

Article

Anti-incinerator sentiment in China: the role of place attachment, trust, and fairness

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Abstract: Globally, public acceptance of waste-to-energy (WtE) incinerators is a crucial factor in implementing national waste-to-energy policies. This study adds to the literature on anti-incinerator sentiment by drawing upon an extended psychological-emotional model that integrates place-, trust-, and fairness-based pathways. A total of 338 residents in the Asuwei area in North Beijing completed a survey on a proposal to construct a WtE incinerator in the vicinity. Hierarchical regression analyses indicate that place attachment positively enhances anti-incinerator sentiment through direct effects, as well as through moderation and mediation effects between risk perception and opposing willingness. Further, institutional trust negatively moderates the impact of perceived risk on anti-incinerator sentiment, in addition to directly reducing perceived risk. Trust also influences anti-incinerator sentiment via risk perception, attesting to the effectiveness of a casual model of trust. Likewise, fairness perception acts as another determinant of opposing sentiment, similar to trust. We further reveal that procedural fairness plays a more significant role in predicting anti-incinerator sentiment than does distributional fairness. These findings demonstrate the importance of using a range of instrumental and more affective strategies to promote social acceptance of renewable energy infrastructure.

Keywords: anti-incinerator sentiment; place attachment; trust; fairness; waste-to-energy

1. Introduction

With rapid economic growth and massive urbanization in China, many metropolises face serious dilemmas regarding municipal solid waste (MSW) disposal. A 2012 World Bank report estimated that by 2025, more than 11% of the world's MSW will be generated in China. More than 188.5 million tons of MSW were produced in China in 2016 [1]. WtE incineration, which recovers energy from discarded MSW and produces electricity and/or steam for heating, is recognized as a renewable source of energy and is the most effective alternative to landfilling, owing to its high efficiency, minimal land requirements, and ability to substantially reduce solid mass [2-4]. WtE incineration is playing an increasingly important role in MSW management and in achieving emissions reduction goals in China [2,5]. According to China's most recent Five Year Plan (2016-2020), the total investment in waste treatment facilities will amount to 192.4 billion Yuan (about \$30 billion), almost half of which will be allocated to the construction of new WtE incinerators. In addition, the proportion of WtE incineration will increase from 28.6% in 2015 to 50% in 2020 [6]. As of the end of 2017, a total of 339 WtE incinerator projects had been built and put into

operation in mainland China, with a total installed capacity of 7.253 million kilowatts and annual power generation of 37.52 billion kilowatt hours [7].

However, the siting of WtE facilities has encountered considerable resistance from local communities, with concerns stemming largely from perceived risks and threats to the local landscape, natural environment, economy, and residents' daily lives [8-10]. Social acceptability becomes a decisive factor in the implementation of WtE incineration policies and programs, and thus policy makers and incinerator operators are interested in the public's sentiments regarding the building of WtE incinerators and in what influences these sentiments. To increase public acceptance of WtE incinerators and other new energy facilities, numerous studies have highlighted the importance of psychological and social factors (e.g., risk and benefit perceptions, affective feelings, and social trust), and provided considerable empirical evidence [4,10-15]. Additional literature has examined socio-psychological factors and how they shape the public's attitudes toward WtE incinerators [15].

In the literature, two persistent approaches are identified [13,16]. First, place-based explanations focus on how risky energy facilities alter the emotional connections residents have to their communities. These include the "Not in My Backyard (NIMBY)" concept, place attachment (or sense of place), and place knowledge. The NIMBY explanation has been dismissed by many scholars given its simplistic way of analyzing attitudes. Thus, a more universal or novel explanation is needed [12,13,17]. Besides the disturbance to natural landscapes, it is widely believed that the presence of energy projects impacts the attachment and identity of local residents to their places [8,18-20]. Given the disturbance, attitudes toward energy projects may become negative or skeptical, even when one has a positive attitude toward renewable technology itself. Therefore, place attachment provides an alternative explanation for opposition that emphasizes psychological processes, such as meaning making, emotional responses, and action [12-13]. Secondly, trust- and fairness-based explanations highlight the importance of placing trust in planning authorities and operating companies, which plan and approve energy projects. Trust in government and scientists are generally represented by trust in location outcomes and planning procedures in some studies [21,22] and perceptions of outcome fairness and procedural fairness (or justice) in other studies [23,24].

Studies that have sought to systematically and empirically investigate these combined effects on social acceptance are scarce. Fast and Mabee, for instance, conducted a comparative case study of a wind farm to assess the impact of policy choices on the place-making and trust-building potential of wind projects in the host community [16]. Based on a survey, Devine-Wright suggested that place attachment, perceived impacts, trust in developers, and procedural justice had significant effects on public attitude toward a proposal to construct a high voltage power line [13]. The present research fills a gap in the literature by examining the relationships between perceived risk, place attachment, trust, fairness perception, and anti-incinerator sentiment among inhabitants living near incinerators in China. Section 2 reviews the literature and develops an extended framework for interpreting individuals' opposing sentiments toward incinerators, while Section 3 describes the methodology issues. The final discussion places our findings in context of the literature and suggests policy implications.

2. Literature review and theoretical framework

2.1 Hypotheses

2.1.1 Place Attachment

As a powerful concept in cultural geography and environmental psychology, “place” refers to a fundamental human trait of creating meaning attached to the spaces we inhabit [25], comprising physical landscapes, social interaction, person and home experiences, and other human activities and processes [26]. Disruptions to place-based attachments, identities, meanings, and values can cause crucial emotional responses, because it is “essential to get to the root of ...emotional relationship to place in order to understand people’s reasons of blocking or facilitating certain community-based efforts” [27] (p. 340). The core construct, place attachment, is usually understood as a positive emotional bond between people and prized socio-physical settings over time at different scales, such as homes, neighborhoods, and cities [28]. These bonds help cultivate group and individual identities [29], a feeling of pride, and a general sense of well-being [30]. However, these links can be disrupted or threatened by diverse forms of change (e.g., landscape transitions, involuntary relocations, and development of large facilities), leading to negative affects, such as anxiety, grief, and anger [31,32].

In the context of siting WtE incinerators, such developments physically (re)shape places and socially characterize communities as renewable energy communities. Opposition intention occurs when inhabitants feel austere external threats posed by environmental changes. According to Devine-Wright, the influence of renewable energy infrastructure on natural landscapes can be considered a disruption to place attachment or a threat to place identity, where disruption not only refers to the physical nature, but also to the symbolic and social values of the landscape [12]. Unlike wind farm projects, which can be perceived positively and negatively, incinerator projects are generally considered threats to the primitive landscape [11,33]. The impacts of local energy development on landscape has been viewed as central to community opposition [34,35]; for instance an incinerator chimney is typically regarded as a visual perturbation to local landscapes. Furthermore, the threat of renewable projects to landscapes is not only a problem of aesthetics, but also represents a loss of symbolic value; that is, people with strong bonds to their community may view such projects as an “alien invasion” [36] (p. 64). Studies have employed place attachment to describe the value of landscapes in explaining public opposition to disputed projects [12,36]. Jasper described the emotions of protest as a continuum from “long term” affects (e.g., love of rural landscape, “fondness for neighborhood,” or ongoing loyalty to place) to immediate reactions [37].

