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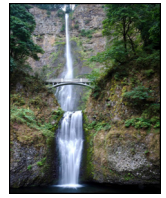
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# Effects of competence- and integrity-based trust on public acceptability of renewable energy projects in China and the Netherlands



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## ABSTRACT

Acceptability of renewable energy projects depends on the trust people have in agents responsible for those projects. Two dimensions of trust are relevant in this respect: competence-based and integrity-based trust. Yet, the unique and interaction effects of these two dimensions of trust on project acceptability are not well understood. We conducted two experimental studies to test these effects in China and the Netherlands. As expected, higher integrity-based trust in responsible agents led to higher project acceptability in both countries. Notably, these effects were independent of the level of competence-based trust. Competence-based trust enhanced project acceptability only in China and only when integrity-based trust was low. Mediation analyses further showed that (part of) the effects of both dimensions of trust on project acceptability could be explained by people's perceptions of how the decisions were made, in both countries. Results suggest that integrity-based trust has a more profound effect on project acceptability.

## 1. Introduction

To mitigate climate change, it is crucial to transit from fossil (e.g., coal and gas) to renewable energy sources (e.g., solar and wind) (European Commission, n.d.). The success of such transition strongly depends on public acceptability of renewable energy projects (Babiker et al., 2018; Devine-Wright, 2009, 2007; Papazu, 2017; Wüstenhagen, Wolsink, & Bürer, 2007). We define public acceptability as the extent to which people evaluate those projects (un)favourably (from now on referred to as “project acceptability”). Different agents may be involved in the development of renewable energy projects, such as governments, energy companies and NGOs (Wüstenhagen et al., 2007). The public usually has to rely on these agents, since most often people do not initiate the projects themselves and/or it is beyond the duty and ability of the public to manage such projects. Therefore, trust in responsible agents is arguably a critical factor that influences project acceptability (Merk, Pönitzsch, Kniebes, Rehdanz, & Schmidt, 2015; Rayner, 2010; Siegrist, Connor, & Keller, 2012; Terwel, Harinck, Ellemers, & Daamen, 2011; Yang, Zhang, & Mcalinden, 2016), besides other factors (see Devine-Wright, 2009; Perlaviciute & Steg, 2014 for reviews).

Research has identified two dimensions of trust that are particularly relevant for project acceptability, namely competence-based trust (i.e., trust in knowledge and expertise of responsible agents) (Gordon, Brunson, & Shindler, 2014; Terwel, Harinck, Ellemers, & Daamen,

2009) and integrity-based trust (i.e., trust in honesty and transparency of responsible agents) (Braun, Merk, Pönitzsch, Rehdanz, & Schmidt, 2018; Graham, Stephenson, & Smith, 2009). Although both dimensions of trust are suggested to be associated with project acceptability (Braun et al., 2018; Graham et al., 2009; Siegrist et al., 2012; Terwel et al., 2009), they have not been studied together in experimental designs, leaving it unknown whether and how competence- and integrity-based trust work together in predicting project acceptability.

Yet, understanding the unique and combined effects of competence- and integrity-based trust on project acceptability is critical for effective and successful implementation of renewable energy projects. For example, if one dimension of trust is more important for project acceptability than the other, it seems more effective to enhance this dimension of trust when aiming to secure public support for the sustainable energy transition. In addition, knowing whether and how both dimensions of trust work together provides insights in whether interventions could best focus on one or both dimensions of trust to effectively promote project acceptability. To fill this gap in the literature, our research uses an experimental design in which we systematically vary both dimensions of trust to examine the unique and interaction effects of competence- and integrity-based trust on project acceptability. Moreover, we conducted studies in China and the Netherlands, respectively, to test the robustness of our findings across countries.

