Perceived fairness	Higher level of perceived fairness leads to higher level of acceptance	Wolsink et al., 2010 [11] Liu et al., 2018 [4]
Public trust	Higher level of public trust leads to higher level of acceptance	Zhou et al., 2022 [20] Chung and Kim, 2009 [2]
Emotional state	More positive emotions lead to higher level of acceptance	Li et al., 2019 [15] Wang et al., 2021a [16]
Demographic characteristics	Local residents who are male, elder, or highly educated hold higher level of acceptance	Ren et al., 2016 [21] Finucane et al., 2013 [22]

From social, psychological, and cultural perspectives, different theories have been applied for a long time to seek the determinants of the public's willingness to accept NIMBY facilities and explore the mechanism involved. For example, people with different demographic characteristics have different subjective conscious judgments and acceptance [21,22].

However, research into this issue is currently insufficient. First, many theories have been applied to describe the mechanism; for example, research based on stakeholder theory shows that effective public participation can reduce NIMBY conflicts, but does not take into account the social impact [19,23,24]. Studies based on affective heuristic theory show that personal perception and emotion can effectively control public acceptance, but ignore the role of external factors [15]. Some scholars combined the theory of planned behavior and the theory of protective motivation to prove that public acceptance is controlled by an individual's perceived behavior [19,23]; in addition, under the perspective of values theory, previous studies have explored the influence of personal values, beliefs, and emotions on public acceptance of nuclear power and nuclear energy, only considering the influence of personal factors [25–27]. Nevertheless, such theories often only consider the influence of personal factors on the mechanism, including personal emotion, personal perception, subjective norms, perceived behavior control, etc., but rarely focus on the mechanism under the joint action of personal and environmental factors.

Second, previous studies have pointed out that people have different degrees of acceptance of NIMBY facilities with different types of hazardous effects [28]. However, no detailed analysis has been made of the mechanism.

Third, studies normally focus on single facilities, such as nuclear power plants and WTE incineration facilities [29,30], with little attention paid to multi-case studies.

To bridge these research gaps, the present study is conducted within a viable and classic analytical framework from the perspective of SCT for understanding the mechanism under different types of hazardous effects involving the joint action of personal and environmental factors. Social cognitive theory is a powerful theory of human intent and behavior that does a good job of extending internal determinants to the outside and is recognized as the established theory for exploring patterns of behavior [28]. It points out that people's behavior intention or behavior pattern is controlled and shaped by personal factors and environmental factors [30–32]. From the perspective of social cognitive theory, public acceptance is a decision jointly affected by personal cognition and social environment, which can provide a solid theoretical basis for studying the mechanism in shaping local residents' public acceptance of NIMBY infrastructures under the joint action of personal factors and environmental factors. In contrast with previous work, multi-case studies are also undertaken to enable more general and persuasive research conclusions to be made.

In the following chapters, Section 2 presents the relevant literature review and the corresponding research hypothesis. Section 3 reports on the research design, including research framework, questionnaire design and sample data collection and analysis. Section 4 describes the research results, including descriptive analysis, *t*-test analysis, and structural equation analysis. Section 5 provides a discussion of the research results. Section 6 summarizes the overall research content, practical significance and shortcomings of the study.

2. Literature Review and Research Hypotheses

2.1. NIMBY Facilities

O'hare put forward the concept of NIMBY facilities in 1977, which refers to those having a positive effect on society and generating benefits for the public to share, while their costs tend to be localized and have certain negative externalities [33]. Previous studies have shown that the urban resilience index system consists of four dimensions, including infrastructure resilience [34], and the development of infrastructure can promote the acceleration of urbanization. Although NIMBY facilities can increase a city's capacity,

the negative impacts on the environment, reputation, and property values often generate strong opposition, with people questioning why they should be burdened by problems caused by others [27,35]. The negative externalities associated with NIMBY facilities have triggered many well-known conflicts in China, such as the Yuhang Jiufeng waste incineration plant incident in Zhejiang Province [10], the Maoming PX project incident in Guangdong Province [10], and the Lianyungang nuclear cycle project incident in Jiangsu Province [36].

NIMBY facilities include not only risk-gathering amenities (nuclear power plants, substations, etc.) and polluting facilities (garbage incineration power plants, sewage treatment plants, etc.), but also those that create a sense of unhappiness, such as funeral homes, drug rehabilitation centers, prisons, etc. [9,37]. At the same time, risk-gathering NIMBY facilities are characterized by having a high risk, large scale, and being small in number, which have an obvious industrial nature.

2.2. Formation of Public Acceptance

Public acceptance plays a pivotal role in the construction and operation of large-scale urban infrastructures and affects whether or not NIMBY facilities can be smoothly built and put into operation [15]. The mechanism is also complex [3] and has been the subject of many long-term studies, revealing the involvement of such factors as trust, public perception, and self-efficacy [3].