Research has shown that place attachment influences behavioral intention toward place change caused by energy projects [18-20,38]. Individuals who hold strong place attachment and a more positive sense of identity from particular rural landscapes are more likely to feel threatened and take part in oppositional behaviors [12,13,18,39]. As for the relationship between place attachment and risk perception, Venables *et al.* reported that attachment offers a feeling of safety and leads to a neglect of nuclear power risk[14]. More generally, Bernardo summarizes that place attachment may contribute to amplifying high probability risk perceptions (less dangerous, but more frequent), while attenuating the perception of low probability risks (often most dangerous, e.g., nuclear accidents) [40]. Such evidence led us to develop the following hypotheses:

Hypothesis 1 Anti-incinerator sentiment toward a community WtE incinerator is a function of the interaction between perceived risk and place attachment to a dwelling community. Specifically:

Hypothesis 1.1 People with higher place attachment have a higher level of anti-incinerator sentiment.

Hypothesis 1.2 People with higher risk perception have a higher place attachment to a dwelling community.

Hypothesis 1.3 People with higher place attachment have a higher risk perception toward a community WtE incinerator.

In the setting of natural disasters, moderating and mediating effects exerted by place attachment are found between risk perception and coping behavioral responses. For example, based on empirical studies in two Italian cities exposed to flood risk, De Dominicis *et al.* found that place attachment negatively moderated the connection between risk perception and preventive coping behaviors [41]. Venables and colleagues suggested that sense of place mediates (but does not moderate) the relationship between the proximity and risk perception for renewable energy projects [14]. Lima and Marques found that place identity acts as a statistical moderator in the relationship between proximity and local people's perceptions of risk in relation to the siting of a new incinerator [42]. However, for controversial energy facilities, this moderating or mediating effect between risk perception-coping sentiment has not been sufficiently investigated. Therefore, further investigation must explore how place attachment affects the connection between risk perception and opposing (or acceptance) sentiment related to WtE sitings.

Hypothesis 1.4 Place attachment moderates the effect of risk perception on anti-incinerator sentiment toward a community WtE incinerator. Specifically, place attachment increases the positive effect exerted by perceived risk on anti-incinerator sentiment.

Hypothesis 1.5 Place attachment mediates the connection of risk perception and anti-incinerator sentiment toward a community WtE incinerator.

Moreover, we cannot be certain whether risk perception acts as a mediator between place attachment and anti-incinerator sentiment. Further, we assume that:

Hypothesis 1.6 Risk perception mediates the connection between place attachment and anti-incinerator sentiment.

2.1.2 Trust and Fairness

A community's acceptance or opposition attitude is also a question of fairness and trust. Trust is conceptualized and studied in different literature, such as in management, organizational behavior, and political science. This term is also a key concept in the literature on the sociology of technology, and "acts as a substitute for knowledge in complex societies characterized by risk" [43] (p. 3). As "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another" [44] (p. 395), trust means "a willingness to rely on those who have the responsibility for making decisions and taking actions related to the management of technology and policy implementation" [45,46] (p. 447). It serves as an indispensable catalyst for satisfying cooperation of diversified actors striving to solve controversial problems [47] and is "essential for the capacity of social-ecological systems to adapt to and shape change" [48] (p. 261).

The multidimensionality of trust has been presented in selective configurations. Based on extant research, Fulmer and Gelfand distinguish between *trust at a level* and *trust in a referent*. Three organizational levels—individual, team, and organizational—and three referents—interpersonal, team, and organization—are elaborated upon [49]. In the context of siting controversial energy projects, trust generally denotes an individual's degree of trust in varied organizational entities, such as operating enterprises, regulatory authorities, and academic circles in incineration area. In two case studies of power line development, Ceglarz *et al.* developed a conceptual meaning of three dimensions of trust—interpersonal, social, and institutional—and underpinned the importance of all of these dimensions in conducting public engagement processes [47]. Additionally, Mah *et al.* proposed three dimensions of trust: trust in motives (integrity, care, and fairness), trust in transparency (openness), and trust in competency (credibility, competence, and reliability), within the context of nuclear power [50]. For our research, we focus on institutional trust, that is, the level of an individual's trust in authorities from regulatory governments and operating enterprises, and experts and scholars in the incinerator field.

There is substantial empirical evidence that institutional trust interacts with risk perception and acceptance of local negative changes [4,51,52]. The degree to which host community members trust the siting process and the wider policy decisions to advance renewable energy programs is of extreme importance to promote the implementation of renewable energy policy [16,53]. In nuclear energy decision-making, distrust in key decision-makers in relation to the dimensions of motives, transparency, and competence is one of the major factors that explains high risk perception and opposition to nuclear energy [50]. In the Chinese mainland, when unfamiliar with nuclear power stations, people are inclined to perceive the benefits and risks through emotional identification and social trust, rather than rational deduction [54]. Specific to the siting of WtE incinerators, trust in authorities (local government and operators) is found to positively associate with public acceptance, both directly and indirectly, through risk perception, and promoting public trust can enhance public acceptance more efficiently than reducing perceived risk [4,55]. Drawing upon these findings, we hypothesize the following:

Hypothesis 2.1 Institutional trust negatively predicts anti-incinerator sentiment toward a community incinerator.

Hypothesis 2.2 Institutional trust negatively influences perceived risk.

Although it is widely recognized that acceptance, trust, and risk perception often interact, there is still considerable disagreement about the underlying patterns of causality among the constructs. As the *casual model of trust* (CMT) indicates, trust affects technology acceptance through risk perceptions or benefits. In a cross-cultural investigation of 23 activities and technological hazards, trust in regulatory organizations was found to be directly and indirectly linked with public acceptance, and perceived benefit plays a more important role than perceived risk in mediating the trust-acceptability casual chain [56]. Regarding nuclear power plants (NPPs), goodwill trust improves acceptance of NPPs by decreasing risk perception, while competence trust improves the acceptance by increasing benefit perception [57]. However, these findings are challenged by the *associationist model of trust* (AMT), which asserts that acceptance drives both trust and risk perception [58,59]. For example, Boecker and Necella found that risk perception is a precondition for trust playing a role in decision making, and there was no empirical evidence to show that the impact of trust on acceptance is mediated through risk perception [60]. Rather than being a determinant, trust

in government regulation is an expression or indication of the acceptability of genetically modified food, and specific risk judgments are driven by more general evaluative judgments, termed “affect” by Poortinga and Pidgeon [61]. Considering the conflicting results, it is necessary to discuss which model is supported in explaining the trust-acceptance relationship in Chinese WtE contexts.

Additionally, within the context of community energy projects, (generalized) trust is found to positively predict the willingness to participate and moderates the effect of community identity on the willingness to participate in a local community energy project [62]. Therefore, in addition to the direct effect of trust on resistant sentiments, we propose an interaction of trust with perceived risk and place attachment. We expect that risk perception or place attachment has a positive association with residents’ anti-incinerator sentiment through changes in trust, and propose the following hypotheses:

Hypothesis 2.3 Trust moderates the positive effect of perceived risk on the anti-incinerator sentiment toward a local incinerator. Specifically, when people have a higher degree of trust, the positive impact of perceived risk on anti-incinerator sentiment will be relieved to some extent.