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### 1.1. Effects of competence- and integrity-based trust on project acceptability

We define “trust” as the extent to which the public evaluates agents responsible for renewable energy projects as trustworthy or not (Liu, Bouman, Perlaviciute, & Steg, 2019). Literature on social cognition posits that competence and integrity are two conceptually different components that people use to form their judgement of an agent, namely whether an agent is competent and has good/ill intentions (Fiske, Cuddy, & Glick, 2007; Fiske, Cuddy, Glick, & Xu, 2002; Wojciszke, Dowhyluk, & Jaworski, 1998). Following this distinction, we conceptualise trust as an overarching concept that encompasses competence- and integrity-based trust (cf. Earle & Siegrist, 2006, 2008). We define competence-based trust as the extent to which responsible agents are perceived to have the relevant knowledge and expertise to implement and manage a renewable energy project. Competence-based trust is therefore mainly based on people’s evaluation of the performance and ability of responsible agents (Earle & Siegrist, 2006, 2008; Fiske et al., 2002). We define integrity-based trust as the extent to which responsible agents are perceived to be honest and transparent about their activities, and are concerned with public interests. Integrity-based trust is therefore mainly based on the perceived morality and intentions of responsible agents (Earle & Siegrist, 2006, 2008; Fiske et al., 2002). Evidence from studies employing factor analyses suggests that competence- and integrity-based trust are not only conceptually different, but can be empirically distinguished as well (e.g., Siegrist et al., 2012).

Both competence- and integrity-based trust have been suggested to positively relate to public acceptability of energy-related projects. Specifically, research showed that people find energy projects, for example carbon capture and storage, more acceptable if they trust that agents responsible for the project have relevant knowledge and expertise, and thus have the competence to successfully implement the project (Terwel et al., 2009). Similarly, the more agents are perceived to be honest and transparent about their activities, and caring about public interest – and are thus seen as integer – the higher is public acceptability of their proposed energy technologies, such as climate engineering (Braun et al., 2018; Graham et al., 2009; Siegrist et al., 2012). So far, studies that showed a positive association between competence- and integrity-based trust on one hand, and project acceptability on the other hand mostly followed a correlational design (e.g., Braun et al., 2018; Siegrist et al., 2012). Hence, the causal direction of such relationships has not been established yet. Notably, a positive relationship may imply, indeed, that trust in competence and/or integrity leads to higher project acceptability, but conversely, it may also imply that people trust the agent is competent and/or integer because they find the renewable energy project acceptable (cf. Poortinga & Pidgeon, 2005).

To our best knowledge, the two dimensions of trust have hardly been studied together, leaving it unknown whether one dimension of trust influences project acceptability more than the other dimension of trust. Correlational studies have suggested that perceived morality of responsible agents tends to be more strongly related to project acceptability than perceived performance of responsible agents (Earle & Siegrist, 2006; Siegrist et al., 2012). Arguably, this is because morality is associated with agents’ good or bad intentions regarding public interests, and therefore used for inferring whether the project will safeguard public interests, which can affect whether the public finds the project acceptable. Competence is less indicative of the good or bad intentions of responsible agents, but more of whether agents have sufficient expertise in a specific field. Hence, competence-based trust might be less useful in inferring whether public interests will be incorporated in the project, and thus less relevant for evaluating how acceptable they find the project (cf. De Bruin & Van Lange, 1999, 2000). These findings suggest that integrity-based trust, which primarily relates to the morality of the responsible agent, would have a stronger effect on project acceptability than competence-based trust, which primarily relates to the performance of the agent. Similarly,

social cognition literature suggests that when evaluating how trustworthy an agent as such is, people rely more on information on whether agents will protect one’s interests more than information on whether agents are capable of conducting the relevant activities (cf. Wojciszke, Bazinska, & Jaworski, 1998). Yet, the social cognition literature has not tapped into whether the same pattern applies for evaluating activities performed by the agent. Our study takes the next step by including project acceptability as the dependent variable.