In WTE facilities, the researchers demonstrated that public acceptance of NIMBY facilities is not only related to how well the public knows about the facility [38], but also is related to perceived physical and psychological distance [20]. Junjun et al. (2021) propose a model called cognition and emotion coupling to explain how individual behavior is influenced and, by using a structural equation model (SEM) to measure the interdependence and causal relationships between different factors, establish the mechanism for shaping local public acceptance [39]. For NIMBY risk perception, Kraft and Clary (1991) introduce a basic model that indicates there to be a positive correlation between public attitudes towards NIMBY facilities and the perceived risks associated with their proximity [40]. For nuclear power generation projects, Park et al., (2014) point out that the importance of trust in the inspectorate is emphasized as a factor influencing the public's decision to oppose or reluctantly accept such projects [41]. Additionally, a comparison between the health risks and benefits of nuclear power reveals that developing nuclear energy within the framework of risk-benefit analysis is feasible [42]. In a survey of public perceptions of biomass energy projects in the UK, the key determinant of public acceptance is identified as public trust [43]. Furthermore, for nuclear power, the public's acceptance of nuclear energy is positively correlated with the perceived benefit [16].

2.3. Social Cognitive Theory

In the late 1970s, SCT was introduced by the American psychologist Bandura as a classic theory in pedagogy and social psychology. Building upon social learning theory (SLT), Bandura emphasizes the concept of self-efficacy and proposes that individual beliefs in their own abilities are a crucial factor influencing their motivational behavior [44]. SCT encompasses several key components, including ternary reciprocal determinism, observational learning, and self-efficacy, among which ternary reciprocal determinism is the central focus [31]. Bandura extensively researched the dynamic and mutually influential relationship between individuals, environment, and behaviors. He conceptualized personal factors, environmental factors, and behavioral factors as theoretical entities that are both independent and interconnected, leading to a mutual determination [45], as shown in Figure 1. Of these, personal factors include self-efficacy, self-control, and result expectation; environmental factors include social environment, social fairness, and social trust; and behavioral factors include individual acceptance, rejection, and choice [32]. Research into SCT is currently more in-depth and extensive, which has been widely applied to knowledge-sharing management, enterprise management, behavioral willingness to partic-

ipate, information system acceptance behavior, innovation and entrepreneurship behavior, education, human resources, and other fields [46,47]. Bandura proposes a five-factor structure model in his subsequent studies of SCT, pointing out that self-efficacy can act on outcome expectations and thus interfere with the occurrence of behavioral patterns [48]. Outcome expectation, a common psychological determinant, usually represents an individual's anticipation of certain behavioral consequences, including perceived risks, benefits, rewards, and sanctions [49].

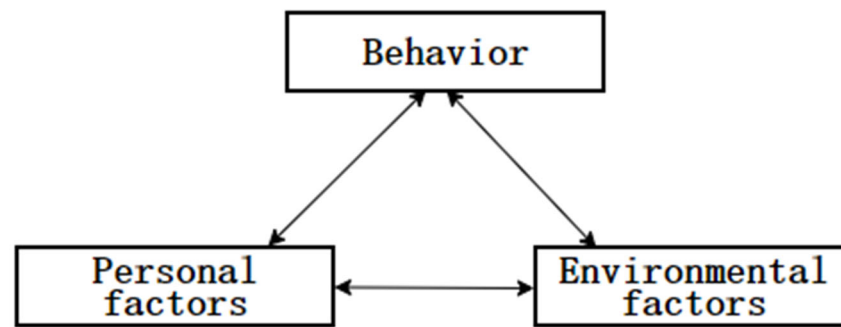


Figure 1. Three-way interaction diagram of social cognitive theory.

2.4. Perceived Risk, Perceived Benefit, and Public Acceptance

As a crucial psychological factor in behavioral research, perceived risk is considered to be a reaction to psychological activities and a subjective judgment of the negative impacts of potentially dangerous things or behaviors [50]. Due to the lack of knowledge, the public's risk cognitive judgment of some unfamiliar or potentially dangerous risk sources is mostly based on emotion and lacks objective understanding [51]. Previous studies have shown that a high-risk perception of NIMBY facilities will lead to lower public acceptance [2,52].

Perceived benefit refers to the perceived possibility that the measures taken positively impact the results [53]. Specifically, when people act in ways they think will benefit them, the result is expected to remain positive for a long time [31]. Although NIMBY facilities pose threats to the physical and mental health, living environment, and social reputation of the local public, their development creates society management benefits, social benefits, economic benefits, etc. [15]. The perceived benefit is regarded as a critical factor in determining the public acceptance of NIMBY facilities [54,55]. In previous studies of the public's attitude towards potentially dangerous facilities or things (e.g., nuclear energy, nuclear power facilities), it has been confirmed that perceived benefits are significantly positively correlated with public acceptance [23,55,56], prompting these hypotheses:

H1. *Perceived risk has a negative impact on the public acceptance of NIMBY facilities.*

H2. *Perceived benefit has a positive impact on the public acceptance of NIMBY facilities.*