Hypothesis 2.4 Trust moderates the positive effect of place attachment on anti-incinerator sentiment toward a local incinerator. Specifically, when people have higher degree of trust, even higher place attachment will not significantly increase the intention to resist an incinerator located in their community.

We also assume that risk perception mediates the linkage between trust and anti-incinerator sentiment, in order to test whether the CMT model is supported. The relationship between trust and general attitude is also the interest of our paper. Thus, two additional hypotheses are proposed:

Hypothesis 2.5 Risk perception mediates the connection between trust and anti-incinerator sentiment.

Hypothesis 2.6 Trust positively influences the general attitude (intention to accept WtE technology).

Distrust associates with feeling treated unfairly or unjustly, which is another emotional cause for oppositional activism, and in this aspect, it can be represented in terms of perceived fairness or justice, including perceptions of both procedural (how decisions are made) and distributional (who gets what) justice [36,63]. Perceived procedural fairness/justice is a subjective assessment of participative and deliberative fora and mechanisms of public engagement [64], including several issues, such as timing, transparency, and equity (for a detailed discussion, see Goedkoop and Devine-Wright [22]). Distributional fairness/ justice is about how costs, risks, and benefits are distributed [34]. A fair settlement plan and transparency in the implementation of the compensation plan are conducive to lessening the interest conflicts [9]. Therefore, the perception of fairness/justice, as emphasized by Wolsink [34] and Wester-Herber [8], is another issue of importance in incinerator siting. Hall *et al.* asserted that distributional justice and procedural justice can foster trust and reduce opposition to energy projects [23]. As stated by Huijts, Molin, and Steg, judgments of fairness can lead to trust and vice versa [65]. Although fairness research has uncovered important findings, it remains unclear whether the effect of risk perception on opposing sentiment is moderated by fairness perception, and whether fairness perception impacts resistance intention through risk perception. Thus, we will further explore the connections between these constructs with respect to incinerator sitings in Chinese society, and the following related hypotheses are suggested:

- Hypothesis 3.1** Fairness perception can reduce anti-incinerator sentiment.
- Hypothesis 3.2** Fairness perception can reduce perceived risk toward a local WtE incinerator.
- Hypothesis 3.3** Fairness perception positively predicts institutional trust in the authorities operating and regulating a WtE incinerator.
- Hypothesis 3.4** The effect of risk perception on anti-incinerator sentiment is moderated by fairness perception.
- Hypothesis 3.5** Risk perception mediates the connection between fairness perception and anti-incinerator sentiment.
- We also hope to understand which fairness perception is more important in predicting accepting attitude. Hence, the last hypothesis is assumed.
- Hypothesis 3.6** In China, distributional fairness perception is more important than procedural fairness perception in predicting anti-incinerator sentiment.

2.2 Theoretical Framework

Based on an extant socio-psychological model and empirical studies on renewable energy projects, an extended model is developed to investigate the effects of psychological-emotional factors on the public’s acceptance of WtE incinerators in China’s metropolitan settings. **Figure 1** shows the hypothesized conceptual model. We integrate place-based and trust-based factors into a model of residents’ attitudes toward WtE incinerator development. In this model, perceived risk, place attachment, trust, and perceived fairness are exogenous variables, and attitude toward WtE incinerators is an endogenous variable.

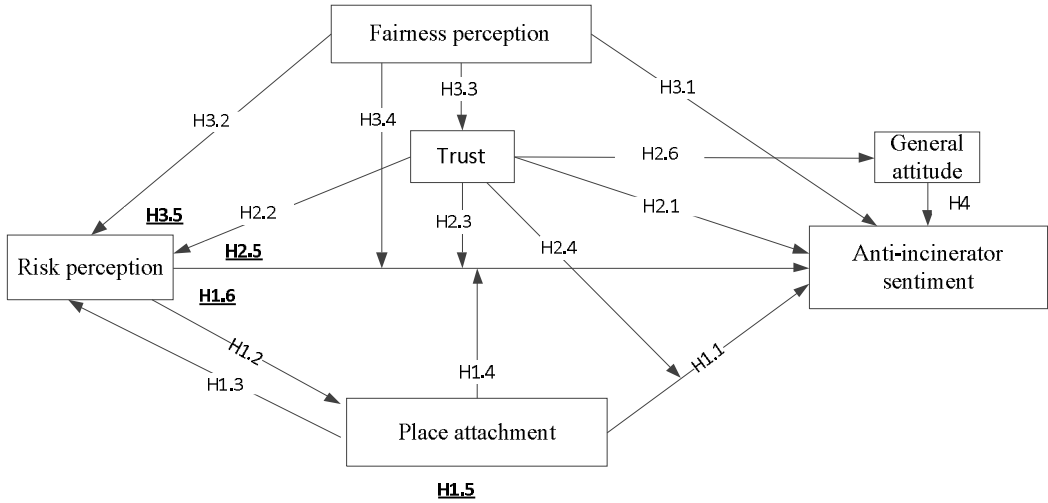


Figure 1. Conceptual model of the study

3. Materials and Methods

3.1 WtE incinerator project and local context

The Asuwei (meaning “defense” in Mongolian) area is located in Xiaotangshan in the Changping District of Beijing and includes several villages (e.g., Asuwei, Erde Zhuang, Niufangjuan, and Baishan) and upscale villa communities (e.g., Baolilongshang, Panaxigu, and Jujun). According to the three-year (2013-2015) implementation plan for the construction of municipal solid waste treatment facilities in Beijing [66], the Asuwei WtE incinerator was planned to be placed into operation by the end of 2017, at which time it was estimated that approximately 3,000

tons of domestic garbage would be disposed of every day, and the annual power generation would reach 350 million kilowatt hours, of which 70% would be integrated into power distribution networks. Since being informed of plans for the Asuwei WtE incinerator, villagers and residents have expressed their complaints in various ways, including signing a petition against the building of incinerator, petitioning government departments, and participating in demonstrations and other protests.

3.2 Procedure and respondents

From May–July 2016, a survey was conducted in the Asuwei area. To approach a heterogeneous sample, a stratified sampling method was used. First, the communities surveyed were divided into rural and urban communities, with the former including the villages of Asuwei, Baishan, and Niufangjuan, and the latter including Baolilongshang and Tang House. Second, 100 questionnaires were distributed door-to-door by local fieldworkers in each community. A total of 500 copies were distributed, and 338 respondents (67.6% response rate) returned a completed survey, with male and female participants ranging in age from 19 to 72 years ($M=45.2$, $SD=12.7$). Overall, the participants have lived in the area for an average of 22.3 years ($SD=19.7$, range: 3–67) and reported an average of approximately 110,000 Yuan in annual household income ($SD=166,000$, Range=20,000–220,000). Table 1 provides an overview of the sample characteristics.