Even if integrity-based trust could have a stronger effect in influencing project acceptability than competence-based trust, the question remains whether integrity-based trust would enhance project acceptability independent of the level of competence-based trust, and whether the effects of competence-based trust on project acceptability depends on the level of integrity-based trust. The social cognition literature suggests that an agent could be seen as highly integer and rather incompetent (and vice versa) at the same time (Fiske et al., 2002). Yet, the social cognition literature has not examined how the mixed perception of the agent as such affects evaluation of activities performed by the agent. To our best knowledge, the interaction effect of both dimensions of trust on project acceptability has hardly been theoretically discussed or experimentally tested. Hence, question remains whether people would accept a renewable energy project launched by an energy company that is perceived as honest and concerned with public interests, while at the same time, it is regarded as having little experience and expertise in developing renewable energy projects. Or would the public find a project acceptable when they believe responsible agents are knowledgeable, but not very integer? Relatedly, do both competence- and integrity-based trust need to be high in order for project acceptability to be high? Or would high trust in either integrity or competence already be sufficient for higher project acceptability? To address these questions, we use an experimental design in which we expose participants to a description of a renewable energy project and systematically vary the level of trust in the competence and the integrity of responsible agents, to test the unique and explore the interaction effects of both dimensions of trust on project acceptability.

Additionally, we test the processes via which the two dimensions of trust influence public acceptability of renewable energy projects. Research suggests that the more people trust the responsible agent, the more acceptable they find the decision-making process related to the concrete project (De Cremer & Tyler, 2007; Siegrist et al., 2012; Tyler, 2000). We define acceptability of the decision-making process as the extent to which people evaluate the decision-making process (un)favourably. Higher acceptability of the decision-making project is in turn associated with higher acceptability of the project (Arvai, 2003; De Vente, Reed, Stringer, Valente, & Newig, 2016; Esaiasson, Gilljam, & Persson, 2017; Siegrist et al., 2012). Therefore, trust in responsible agents may enhance project acceptability via increased acceptability of the decision-making process. However, no study has looked at whether the process is the same or different for the two dimensions of trust.

It is often argued in the literature that people evaluate the decision-making process positively particularly when they consider the decision-making procedures as transparent, unbiased, fair and considering different interests and concerns (Leventhal, 1980; McComas, Besley, & Yang, 2008; Tyler, Blader, & Tyler, 2016; Visschers & Siegrist, 2012; Zoellner, Schweizer-Ries, & Wemheuer, 2008). Particularly integrity-based trust seems to be related to whether people think the agent will be transparent about its activities and will take public interests into consideration during decision making about a project (cf. Tyler, 1989, 1994). Therefore, we propose that this mediation effect is particularly likely for integrity-based trust. On the other hand, competence-based trust refers mostly to perceived knowledge and expertise of agents in developing the technology, which indicates that the agents are capable of making decisions, but does not say much about how the decisions are made and whether public interests will be considered during decision-making process. Hence, we propose that competence-based trust is less likely to influence project acceptability via acceptability of the decision-

making process.

### 1.2. Effects of competence- and integrity-based trust on project acceptability in different countries and cultures

We test our theoretical reasoning in different countries, in order to assess the extent to which the model is robust and generalizable across different countries and cultures. There is evidence to suggest that trust in responsible agents is crucial for public acceptability of renewable energy projects across different countries and cultures (Liu et al., 2019). Yet, it is not clear to what extent the two dimensions of trust, namely competence- and integrity-based trust, influence project acceptability similarly in different countries and cultures. As yet, most studies that distinguish both dimensions of trust and test their relationship with public acceptability have been conducted in Western European countries (e.g., Siegrist et al., 2012; Terwel et al., 2009). Hence, the question remains whether similar findings can be found in other countries, such as East-Asian countries. To address this question, we tested our reasoning in an East-Asian country, China, and in a Western European country, the Netherlands. We expected our theoretical reasoning to be robust across the two countries because previous research suggests that both dimensions of trust may matter for project acceptability in each country. For example, research suggests that people in both cultures consider the knowledge and skills of responsible agents important when evaluating acceptability of a project (Terwel et al., 2009; Wang & Li, 2016). Therefore, we expect competence-based trust to be associated with higher project acceptability in both countries. Next, since seeking justice and caring for others are universal moral values (Kinnier, Kernes, & Dautheribes, 2000), hence we expect that integrity-based trust has even a stronger positive effect on project acceptability in both countries.