2.5. Positive Affect Tag

SCT provides a profound theoretical perspective for understanding the role of emotional experience. As a sign or information for judging one's own ability, emotional state is one of the four key sources of self-efficacy [57]. Studies have shown that people can measure their self-confidence by their emotional state when participating in an action [58]. When individuals experience positive emotional states, such as happiness, they are more inclined to anticipate success than when they experience negative emotional states, such as anxiety or stress. This positive emotional state tends to result in higher levels of self-efficacy [59,60]. Affect heuristic theory holds that emotion can be understood as a feeling state [61]. During the site selection, construction, and operation of NIMBY facilities, the public primarily relies on its subjective feelings and perceptions. It has been demonstrated

that there is a higher perception of benefit and a lower perception of risk when people have positive emotions [62,63], prompting these hypotheses:

H3a. *A positive affect tag has a negative impact on perceived risk.*

H3b. *A positive affect tag has a positive impact on perceived benefit.*

H3c. *A positive affect tag has a positive impact on self-efficacy.*

2.6. Self-Efficacy

Self-efficacy refers to an individual's belief in their ability to perform a certain behavior in a certain situation, which is a key internal force driving the occurrence of behavior patterns [64,65]. It is defined as the local public's self-assurance to improve the efficiency of the construction and operation of the NIMBY facilities and to avoid the risks they create [16].

Studies indicate that people are more likely inclined to refuse to perform a certain behavior when they lack confidence in themselves to perform it; in contrast, they are often willing to accept such behavior when they can guarantee their ability to avoid the risks and enjoy the benefits [66]. In other words, self-efficacy can directly affect behavior patterns and guide the occurrence of behaviors [67]. On the other hand, the influence of self-efficacy on behavior patterns is mediated by outcome expectations (e.g., perceived risk, perceived income) [68]. Self-efficacy can significantly affect perceived risks and perceived benefits [53]. Research into the public acceptance of NIMBY facilities has verified that those with high self-efficacy can see a greater perceived benefit [68], while the perceived risks of people with low self-efficacy are amplified, leading to lower acceptance of NIMBY facilities [68], prompting these hypotheses:

H4a. *Self-efficacy has a negative impact on perceived risk.*

H4b. *Self-efficacy has a positive impact on the public acceptance of NIMBY facilities.*

H4c. *Self-efficacy has a positive impact on perceived benefits.*

2.7. Social Environment

According to SCT, behavior is influenced by personal factors and restricted by external environmental factors. Individuals in different situations have different behavior patterns [69,70]. As an inseparable part of SCT, the social environment potentially impacts individual perception and behavior patterns [71]. Within the SCT framework, on the one hand, the social environment directly affects behavior and guides people's behavioral intentions or choices [31,68]. On the other hand, environmental reactions cause changes in individual subjective emotions and cognition (self-efficacy), which further affect behavioral intention. In other words, the behavioral pattern results from the interaction of individual cognition (self-efficacy) and the social environment [64]. In addition, the latter can also interfere with behavioral intention, attitudes, and choices by adjusting the expectation of results, such as perceived risk and perceived benefit [28,41], prompting these hypotheses:

H5a. *The social environment has a positive impact on self-efficacy.*

H5b. *The social environment has a negative impact on perceived risk.*

H5c. *The social environment has a positive impact on perceived benefits.*

H5d. *The social environment has a positive impact on the public acceptance of NIMBY facilities.*

Figure 2 shows the final conceptual framework. Based on SCT, self-efficacy and outcome expectation (perceived risk and perceived benefit) are chosen as personal factors, social environment as environmental factors, and public acceptance as behavioral patterns, which constitute the basic framework of this study. Moreover, it has been shown that public acceptance of NIMBY facilities can be regarded as the behavioral pattern in SCT [16]. Moreover, the positive affect tag is extended outside the basic framework of SCT as another control variable. The assumed relationships between public acceptance of NIMBY facilities, perceived risk, perceived benefit, positive affect tag, self-efficacy, and social environment are integrated.

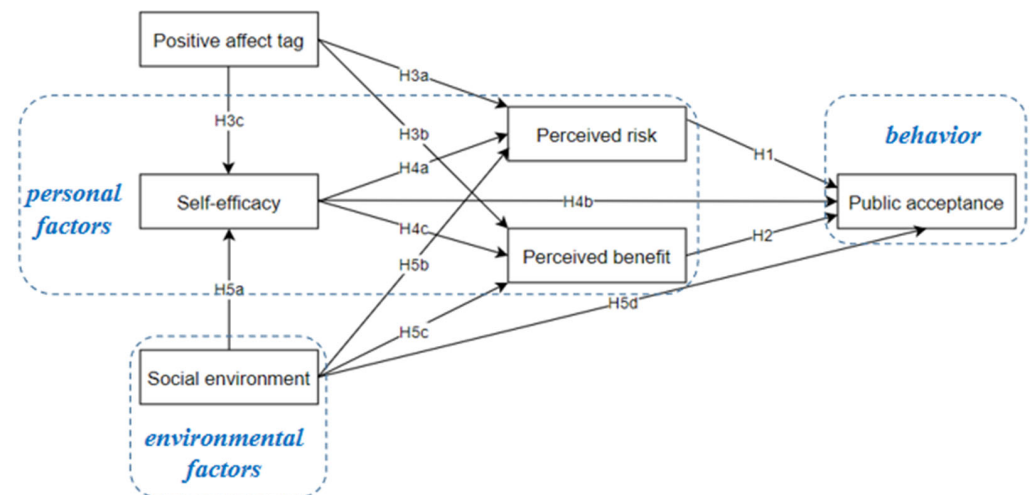


Figure 2. Conceptual framework.