Table 1. Sample demographics (N=338)

Variable	Group	Frequency	Percentage (%)	Variable	Group	Frequency	Percentage (%)
Gender	Male	180	53.3	Average annual household income	<50K(RMB)	132	39.1
	Female	158	46.7		60K-100K	61	18.0
Age	18-30	47	13.9		110K -200K	103	30.5
	31-40	89	26.3		210-300K	33	9.8
	41-50	92	27.2		>310K	10	3.0
	51-60	77	22.8	Dwelling time	<10 (years)	143	42.3
	>61	33	9.8		11-20	76	22.5
Educational level	Primary	91	26.9		21-30	41	12.5
	Secondary	158	46.7		31-40	20	5.9
	Higher	89	26.3		41-50	22	6.5
Home-ownership	Renter	76	22.5		51-60	25	7.4
	Owner	262	77.5		>60	11	3.3
Community type	Urban	170	50.3		Rural	168	49.7

3.3 Measures

A 34-item questionnaire was designed following reviewed literature to evaluate: (1) respondents’ resistant sentiment toward the WtE incinerator in a dwelling community; (2) respondents’ perceptions of risk and place attachment to the dwelling community; (3) respondents’ institutional trust levels in key actors, namely academics/experts, operators, and regulatory agencies, and perceptions of fairness, including procedural fairness and distributive fairness; and (4) respondents’ socio-demographic characteristics. A seven-point Likert scale (1=strongly disagree, 4=neutral/undecided, and 7=strongly agree) was used to rate the above constructs. The measures for each construct are presented as follows:

General attitude (GA). Three items (Cronbach's $\alpha = 0.91$) measuring residents' attitude toward WtE industry or technology are adapted from previous studies [15]. The items are: "I think WtE incineration is necessary to dispose MSW" (GA1), "I accept incinerators in my city" (GA2), and "I am not in favor of developing WtE incinerators as a form of disposing garbage" (GA3).

Anti-incinerator sentiment (AS). First, we adopted an item to identify the basic intention, which is "I am willing to oppose the construction of a WtE incinerator in my community". Then, four items were adapted from De Groot and Steg [67] and Prati and Zani [68] to measure anti-incinerator sentiments (Cronbach's $\alpha = 0.86$). Respondents were asked "If you are willing to oppose the construction of an incinerator, will you assume the following kinds of behavior?" The four kinds of actions comprise expressing opinions against the building of incinerators (AS1), signing the petition against the building of incinerators (AS2), petitioning government departments (AS3), and participating in demonstrations and other protests (AS4). We averaged scores, and higher numbers indicate higher anti-incinerator sentiment.

Perceived risk (PR). To assess risk perception of a WtE incinerator, a three-item scale (Cronbach's $\alpha = 0.76$) was used, adapted from Brewer and colleagues' meta-analysis of risk, including perceived likelihood, perceived susceptibility, and perceived severity [69]. They are: "It is likely that I could get sick from the proposed incinerator" (PR1), "I get sick more easily than before the incinerator was built" (PR2), and "Pollution from the incinerator can cause cancer and even death" (PR3).

Place attachment (PA). PA is measured as neighborhood attachment using a four-item scale (Cronbach's $\alpha = 0.89$) borrowed from Fornara *et al.*, which measured integration, identity, and rootedness toward the neighborhood of residence [70]. The items are: "This neighborhood is part of me" (PA1), "It would be very hard for me to leave this neighborhood" (PA2), "This is the ideal neighborhood for me" (PA3), and "I do not feel integrated in this neighborhood" (PA4).

Institutional trust (IT). A list of organizations and institutions was read to participants, and they were asked how much trust they have in **motives, transparency, and competency**. These entities were divided into three groups: industry, government, and community of scientists. Incinerator industry trust (IIT) refers to trust in operators of incinerators, governmental trust (GT) consists of trust in incinerator regulatory authorities, such as the Environmental Protection Agency and City Administration Bureau. Academics/experts trust (AT) indicates trust in scientists and engineers working in incineration related fields. The items (Cronbach's $\alpha = 0.95$) adapted from Mah *et al.* [50] are: "I trust in operators of incinerators" (T1), "I trust in scientists and engineers in incineration areas" (T3), "I trust in incinerator regulatory authorities, such as the Environmental Protection Agency" (T3). Together, the three items formed an internally consistent scale (Cronbach's $\alpha = 0.821$).

Fairness perception (FP). Two dimensions of justice as it relates to the location of energy facilities are procedural justice and distributional justice [71]. Based on the work of Tyler [72] and King and Murphy [73], a seven-item procedural justice scale (Cronbach's $\alpha = 0.95$) was used to measure four aspects of procedural fairness perception: voice, respect, trustworthiness, and fairness. Distributive justice in this study was measured via a two-item scale (Cronbach's $\alpha = 0.86$) borrowed from Visschers and Siegrist [53]. The items focused on the fairness of decision in general and on the costs and benefits for the local communities, which included "The financial compensations (e.g., tax payments of operators) counterbalance the disadvantages (e.g., accident risks and environmental

pollution)” and “The wishes of the population at that site are sufficiently considered at the site selection of WtE incinerators”.

3.4 Data analysis

To test the hypotheses, multiple regression analyses and moderation and mediation analyses were performed using IBM SPSS version 21 and its PROCESS procedures [74,75]. Our study is divided into three sections: (1) interactions between risk perception, place attachment, and anti-incinerator sentiment; (2) interactions between risk perception, trust, and anti-incinerator sentiment; and (3) connections between risk perception, fairness perception, and anti-incinerator sentiment.

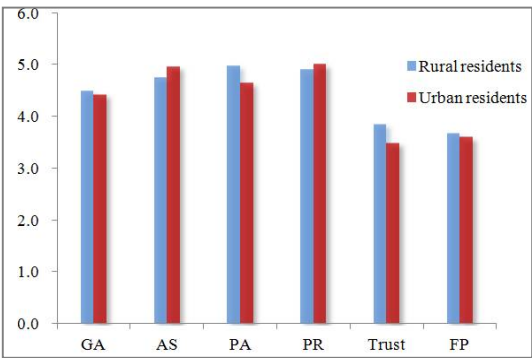
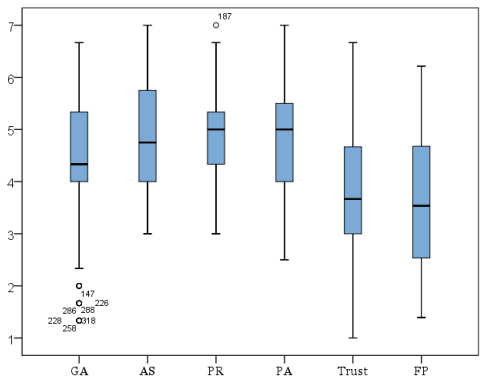
4. Results

4.1 Descriptive statistics

As Table 2 and Figure 2 show, first, residents’ general attitudes about WtE incineration as a means of disposing MSW are positive although anti-incinerator sentiment is slightly higher. Expressing opinions against incinerators is the most preferred form of protest, while participating in protests is the least preferred form of protest. Second, the data show higher levels of risk perception and place attachment than general attitude and anti-incinerator sentiment. The respondents report a subaverage level of institutional trust and fairness perception, especially about trust in operators and distributive fairness.