In sum, we:

- Hypothesis 1: tested that higher levels of competence- and integrity-based trust lead to higher public acceptability of renewable energy projects;
- Hypothesis 2: tested that integrity-based trust has a stronger effect on project acceptability than competence-based trust;
- Exploratory Hypothesis 3: explored the interaction effect of both dimensions of trust on project acceptability;
- Hypothesis 4: tested that acceptability of the decision-making process particularly mediates the relationship between integrity-based trust and project acceptability;
- Hypothesis 5: tested that the effects of both dimensions of trust on project acceptability are similar in China (Study 1) and the Netherlands (Study 2).

## 2. Method

### 2.1. Procedure and design

We tested our reasoning via an online survey with respondents from a pre-recruited Chinese panel (Study 1) and a pre-recruited Dutch panel (Study 2). In both countries, participants received an invitation to complete an online study about local renewable energy projects. At the end of the study, participants were thanked and received a token amount of money for their participation. The questionnaire was in Chinese in China and Dutch in the Netherlands.<sup>1</sup>

<sup>1</sup>The questionnaire was developed in English, and then translated into Chinese (Mandarin) by a native Chinese speaker. Eleven native Chinese speakers filled out the questionnaire to test whether all questions were clear. Revisions were made wherever needed. In addition, the same English questionnaire was translated into Dutch by a native Dutch speaker. Four native Dutch speakers checked the translation of the Dutch questionnaire to test

In both countries, we followed a  $2 \times 2$  between-subjects design to test our hypotheses. Participants were asked to imagine that an energy company is planning to implement a wind energy project in the area they live in, and that they could give their opinion about the project together with other residents in this area. They were told that the energy company has already decided about the location of the wind farm and the number of wind turbines to be installed, and that they and other residents in their area can together influence some aspects of this wind energy project, such as size and colour of the wind turbines to be installed. Next, we manipulated the level of competence- and integrity-based trust in the energy company respectively, as follows<sup>2</sup>:

**Competence-based trust in the energy company.**<sup>3</sup> In the low competence-based trust condition, participants read that the energy company has started to develop wind energy projects recently. The energy company has little experience, not a lot of knowledge and expertise in developing wind energy projects. In the high competence-based trust condition, participants read that the energy company has been developing wind energy projects for many years. The energy company has much experience, extensive knowledge and expertise in developing wind energy projects.

**Integrity-based trust in the energy company.** In the low integrity-based trust condition, we informed participants that the energy company is known as a company that is dishonest, not open and not transparent about its activities. Furthermore, they read that in the past, the energy company hardly took the interests of local residents into account when developing energy projects. In the high integrity-based trust condition, we informed participants that the energy company is known as a company that is honest, open and transparent about its activities. Next, they read that in the past, the energy company took the interests of local residents very much into account when developing energy projects.

### 2.2. Measures

After reading the scenario, we asked participants to indicate how acceptable they find the wind energy project in the area they live in and the decision-making process about this wind energy project. In addition, we included a manipulation check of competence- and integrity-based trust in the energy company. Besides, participants answered some demographic questions.