3. Research Design

3.1. Research Framework

The traditional hypothesis testing method is adopted. Firstly, the conceptual model was established based on SCT, and the corresponding assumptions and variable measurements were identified by a large literature search and content analysis. Secondly, according to the geographical location and population distribution of Zhejiang Province, residents within 3 km of polluting facilities and psychologically excluded facilities were investigated by a questionnaire in Hangzhou, Taizhou, Quzhou, and Shaoxing to obtain data relating to the social environment, self-efficacy, positive affect tag, perceived risk, perceived benefit, and public acceptance. Finally, an SEM was used to compare the mechanism in terms of polluting and psychologically excluded facilities, as well as a *t*-test to compare the difference in the local public's views of different types of hazardous effects from different dimensions.

3.2. Questionnaire Design

The research questionnaire comprises two parts. The first involves such demographic information as gender, age, and education level, and the second part is used to measure the six dimensions constructed in the model. The measurement items of the questionnaire are all taken from previous studies. The items relating to perceived risk and public acceptance are derived from [4], while items concerning perceived benefit, self-efficacy, and social environment are derived from [16] and three positive affect tag measurement items are raised by [15]. Participants are asked to rate their level of agreement with the statements on a five-point Likert scale from 1 ("extremely disagree") to 5 ("extremely agree").

To ensure the reliability and validity of the questionnaire, a small-scale pilot survey was conducted in Hangzhou. A total of 100 respondents around the facility were involved, and a total of 86 valid questionnaires were collected. Then, Cronbach's alpha was used to analyze the reliability and validity of the resulting data. The results showed that Cronbach's

alpha of each dimension was between 0.871 and 0.908, and the KMO was between 0.707 and 0.875, indicating the designed questionnaire had good reliability and validity.

3.3. Sample and Data Collection

According to data analysis and news reports, there have been several NIMBY conflicts in Zhejiang Province, such as the Yuhang Jiufeng waste incineration plant incident, the Ningbo PX project incident, and the Haiyan waste incineration plant incident. Due to their anticipated huge negative impact on the local public, these NIMBY projects were strongly resisted, and construction was forced to stop. Therefore, Zhejiang Province was selected as the research city. According to the geographical distribution of Zhejiang Province, four prefecture-level cities (Hangzhou, Shaoxing, Quzhou and Taizhou) were randomly selected as specific research sites by a random sampling method in accordance with the four directions of east, south, west, and north. According to existing studies, polluting facilities mainly affect people's living environment and physical health, typically including waste incineration power plants, sewage treatment plants, etc; psychologically excluded facilities mainly have potential threats to people's mental health, such as funeral homes, drug rehabilitation facilities, and other facilities [6,7]. So, in the current study, for polluting facilities, WTE incineration facilities, waste transfer stations, sewage treatment plants, etc., were chosen because such facilities are more likely to pose threats to the human living environment and health. As for psychologically excluded facilities, such facilities as funeral homes, prisons, and drug rehabilitation centers, were chosen for their potential to harm people's mental health and make them feel rejected.

The questionnaire was conducted from 15 June 2022 to 18 September 2022. A polluting and a psychologically excluded facility were randomly selected in each prefecture-level city. Therefore, eight facilities were finally selected, including four polluting and four psychologically excluded facilities. According to previous research, respondents living farther than 3 km from a NIMBY facility were unlikely to show much interest in the facilities or would even be aware of [21]. Therefore, defining the research area as within 3 km of the selected facilities is more appropriate. Potential target respondents for the survey were identified as local residents residing in the selected survey areas. The respondents were selected by a stratified random sampling process. A total of 600 questionnaires (300 for both polluting and psychologically excluded facilities) were dispatched to selected respondents. After eliminating responses with missing items and multiple options, 513 valid questionnaires (246 and 267 for polluting and psychologically excluded facilities, respectively) were collected—a final response rate of 85%. Compared with traditional social surveys, although the overall efficiency of 85% is clearly very high, previous studies have shown that face-to-face field surveys can substantially increase the response rate, especially in China [21]. Present research refers to the previous studies of scholars [9] and drew the regional distribution of sample data in this survey, as shown in Figure 3.

Table 2 provides details of the survey and socio-demographic data of the respondents. The present study conducted a survey in Zhejiang Province, so we selected the demographic data to be investigated according to the demographic information released in the latest statistical yearbook of Zhejiang Province. Gender, age and education level were selected as survey indicators. Following the data published in the Statistical Yearbook of Zhejiang Province in 2022, the gender and age distribution of the respondents indicates the sample of respondents to be reasonably representative of the population in Zhejiang Province.