Table 2. Overview of main constructs

Measures (N=338)	Mean	SD	Measures	Mean	SD
General attitude (GA)	4.46	1.17	Place attachment (PA)	4.82	1.07
GA1 (necessity)	4.46	1.05	PA1 (integration)	4.77	1.10
GA2 (acceptance in one’s city)	4.38	1.25	PA2 (identity)	4.58	1.27
GA3 (technological acceptance)	4.55	1.48	PA3 (rootedness)	4.90	1.13
Anti-incinerator sentiment (AS)	4.86	1.24	PA4 (integration)	5.00	1.41
AS1 (express opinions)	5.28	1.22	--	--	--
AS2 (sign petitions)	4.88	1.25	Institutional trust	3.68	1.46
AS3 (petition the gov.)	4.65	1.25	IT1 (Trust in academics)	4.08	1.45
AS4 (participate in protests)	4.20	1.09	IT2 (Trust in operators)	3.09	1.48
Perceived risk (PR)	4.95	0.81	IT3 (Trust in regulatory agencies)	3.87	1.66
PR1 (perceived likelihood)	5.02	1.00	Fairness perception (FP)	3.64	1.26
PR2 (perceived susceptibility)	4.98	0.97	Procedural fairness	3.79	1.60
PR3 (perceived severity)	4.85	1.01	Distributive fairness	3.50	1.32



(a) **(b)**
Figure 2. (a) Box plot of main constructs; (b) Comparison of group arithmetic means

Note: GA: General attitude, AS: Anti-incinerator sentiment, PR: Perceived risk, PA: Place attachment, FP: Fairness perception

We analyzed whether rural and urban residents hold different perceptions and attitudes toward the community WtE incinerator and their dwelling place. As shown in **Figure 3**, for the six variables, a comparison of group arithmetic means indicates nearly equal levels, and according to Levene’s test, the assumptions of homogeneity of variance for all constructs were not rejected (all $p > 0.05$, $F < 3.03$). Thus, using an *independent sample t test* to compare the intergroup differences, we find that all other main constructs are not significantly different, excepting place attachment ($t(335) = 2.92$, $p = 0.004$, 95% CI [0.11, 0.56]) and trust ($t(336) = 230$, $p = 0.022$, 95% CI [0.05, 0.67]). In addition, the magnitude of difference in the mean is negligible. Thus, we integrated the two groups of data and further investigated their characteristics and inner casual relationships.

4.2 Correlation analysis

Correlations between the variables of interest are shown in **Table 3**. General attitude shows a moderate negative relationship with anti-incinerator sentiment; perceived risk, by contrast, shows a positive relationship with trust and fairness perception. There is a slightly stronger correlation between anti-incinerator sentiment and risk perception, along with trust and fairness perception, with which the relationships are negative. Hence, we also find a positive association between perceived risk and place attachment, and relatively higher and negative linkages of the former with trust and fairness. Finally, trust presents a slightly stronger positive connection with fairness, as expected.

Table 3. Constructs’ partial correlations

Construct	GA	AI	PR	PA	Trust	FP
General attitude	1					
Anti-incinerator sentiment	-.34***	1	.			
Perceived risk	-.46***	.64***	1			
Place attachment	-.19*	.26***	.49**	1		
Trust	.39***	-.66**	-.56**	-.30*	1	
Fairness perception	.37***	-.57***	-.63*	-.27**	.59***	1

Note: *** $p < .001$, ** $p < .01$, * $p < .05$; Control: age, educational level, gender, homeownership, community style, household income. and dwelling time.

4.3 Regression analysis 1: Risk perception, place attachment, and anti-incinerator sentiment

To avoid multicollinearity problems among predictor variables, the authors examined the correlation matrix and avoided using two variables with correlation coefficients higher than 0.5 in the same model (e.g., risk perception and trust and fairness perception) [76]. All the Durbin-Watson test values of the regression models listed on in Tables 4–10 are between 0–4, indicating that the observed values of the multiple linear regression are mutually independent. Moreover, the

tolerances of all the variables are greater than 0.1, and the Variance Inflation Factors (VIF) are less than 10, suggesting that multicollinearity is not a serious problem.

Given that present research predicts relatively complicated causal relationships, excepting hierarchical regression analysis, the PROCESS procedure in SPSS was adopted to examine the hypotheses in the conceptual framework (see Figure 1) for its prominent advantages by centering all predictors automatically, computing the interaction terms, and providing simple slop analysis results (see Field [77] for a detailed discussion).

As shown in **Table 4**, Model 2 indicates that perceived risk is a significant (positive) predictor of place attachment toward a dwelling community ($\beta = 0.42, t = 10.19, p < 0.001$), explaining some amount of the variance in place attachment ($\Delta R^2 = 0.16, \Delta F = 104.22, p < 0.001$), supporting the **H 1.2**. In Model 4, place attachment was significantly positive ($\beta = 0.57, t = 10.19, p < 0.001$) in predicting perceived risk with some explanatory power ($\Delta R^2 = 0.21, \Delta F = 104.22, p < 0.001$). Thus **H 1.3** is confirmed. Therefore, place attachment and risk perception are inseparable and promote one another, implying possible mutual mediating effects. In Models 5 and 6, we find that the regression coefficients of trust and fairness perception are both significantly negative on predicting perceived risk, which supports **H 2.2** and **H 3.2**. Again, these results suggest a possible mediation effect of risk perception between trust (or fairness perception) and anti-incinerator sentiment. These results are in line with the conclusions drawn from most of the reviewed literature.

Table 4. Hierarchical regression of place attachment and risk perception

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Variables	PA	PA	PR	PR	PR	PR
Educational level ^a			0.14*	0.15*	0.13*	0.12*
Homeownership ^b	0.42***	0.33***	0.24***			
Dwelling time	0.27***	0.21**	0.15*			0.08*
Perceived risk		0.42***				
Place attachment				0.57***		
Trust					-0.33***	
Fairness perception						-0.39***
Adjusted R2	0.34	0.50	0.10	0.315	0.38	0.47
F	25.83***	42.72***	6.34***	20.31***	26.44***	36.40***
ΔR^2	0.36	0.16	0.12	0.21 ^c	0.28 ^d	0.35 ^e
ΔF	25.83***	104.22***	6.23***	104.22*** ^c	148.40*** ^d	218.79*** ^e

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; β = standardized coefficients; Only significant coefficients are presented.
^a Dummy variable for holding bachelor's degree or higher; ^b Dummy variable for renting tenant (vs. being owner); ^{c, d, e} are all relative to Model 3.