**Acceptability of the wind energy project.** We asked participants to what extent, on a 7-point scale ranging from  $-3$  to  $3$ , they thought the wind energy project in the area they live in was: *very unacceptable* to *very acceptable*, *very bad* to *very good*, *very negative* to *very positive*, and *very unnecessary* to *very necessary*. We computed the mean scores of these four items, reflecting participants' evaluation of the acceptability of the wind energy project (China:  $M = 0.75$ ,  $SD = 1.55$ ,  $\alpha = 0.92$ ; the Netherlands:  $M = 0.38$ ,  $SD = 1.70$ ,  $\alpha = 0.95$ ).

**Acceptability of the decision-making process.** We asked participants to what extent, on a 7-point scale ranging from  $-3$  to  $3$ , they thought the decision-making process about the wind energy project was: *very unacceptable* to *very acceptable*, *very bad* to *very good*, *very negative* to *very positive*, and *very unnecessary* to *very necessary*. We computed the mean scores of these four items, reflecting participants' decision-making process acceptability around the wind energy project (China:  $M = 0.67$ ,  $SD = 1.53$ ,  $\alpha = 0.91$ ; the Netherlands:  $M = -0.11$ ,

(footnote continued)

whether all questions were clear. Revisions were made wherever needed. Importantly, changes were made consistently in the Chinese and Dutch questionnaires. Original Chinese and Dutch questionnaires can be found in Supplementary Information C and D.

<sup>2</sup>Before reading about the wind energy project, participants first completed a value measure (Steg, Perlaviciute, van der Werff, & Lurvink, 2014).

<sup>3</sup>Detailed English scenario descriptions can be found in Supplementary Information B.



$SD = 1.61, \alpha = 0.93$ ).

### 2.3. Manipulation check

**Competence-based trust in the energy company.** We asked participants to what extent, on a 7-point scale ranging from  $-3$  to  $3$ , they thought the energy company that was going to implement the wind energy project in the area they live in: *has little experience in developing wind energy projects to has much experience in developing wind energy projects*, and *has little knowledge in developing wind energy projects to has extensive knowledge in developing wind energy projects*. We computed the mean scores of the two items, reflecting participants' perceived competence-based trust in the energy company (China:  $M = 0.33, SD = 2.30, r = 0.91$ ; the Netherlands:  $M = 0.18, SD = 2.17, r = 0.92$ ).

**Integrity-based trust in the energy company.** We asked participants to what extent, on a 7-point scale ranging from  $-3$  to  $3$ , they thought the energy company that was going to implement the wind energy project in the area they live in: *is dishonest about its activities to is honest about its activities*, *is not transparent about its activities to is transparent about its activities*, and *took interests of local residents very little into account in the past to took interests of local residents very much into account in the past*. We computed the mean scores of these three items, reflecting participants' perceived trust in the energy company (China:  $M = 0.02, SD = 2.34, \alpha = 0.97$ ; the Netherlands:  $M = -0.04, SD = 2.11, \alpha = 0.95$ ).

## 3. Study 1: effects of competence- and integrity-based trust on project acceptability in China

### 3.1. Participants

We received 252 valid responses for further analyses in China,<sup>4</sup> of which 114 were male and 138 were female, with the mean age of 33 years ( $SD = 7.19$ ). Respondents were diverse in terms of income and regions.<sup>5</sup> See Supplementary Information A for detailed demographic information.

### 3.2. Results

#### 3.2.1. Manipulation check

<sup>6</sup>As expected, perceived competence-based trust was higher in the high competence-based trust condition ( $M = 2.01, SD = 1.04$ ) than in the low competence-based trust condition ( $M = -2.25, SD = 0.75; t(200) = -36.65, p < .001, Cohen's d = 4.70$ ). In addition, perceived integrity-based trust was higher in the high integrity-based trust condition ( $M = 2.07, SD = 0.94$ ) than in the low integrity-based trust condition ( $M = -2.34, SD = 0.59; t(228) = -45.16, p < .001, Cohen's d = 5.62$ ). This suggests that our experimental manipulations were successful.<sup>7</sup>

<sup>4</sup>134 respondents only filled out a small part of the questionnaire and 94 respondents did not pass attention check questions. These data were excluded by the panel company and was not provided to researchers. Initial sample sizes were determined based on power analysis sizes for the F test of ANOVA (main effects and interactions) with medium effect size (0.25) and power (0.8), which resulted in an estimated total sample size of 179. We instructed the panel companies to reach at least 180 valid responses, which resulted in 252 valid responses in China and 188 valid responses in the Netherlands.