Regarding education level, most of the psychologically excluded facilities are located in urban areas, since the sites of such facilities are far less remote than those of polluting facilities. As a result, the proportion of respondents with postgraduate education in the survey samples of psychologically excluded facilities is much higher than that of polluting facilities.

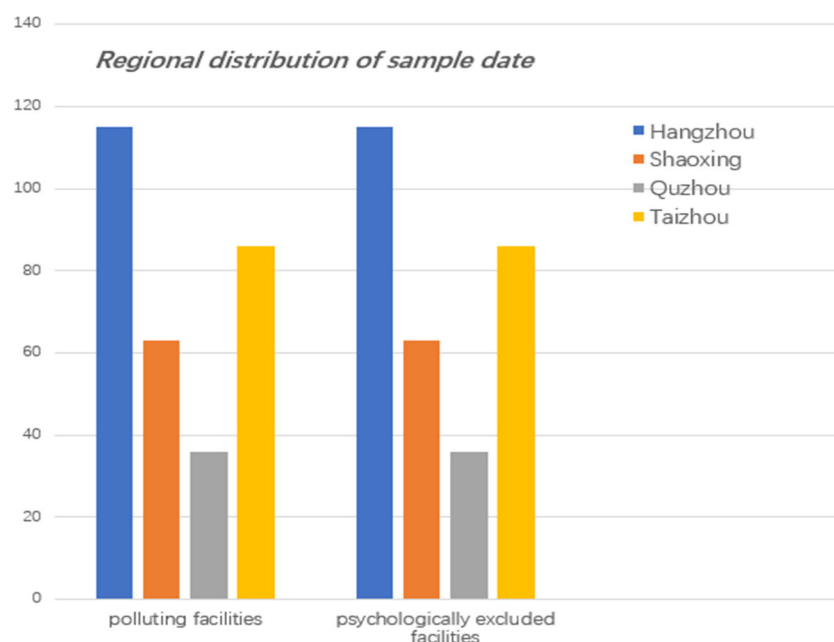


Figure 3. Regional distribution of sample data.

Table 2. Demographic characteristics of the respondents.

Profile	Category	Frequency (%)		
		Type A	Type B	Zhejiang
Gender	Male	122 (49.6%)	130 (48.7%)	33.7 million (52.1%)
	Female	124 (50.4%)	137 (51.3%)	30.9 million (47.8%)
Age	18–34	56 (22.8%)	66 (24.7%)	9.8 million (23.2%)
	35–59	118 (47.9%)	131 (49.1%)	20.4 million (48.3%)
	≥60	72 (29.3%)	70 (26.2%)	12.1 million (28.5%)
Education Level	≤Junior High School	132 (53.6%)	124 (46.4%)	
	Senior High School	51 (20.7%)	60 (22.5%)	
	Junior College	34 (13.8%)	35 (13.1%)	
	Undergraduate	27 (11.0%)	32 (12.0%)	
	≥Graduate	2 (0.8%)	16 (6.0%)	

Note: Types A and B denote polluting and psychologically excluded NIMBY facilities, respectively.

3.4. Data Analysis

The data analysis process is divided into three steps. Firstly, the respondents' attitudes towards polluting and psychologically excluded facilities are assessed using descriptive statistical analysis. Secondly, SEM is used as it is a widely utilized statistical method in academic and professional domains and is employed in numerous research studies, including those examining contractor's construction waste management behaviors [72], as well as individual's food waste behaviors [73], which is well suited to empirically test the hypothesized relationships and compare the mechanism with different types of hazardous effects. Finally, the *t*-test is used to compare the differences in local public opinions of facilities with different types of negative effects because it measures the significance of the differences in mean values between the two data groups.

4. Results

4.1. Descriptive Statistics

Table 3 summarizes the results of the descriptive statistical analysis of the survey data of polluting and psychologically excluded facilities. For polluting facilities, the mean

scores of perceived risk and perceived benefit are 3.21~3.50 and 1.74~2.20, respectively, indicating the local residents' perceived risk degree to polluting facilities is relatively high, yet the perceived benefit is very low. The average score range of self-efficacy, positive affect tag, social environment, and public acceptance is between one and three, which means that people hold a quite negative attitude toward polluting facilities. For psychologically excluded facilities, the perceived risk and perceived benefit scores range from 2.26 to 2.69 and 2.23 to 2.42, respectively, revealing that local residents believe such facilities may not bring them much risk and benefit. Moreover, the mean scores of the other four control variables, including self-efficacy, positive affect tag, social environment, and public acceptance, are higher than three, which suggests the local residents have a relatively greater positive attitude to psychologically excluded facilities, with stronger inclusiveness and higher acceptance.

Table 3. Statistical results of the descriptive variables.