To test the interaction effect of perceived risk and place attachment on predicting anti-incinerator sentiment, the PROCESS procedure was used. As shown in **Table 5**, analysis reveals a significant (positive) main effect of risk perception ($\beta = 0.59, 95\% \text{ CI } [0.52, 0.65], t = 17.89, p < 0.001$), consistent with prevailing views; this suggests that high perceived risk promotes anti-incinerator sentiment. There is also a significant and positive effect of place attachment ($\beta = 0.66, 95\% \text{ CI } [0.59, 0.74], t = 17.19, p < 0.001$), supporting **H1.1**. More importantly, there is a significant interaction effect ($\beta = -0.12, 95\% \text{ CI } [-0.17, -0.06], t = -4.43, p < 0.001$), indicating that place attachment negatively

moderates the relationship between perceived risk and anti-incinerator sentiment (conditional effect of X on $Y = 0.59 - 0.12M$), which supports **H1.4**.

Table 5. Risk perception, place attachment, and anti-incinerator sentiment.

Model	<i>R-sq</i>	<i>R2-chng</i>	<i>F</i>	<i>Sig.</i>	β	<i>t</i>	<i>p</i>
	0.50		32.06	0.000			
Constant					4.923	162.109	0.000
Perceived risk (standardized)					0.586	17.889	0.000
Place attachment (standardized)					0.661	17.189	0.000
PR*PA		0.009	19.594	0.000	-0.116	-4.427	0.000

Note: Control= Z-age, Z-educational level, Z-gender, Z-homeownership, Z-community type, Z-household income, Z-dwelling time

To further clarify the two-way interaction, spotlight analysis was conducted at one standard deviation above and below the mean place attachment using the procedure by Aiken and West [78]. The result (see **Figure 4**) reveals that when residents maintain higher attachment to their dwelling place, there is a significant (positive) but slightly weaker relationship between perceived risk and anti-incinerator sentiment ($\beta = 0.47$, 95% CI [0.39, 0.55], $t = 11.30$, $p < 0.001$). Similarly, when lower place attachment is perceived by residents, there is also a significant (positive) and a slightly stronger relationship between perceived risk and anti-incinerator sentiment ($\beta = 0.70$, 95% CI [0.62, 0.78], $t = 16.63$, $p < 0.001$). This indicates that a high level of attachment increases awareness of anti-incinerator sentiment, regardless of risk perception, and in the case of lower attachment, the anti-incinerator willingness will be constrained to a lower degree, although it rises faster.

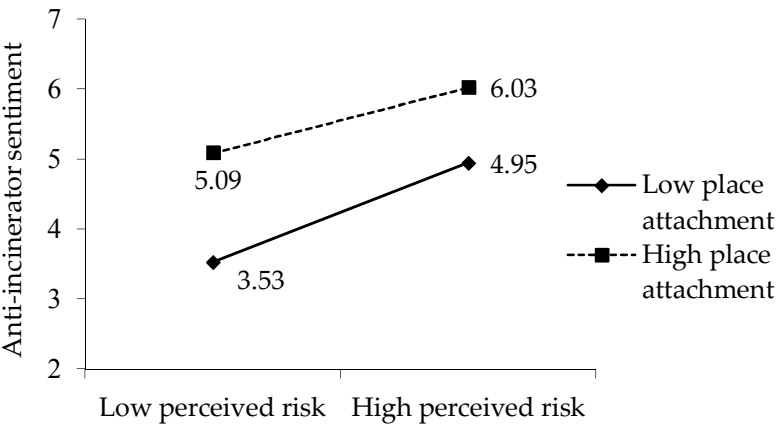


Figure 4. Interaction of perceived risk and place attachment

Next, we tested H1.5 and H1.6. Because H1.1 and H1.2 have been confirmed (a and b are both significant, see **Table 6**), we expect that there is a mediating effect presented by place attachment between risk perception and anti-incinerator sentiment. Thus, the bootstrap method and PROCESS Procedure for SPSS were employed to test the interaction of the independent variable (perceived risk) and mediating variable (place attachment), and we find that the direct effect (c') of risk perception and anti-incinerator sentiment is significant ($\beta = 0.584$, $SE = 0.035$, 95% CI [0.532, 0.663], $t = 2.684$, $p = 0.0076$), and more importantly, the indirect effect ($a*b$) was proved (effect = 0.272, $SE = 0.032$, 95% CI [0.204, 0.329], $p < 0.001$). Thus, **H1.5** is supported.

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Table 6. Mediation effect of place attachment

Panel 1:	Mediator (place attachment)				Anti-incinerator sentiment		
		Coeff.	SE	p	Coeff.	SE	p
Perceived risk	<i>a</i>	0.419	0.041	0.000	<i>c'</i>	0.584	0.035
Place attachment	-	-	-	-	<i>b</i>	0.649	0.039
Constant		-0.002	0.386	0.967		4.859	0.027
Panel 2:		Sobel test (<i>a*b</i>)			95% confidence intervals		
	<i>Value</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LLCI	ULCI	
Direct effect	0.584	0.034	17.343	0.000	0.518	0.650	
Indirect effect	0.272	0.032	-	-	0.204	0.329	

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Similarly, we tested the possible mediation effect of risk perception between place attachment and anti-incinerator sentiment. It was found that the direct effect (*c'*) of place attachment and anti-incinerator sentiment was not significant ($\beta = -0.101$, $SE = 0.061$, 95% CI [-0.220, 0.018], $t = -1.667$, $p = 0.096$), but the indirect effect (*a*b*) was proved ($effect = 0.422$, $SE = 0.049$, 95% CI [0.325, 0.519], $p < 0.001$), supporting **H1.6**. In summary, the hypothesized mediation effects of place attachment and risk perception are acknowledged, and risk perception appears a have a higher magnitude on mediation effect than place attachment.

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4.4 Regression analysis 2: trust, fairness, general attitude, and anti-incinerator sentiment

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Then, we added institutional trust, fairness perception, and general attitude in our analysis models. For the main effects tests, as shown in **Table 7**, Models 2–4 indicate that trust, fairness perception, and general attitude all negatively predict anti-incinerator sentiment, and trust provides more explanatory power than the other two variables ($\beta = -0.55$, $\Delta R^2 = 0.39$, $\Delta F = 253.75$, $p < 0.001$). Hence, our findings provide support for **H 2.1**, **H 3.1**, and **H4**. Thus, the greater the amount of trust in authorities, perceived fairness, and more open and inclusive attitudes to WtE incineration (including industry and technology), the less likely one is to object to an incinerator located in the community.

Table 7. Hierarchical regression of anti-incinerator sentiment

	Model 1	Model 2	Model3	Model 4
Variables	AI	AI	AI	AI
Gender			-0.22*	
Homeownership	0.73***		0.49**	0.53**
Community type	0.39*			
Trust		-0.55***		
Fairness perception			-0.50***	
General attitude				-0.34**
Adjusted R2	0.09	0.48	0.38	0.19
F	5.78***	40.65***	26.96***	11.12***
ΔR^2	0.11	0.39	0.29	0.10
ΔF	5.78***	253.75***	156.19***	43.27***

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Similarly, the moderation effect of trust is tested by SPSS the PROCESS procedure. Analysis reveals that, in addition to the main effect of trust ($\beta = -0.52$, 95% CI [-0.64, - 0.43], $t = -9.92$, $p < 0.001$), there is a significant interaction effect ($\beta = -0.12$, 95% CI [-0.20, - 0.05], $t = -3.17$, $p = 0.002$), indicating

that the relationship between risk perception and anti-incinerator sentiment is moderated by institutional trust (Table 8), supporting H2.3.