Variables	Item	Type A		Type B	
		Mean	Std. Dev	Mean	Std. Dev
Perceived risk	Q1	3.50	1.038	2.38	1.144
	Q2	3.21	1.052	2.46	1.153
	Q3	3.44	1.069	2.69	1.292
	Q4	3.23	1.045	2.26	1.020
Perceived benefit	Q5	1.95	0.848	2.23	0.985
	Q6	2.20	0.986	2.42	1.094
	Q7	1.96	0.880	2.33	1.077
	Q8	2.00	0.872	2.33	0.996
Self-efficacy	Q9	1.74	0.765	2.25	1.041
	Q10	2.29	0.977	3.09	0.930
	Q11	2.15	0.960	3.13	1.001
	Q12	1.93	0.915	2.74	0.920
Positive affect tag	Q13	2.12	1.004	2.90	0.871
	Q14	2.12	0.972	2.96	0.858
	Q15	2.40	1.080	3.35	0.830
Social environment	Q16	2.42	1.124	3.12	1.081
	Q17	2.26	0.958	3.10	1.014
	Q18	2.51	0.996	3.19	0.923
Public acceptance	Q19	2.49	1.023	3.21	0.968
	Q20	2.12	0.969	3.01	0.964
	Q21	1.97	0.956	2.97	1.023

4.2. *t*-Test Analysis

Table 4 shows the *t*-test results, indicating that there are certain differences in the mechanism with different types of hazardous effects. From the perspective of perceived risk, perceived benefit, self-efficacy, positive affect tag, social environment, and public acceptance, the *p* values are all less than 0.001, which indicates that there are significant differences in the mechanism shaping the acceptance of facilities with different types of hazardous effects: polluting and psychologically excluded facilities. At the same time, the standard deviations are all between zero and two, and most of them are between zero and one, which indicates that the data are small in dispersion, close in aggregation, and close to the true value. In general, the acceptance of polluting facilities is much lower than that of psychologically excluded facilities.

4.3. Structural Equation Analysis

Table 5 shows, through SEM analysis, the model fitting indices for the total sample and two kinds of sub-samples for polluting and psychologically excluded facilities. These show that the indices of all samples have reached the recommended values except for the psychologically excluded facilities sample, in which the GFI is slightly less than 0.9, which indicates that the survey data fit the model sufficiently well.

Table 4. Comparison of public acceptance mechanism of different types of NIMBY facilities.

Item	Type	Average Value	Standard Deviation	t-Value	Sig
PR	type A	3.35	0.889	10.626	***
	type B	2.45	1.022		
PB	type A	1.97	0.675	−4.865	***
	type B	2.31	0.906		
SE	type A	2.12	0.844	−11.653	***
	type B	2.98	0.831		
PAT	type A	2.21	0.913	−11.835	***
	type B	3.07	0.723		
SEN	type A	2.40	0.896	−9.209	***
	type B	3.14	0.923		
PA	type A	2.19	0.840	−11.484	***
	type B	3.06	0.873		

Note: *** $p < 0.001$.

Table 5. Recommended value of fit indices and actual value.

Fitness Index	χ^2/df	RMR	RMSEA	GFI	NFI	IFI	TLI	CFI
Recommended value	<3	<0.08	<0.08	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9
Model A	1.761	0.040	0.054	0.902	0.910	0.959	0.951	0.959
Model B	1.889	0.055	0.059	0.892	0.911	0.956	0.947	0.955
Total	2.120	0.041	0.047	0.936	0.953	0.956	0.947	0.955

Note: See Table 2 note.

It can be seen from the above analysis that the SCT provides a solid theoretical basis for exploring the mechanism under the joint action of personal factors and environmental factors, with the latter having a significant influence.

As Figure 4 shows, all the hypothetical relationships are well supported except for H2 and H3b in Model A (polluting facilities) and H2, H3a, H3b, and H4a in Model B (psychologically excluded facilities). In addition, perceived risk is significantly positively correlated with self-efficacy and significantly negatively correlated with the positive affect tag for polluting facilities but not significantly so for psychologically excluded facilities.

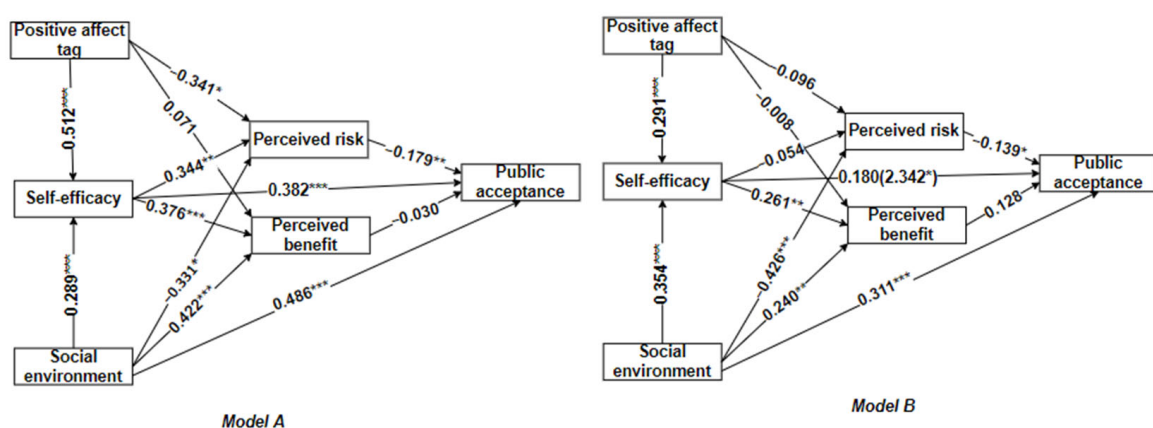


Figure 4. Standardized path coefficients. Notes: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

5. Discussion

The present study shows that, firstly, SCT provides a solid theoretical basis for exploring the specific mechanism shaping local public acceptance of NIMBY facilities under the joint action of personal and environmental factors. Secondly, there is a significant difference in the mechanism with different types of hazardous effects. Compared with polluting facilities, the local public has a more positive attitude towards psychologically

excluded facilities. Although nimbyism is usually regarded as negative, it is interesting that the public seems more accepting of psychologically excluded nimbyism than of polluting nimbyism.

According to the SEM analysis, three important findings are obtained. First, a perceived benefit is not an important determinant of local public acceptance of NIMBY facilities, which is quite different from most previous research results [56,63,74]. On the one hand, NIMBY facilities have created a series of hazards to the local public. They are so unbearable and have expressed strong concerns about the negative external effects and pay more attention to the risk. In particular, it will be difficult for people to change their attitude towards NIMBY facilities when they have already formed a fixed perception that they threaten them [75]. On the other hand, studies have confirmed that it is only when local people are experiencing serious economic difficulties that they can change their attitudes [76]. However, in the context of rapid economic development, the benefits that NIMBY facilities can create are negligible. Consequently, public acceptance is mainly controlled by perceived risk rather than perceived benefit.

Second, the positive affect tag indirectly predicts public acceptance through perceived risk for polluting facilities, which corresponds with existing studies [15,77]. However, strangely, no similar results have been found in terms of psychologically excluded facilities, and the role of the positive affect tag on perceived risk is not significant. Studies have shown that emotion plays a key role in determining the public's attitude toward NIMBY facilities [78]. Due to the lack of relevant professional knowledge or information, emotion can become the main source of the public's risk perceptions. In our research, local public risk perception of polluting NIMBY facilities mainly depends on emotional judgment because of the lack of relevant professional knowledge. As for the psychologically excluded facilities, most of the surrounding NIMBY staff residents have more professional knowledge about the facilities and the degree of threat involved, which leads to many local residents tending not to rely entirely on emotional judgment of the risks involved.

Finally, the influence of self-efficacy on the perceived risk is confirmed in terms of polluting NIMBY facilities, but such an effect is not significant in terms of psychologically excluded facilities. A previous study has shown that self-efficacy may not be consistently associated with perceived risk: even if people believe they can manage to avoid the risks associated with the facility, they can still be convinced that the facility poses a significant risk to their mental health, living environment, etc. [79]. In addition, perceived risk is usually influenced by factors other than personal self-efficacy, such as community participation, trust in facility operators, and the perceived benefit of facilities [4,41], which may even affect people with a high sense of self-efficacy. Another explanation is that the relationship between self-efficacy and perceived risk may be related to the specific characteristics of NIMBY facilities. The project's success depends on the perceived benefits involved and a comprehensive understanding of their characteristics [80]. In other words, psychologically excluded NIMBY facilities themselves may not be seriously harmful, leading to the public's low level of perceived risk despite a low sense of self-efficacy.

The *t*-test results raise three main issues. First, the local public's perceived risk of polluting NIMBY facilities is much greater than that of the psychologically excluded facilities. In contrast, the perceived benefit is much weaker. People tend to think more about physical health than mental health when considering the potential benefits and risks associated with each facility. Polluting NIMBY facilities create more obvious and real risks to the local public than psychological exclusion. For example, odors and pollutants discharged from landfill sites or waste treatment plants will affect air quality and harm human health [4,10]. But drug rehabilitation centers and prisons may not have any direct physical impact on the surrounding environment. Moreover, the operation of polluting NIMBY facilities is usually more difficult for laypeople to understand. Studies have shown that people are often afraid of what they do not understand, and for unfamiliar or potentially threatening technologies or facilities, a lack of expertise usually leads to a higher perception of risk [41,81]. In addition, environmental issues have become more prominent

over time, while mental health has only recently begun to receive more attention from society [82]. People may be more aware of the risks related to pollution because they have been exposed to pollution for a long time through news reports and social media platforms.

Second, from the two dimensions of self-efficacy and positive affect tag, the public has lower self-efficacy and more negative emotions towards polluting NIMBY facilities. It has been shown that people tend to experience lower self-efficacy when they think that threats are difficult to manage and uncontrollable [83]. The risks created by polluting NIMBY facilities are tangible and uncontrollable, for example, the pollutants such as sulfur dioxide, nitrogen oxides, and particulate matter produced by garbage incineration. These pollutants lead to respiratory diseases, including asthma and bronchitis [10]. Moreover, people are usually faced with unknown and ambiguous problems owing to the complicated operations and management procedures of polluting NIMBY facilities, often leading to lower self-efficacy and increased negative emotions [84].