Table 8. Risk perception, trust, and anti-incinerator sentiment

Model	R ²	R ² -chg	F	Sig.	β	t	p
	0.609		50.934	0.000			
Constant					4.680	111.960	0.000
Perceived risk (standardized)					0.446	8.783	0.000
Trust (standardized)					-0.532	-9.920	0.000
PR*Trust		0.012	10.077	0.002	-0.122	-3.174	0.002

Spotlight analysis results (Figure 5) reveal that, whether people perceive a lower or a higher level of trust, there is also a significant and positive connection between risk perception and anti-incinerator sentiment (low trust: $\beta = 0.57$, 95% CI [0.45, 0.69], $t = 9.37$, $p < 0.001$; high trust: $\beta = 0.32$, 95% CI [0.19, 0.45], $t = 4.86$, $p < 0.001$). Specifically, when people perceived a higher degree of trust, the positive impact of perceived risk on anti-incinerator sentiment would be relieved to some extent. Conversely, in the case of lower trust, not only does risk perception give rise to a higher level of anti-incinerator willingness at any level, but the anti-incinerator tendency goes up more sharply.

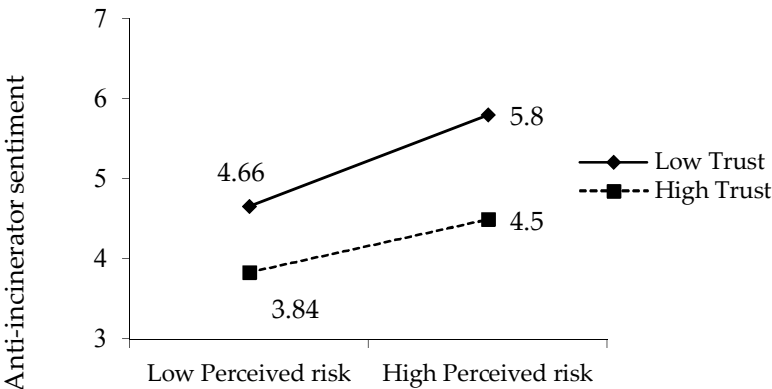


Figure 5. Interaction of perceived risk and trust

Analyses reveal that there is no significant interaction between trust and place attachment on predicting anti-incinerator sentiment ($\beta = -0.04$, 95% CI [-0.13, 0.04], $t = -1.01$, $p = 0.314$), rejecting H2.4 (see Table 9).

Table 9. Place attachment, trust, and anti-incinerator sentiment

Model	R ²	R ² -chg	F	Sig.	β	t	p
	0.502		32.824	0.000			
Constant					4.735	97.478	0.000
Place attachment (standardized)					0.081	1.384	0.168
Trust (standardized)					-0.781	-14.756	0.000
PA*Trust		0.002	1.018	0.314	-0.044	-1.009	0.314

Likewise, the SPSS PROCESS procedure was employed to test the interaction between the independent variable and mediating variable, and we found that the direct effect (c') of trust and anti-incinerator sentiment is significant ($\beta = -0.362$, $SE = 0.037$, 95% CI [-0.532, -0.663], $t = -9.723$, $p <$

0.001), and the indirect effect ($a*b$) was proved ($effect = -0.187, SE = 0.027, 95\% CI [-0.242, -0.139], p < 0.001$) (**Table 10**). **H2.5** is supported. As for **H3.5**, mediation analysis reveals that the direct effects (c') of fairness perception and anti-incinerator sentiment are significant ($\beta = -0.232, SE = 0.046, 95\% CI [-0.323, -0.142], t = -5.060, p < 0.001$), and more importantly, the indirect effect ($a*b$) were also proved ($effect = -0.265, SE = 0.035, 95\% CI [-0.341, -0.203], p < 0.001$), supporting **H3.5**.

Table 10. Mediation effect of place attachment

Panel 1:	Mediator (risk perception)				Anti-incinerator sentiment		
		Coeff.	SE	p	Coeff.	SE	p
Trust	<i>a</i>	-0.330	0.027	0.000	<i>c'</i>	-0.362	0.037
Perceived risk	-	-	-	-	<i>b</i>	0.568	0.063
Constant		6.166	0.106	0.000		3.274	0.407
Panel 2:		Soble test ($a*b$)				95% confidence intervals	
	Value	SE	t	p	LLCI	ULCI	
Direct effect	-0.362	0.037	-9.723	0.000	-0.435	-0.289	
Indirect effect	-0.187	0.027	-	-	-0.242	-0.139	

Last, hierarchical regression analyses reveal that fairness perception significantly and positively predicts institutional trust ($\beta = 0.54, t = 13.40, p < 0.001$), with fair explanatory power ($\Delta R^2 = 0.28, \Delta F = 179.47, p < 0.001$). Similarly, there is a significant (positive) connection between trust and general attitude ($\beta = 0.42, t = 7.80, p < 0.001$). Hence, **H3.3** and **H2.6** are supported.

The PROCESS procedure was used to test the moderation effect of fairness perception between risk perception and anti-incinerator sentiment. Analysis reveals that there is a significant interaction effect ($\beta = -0.10, 95\% CI [-0.18, -0.02], t = -2.58, p = 0.010$), indicating that the relationship between risk perception and anti-incinerator sentiment is also moderated by fairness perception, supporting **H3.4**. Moreover, we find that when risk perception is high, the moderation effect of fairness perception is greater and vice versa, suggesting that fairness and justice play a larger role in the case of higher levels of perceived risk.

As for **H 3.6**, hierarchical regression analyses reveal that both procedural fairness ($\beta = -0.51, t = -11.06, p < 0.001$) and distributive fairness ($\beta = -0.43, t = -9.13, p < 0.001$) negatively predict anti-incinerator sentiment, and the former ($\Delta R^2 = 0.24, \Delta F = 122.38, p < 0.001$) explains a greater amount of variance than the latter ($\Delta R^2 = 0.18, \Delta F = 83.36, p < 0.001$), indicating that **H3.6** is not supported. Therefore, in China, procedural fairness perception is more important than distributional fairness perception in predicting anti-incinerator sentiment.

4. Conclusions and Policy Implications

This study introduced and tested an extended psychological-emotional model focusing on perceived risk, place attachment, institutional trust, fairness perception, and anti-incinerator sentiment in the context of a proposed WtE incinerator in an urban-rural fringe area in Beijing. Results reveal that people’s anti-incinerator sentiment, risk perception regarding a community WtE incinerator, and place attachment toward their dwelling place are high, suggesting a generally negative attitude toward community-based energy projects and a positive linkage to their communities. By contrast, institutional trust, whether in governments or facility operators, is rather low, as is fairness perception, including distributive and procedural fairness. Additionally, we find a

moderate general attitude toward the WtE incineration industry and technologies, indicating that WtE incineration is accepted as a necessary way to dispose of MSW.