Thirdly, when the public considers psychologically excluded NIMBY facilities, the social environment is perceived to be less disrupted. Previous studies have shown that a credible and fair social environment can improve the public's judgment of the value of NIMBY facilities and enhance public acceptance [11,28]. Polluting NIMBY facilities are usually opposed by local communities because most of their costs tend to be localized [4]. Therefore, the local government is more inclined to avoid opposition through opaque and unfair decision-making procedures (e.g., the decision-announcement-defense (DAD) model) [85]. As a part of the social environment, distributive justice also causes different public views of the social environment and affects the acceptance of NIMBY facilities [16]. Compared with psychologically excluded NIMBY facilities, polluting facilities create a stronger sense of unfair cost-benefit distribution to the local public. It may be an important reason for the public to show the otherness in the social environment dimension when they faced NIMBY facilities with different types of hazardous effects.

In nimbyism, the construction of NIMBY facilities will not only be resisted by the local public, but also by local administrators or politicians [86]. "NIMBY being accompanied by NIMTO" is a common phenomenon, especially in urban planning and development. The NIMBY (Not-In-My-Backyard) term is generally given a negative connotation regarding all types of local opposition led by opportunistic behavior of residents, while NIMTO (Not-In-My-Term-Of-Office) is the opposition of local administrators or politicians, they are reluctant to approve the construction of these facilities during their term of office because they fear it will affect their political future [87,88]. Additionally, nimbyism may, in some cases, be used by powerful groups to preserve the status quo, prevent social and economic change, and use their wealth and influence on lobby governments against changes to the status quo, even if those changes are socially and environmentally beneficial [89].

These research findings not only have profound theoretical significance but also have certain practical application value. The research results are conducive to the planning and decision-making of NIMBY facilities with different types of hazardous effects and the formulation of related policies and provide certain practical references for relevant government departments and decision-makers in the siting, construction, and operation of NIMBY facilities, so as to better deal with potential environmental or health risks, improve public satisfaction, and maintain social order and stability, and to promote the high-quality and sustainable development of NIMBY infrastructure projects in China.

6. Conclusions

Given the key role of public acceptance in the successful incorporation of NIMBY facilities into a community, the present study conducts a viable and classic analytical framework for understanding the specific mechanism involved in shaping this acceptance under the joint action of personal and environmental factors from the perspective of SCT and further analyzes the differences in the mechanism with different types of negative effects by SEM and *t*-tests. The results reveal that, firstly, SCT does provide a solid theoretical basis for exploring the mechanism under the joint action of personal and environmental factors.

Secondly, self-efficacy indirectly predicts public acceptance by influencing perceived risk. The effect of the positive affect tag on public acceptance is mediated by the perceived risk in shaping the local public's acceptance of polluting NIMBY facilities, but not for psychologically excluded facilities. Moreover, the public acceptance of NIMBY facilities with different types of hazardous effects is mainly affected by the perceived risk but not controlled by a perceived benefit. In general, the public tends to possess lower perceived risk, higher perceived benefit, a stronger sense of self-efficacy, and a more positive attitude than polluting NIMBY facilities when faced with the siting of psychologically excluded facilities.

Based on these findings, this study has the following practical significance and application value. The research results are helpful for decision-makers, relevant governments, and enterprises to reasonably introduce relevant policies and measures, provide practical references, and better deal with potential risks in the location, construction, and operation of NIMBY infrastructures. In addition, it can help contain NIMBY conflicts, maintain social stability and harmony, and contribute to the achievement of Sustainable Development Goal (SDG) 16 (promoting peaceful and inclusive societies for sustainable development) and (SDG) 11 (Building inclusive, safe, resilient and sustainable cities and human settlements). In practical applications, we can formulate different plans for different types of NIMBY facilities, take different benefit compensation measures, risk response measures, etc., to promote the sustainable and high-quality development of different types of NIMBY facilities.

Although this study counters the deficiency of previous research into the public acceptance of NIMBY infrastructures by exploring the differences in the mechanism shaping the local public's acceptance of NIMBY facilities with different types of hazardous effects, it has certain practical significance to promote the high-quality development of NIMBY infrastructures in China; there are also some limitations. The research data are restricted to Zhejiang province and the influence of regional differences is not considered. Moreover, the applicability of these research conclusions in other countries has not been verified, and extrapolating the research conclusions to other countries and contexts requires us to have a deep understanding of the cultural and social background of other countries, consider cultural differences, and conduct localized research to ensure that our research conclusions can be effectively applied to other countries. On the one hand, specific regions or populations that future research could focus on, for example, the central region, the western region, and even in the whole country, can turn this limitation into an opportunity for further study. On the other hand, further work is needed to explore how cross-culturalism affects the shaping of local public acceptance of NIMBY infrastructures and to establish the extent to which the findings generalize to other parts of China and similarly placed regions worldwide.

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