The most intriguing findings of this research are as follows: first, anti-incinerator sentiment is a function of the interaction between risk perception, place attachment, institutional trust, fairness perception, and general attitude from a psychological-emotional perspective. Place attachment is positively associated with anti-incinerator sentiment, consistent with numerous studies on renewable energy projects [14,19]. One explanation is that people with a higher level of attachment tend to take their place largely for granted, owing to a lack of competing place experience, refusing any potential upheavals to the residence place [79]. The higher the degree of immobility and rootedness in one place, the more the “home” place is regarded as “an irreplaceable refuge, a site of unreflective security, certainty and familiarity in otherwise insecure, unstable and nameless space” [80] (p. 208). Place attachment and risk perception reinforce one another, suggesting that local residents’ sense of place may actually intensify as a socio-cultural response to a perceived threat or stigmatization [14], and that, in turn, acts as a situational amplifier of perceived risks. Conversely, trust in authorities, fairness perception, and general attitude represent the negative predictors of anti-incinerator sentiment in our study which replicates many studies on technology acceptance [4,53,62].

Place attachment positively enhances anti-incinerator willingness, through both moderating and mediating paths between risk perception and anti-incinerator sentiment, indicating that it amplifies the positive effect exerted by perceived risk on anti-incinerator sentiment and serves as a bridge connecting the two concepts. Conversely, risk perception acts as a mediator in connecting place attachment and opposing intention toward the incinerator. An impressive body of literature indicated that place-related constructs exhibit different effects and even a lack of significant effects in predicting the acceptance of energy projects. For the most of controversial facilities (such as nuclear power stations, coal mines, and powerlines), the effect of place attachment was negative (e.g., Devine-Wright [13], Venables *et al.* [14]), while for many studies about tidal energy facilities and wind farms, the effect is positive [19,33]; no effect has been found for solar energy development [81]. In addition, a lack of investigation into the moderation or mediation effects of place attachment between risk perception and opposing willingness may be a possible reason for these contradictory conclusions.

Further, institutional trust not only directly reduces anti-incinerator sentiment and promotes positive general attitude toward developing incinerator projects, but it also negatively moderates the impact of perceived risk on protesting willingness, consistent with other studies (e.g. Liu *et al.*, [4]). In the case of high levels of trust, even a greater magnitude of risk perception would make it difficult to generate an inevitable anti-incineration tendency. On the contrary, a low level of trust magnifies the impact of risk perception on anti-incinerator sentiment. That is, trust in authorities generally contributes to weakening the negative evaluation of the introduction of renewable energy facilities. Trust also influences anti-incinerator sentiment through lessening risk perception, partially attesting to the effectiveness of the *casual model of trust* [58]. However, we do not confirm that trust moderates the connection between place attachment and anti-incinerator sentiment. Because we did not consider further factors, such as motivation, value [82,83], environmental and climate change beliefs [15,84], affect [85,86], and personal norms [67], we fail to discuss whether the *associationist model* is effective in our analysis. As stated by Boecker and Necella [60] (p. 275), “trust and risk judgments

are driven by and thus simply indicators of higher order attitudes toward a certain technology which determine acceptance instead." For example, a study indicated that altruism values buoy wind energy attitudes, while valued of traditionalism diminishes wind energy support [84].

Finally, fairness perception lessens risk perception and objecting attitudes toward community-based initiatives and promotes institutional trust. Risk perception mediates the connection between fairness and anti-incinerator sentiment, similarly to its role in *the casual model of trust*. With regard to fairness, we find that procedural fairness plays a more important role in predicting anti-incinerator sentiment than distributive fairness, indicating that, in contrast to the benefit-risk allocation, whether the planning and construction process of risk facilities is open, equal, and transparent has greater weight for people's risk perception and acceptance tendencies. This result implies the importance of information communication and public engagement in decision-making processes, and appears to be more in line with previous literature, which argued that procedural fairness, or participatory justice contributes to the promotion of trust in the relationship between a company and community, and ultimately facilitated the acceptance of community (e.g. Hagget [21]; Lacey *et al.* [87]; Liebe *et al.*, [88]). However, this contradicts other studies; Visschers and Siegrist noted that outcome fairness, along with general attitudes toward nuclear power, strongly increase decision acceptance, and procedural fairness had only a small impact [53].

Based on an extended psychological-emotional model and systematic empirical study, the study addresses a gap in the literature on place attachment [12,13,89], institutional trust [47,59], and fairness perception [53,90] with regard to a community WtE incinerator project in China, and makes a scholarly contribution to research on the social acceptability of community renewable energy and the transformation of human-place relationships disturbed by the introduction of energy projects. The conclusions of this study can be expected to contribute to the improvement of planning and locating policies that take into account local residents' attachment and identity to dwelling places, public participation in the early stages of siting processes, and information communication, which are thought by most scholars to be effective strategies to promote fairness perception and trust in regulatory authorities and companies [21,27,87]. By enhancing local residents' attachment, or at least not disturbing it, we hope it will help reduce risk perceptions, discourage people's anti-incinerator sentiment, and promote social acceptance. To increase people's place dependence to their dwelling place, for example, authorities can coordinate the appearance of the building with the local natural landscape, or provide local residents with jobs and necessary financial subsidies.

Another important contribution is the confirmation of the importance of fairness perception and institutional trust, which can reduce anti-incinerator attitudes directly and indirectly via risk perception, implying the needed prioritization of public engagement and risk communication, rather than economic compensation, when implementing the renewable energy policy [4,91]. However, as many authors have observed, the lack of participating opportunities was a common phenomenon in the siting procedures of renewable energy project, including wind farms, nuclear power stations, unconventional gas development, and WtE incinerators [54,64,92]. At present, during the process of advancing renewable energy policy in China, deficient public participation and inefficient risk communication have been widely criticized, especially during environmental impact assessments. Although a series of regulations and policies have been successively

promulgated and implemented, long-term and strenuous efforts are required to ensure genuine public participation and risk management.

We show that trust does play an indispensable role in advancing community renewable energy projects. Trust is a prerequisite for cooperation and requires strong and continuous communication efforts. As stated by Fast and Mabee [16] (p. 28), “host communities trust in the siting process is independent of their trust in wider energy policy.” In the context of China’s WtE incinerators, trust is more related to opportunities for meaningful engagement in the decision-making process and more communication with the public about the risks, benefits, and costs associated with controversial facilities. Furthermore, trust is mutual, and the prerequisite for public trust is trust in the public first. In fact, developers often express skepticism regarding the capacities and representativeness of community actors, and community actors view developers as solely motivated by profit, instrumentally using public engagement to gain planning consent. For trust to be built, more positive strategies should be undertaken (for instance, partner identification mechanisms and shared ownership should be adopted within the energy transformation context [22]).

The present study has several limitations. First, there are methodology limitations, including the small sample size used to test the hypotheses, and the short time frame of investigation. As a result, the change trajectories of people’s risk attitudes and range of perceptions have not been captured. Second, our conceptual model did not involve other important “higher order” attitudinal factors, such as value, environmental beliefs, and personal norms. Therefore, further research is necessary on these subjects using detailed qualitative analysis and systematic quantitative study; in addition, a longitudinal survey would provide additional insight into respondents’ risk perceptions and protective behavioral intentions.

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