<sup>5</sup>Respondents were from 17 provinces, 3 autonomous regions, 4 central governmental direct-controlled municipalities and 1 special administrative region of China.

<sup>6</sup>The pattern of the results did not change when we included gender, age, education and income as covariates. Therefore, we report the results without including these as covariates.

<sup>7</sup>As pointed out by an anonymous reviewer, the perceptions of integrity in the low-integrity condition ( $M = -2.34$ ) may be substantially more negative

#### 3.2.2. Effects of competence- and integrity-based trust on project acceptability

A two-way ANOVA showed significant main effects of competence-based trust,  $F(1, 248) = 24.98, p < .001, \eta^2 = 0.092$ , and integrity-based trust,  $F(1, 248) = 72.72, p < .001, \eta^2 = 0.227$ , on project acceptability. Both higher competence-based trust and integrity-based trust led to higher project acceptability.

The main effects of competence- and integrity-based trust on project acceptability were qualified by a significant interaction effect ( $F(1, 248) = 6.00, p = .015, \eta^2 = 0.024$ ). As depicted in Fig. 1, follow-up pairwise comparisons revealed that project acceptability was lowest when both integrity-based and competence-based trust were low. Higher integrity-based trust led to higher project acceptability, both when competence-based trust was low ( $p < .001, \text{Mean difference} = 1.82, 95\% \text{ CIs } [1.38, 2.26]$ ) and when competence-based trust was high ( $p < .001, \text{Mean difference} = 1.01, 95\% \text{ CIs } [0.53, 1.49]$ ). Higher competence-based trust only enhanced project acceptability when integrity-based trust was low ( $p < .001, \text{Mean difference} = 1.23, 95\% \text{ CIs } [0.76, 1.71]$ ). When integrity-based trust was high, having more trust in the competence of responsible agents did not lead to significantly higher project acceptability ( $p = .06, \text{Mean difference} = 0.42, 95\% \text{ CIs } [-0.02, 0.87]$ ). The unique and interaction results suggest that the effect of integrity-based trust on project acceptability was stronger than the effect of competence-based trust, as expected.

#### 3.2.3. Moderated mediation analysis

Following Hayes's Process procedures for testing moderated mediation, we explored whether the relationship between each dimension of trust and project acceptability was mediated by decision-making process acceptability, when controlling for the other dimension of trust. Results revealed a significant moderated mediation (index =  $-0.49, SE(\text{Boot}) = 0.24, 95\% \text{ CIs } [-0.97, -0.05]$ ).

Results revealed significant main effects of competence-based trust ( $b = 0.98, p < .001, 95\% \text{ CIs } [0.50, 1.45]$ ), and integrity-based trust ( $b = 1.80, p < .001, 95\% \text{ CIs } [1.36, 2.24]$ ), on decision-making process acceptability. The main effects of competence- and integrity-based trust on decision-making process acceptability were qualified by a significant interaction effect ( $b = -0.71, p = .03, 95\% \text{ CIs } [-1.36, -0.06]$ ). Follow-up pairwise comparisons revealed that higher integrity-based trust led to higher decision-making process acceptability, regardless of competence-based trust being low ( $p < .001, \text{Mean difference} = 1.80, 95\% \text{ CIs } [1.36, 2.24]$ ) or high ( $p < .001, \text{Mean difference} = 1.09, 95\% \text{ CIs } [0.61, 1.57]$ ). Higher competence-based trust only enhanced decision-making process acceptability when integrity-based trust was low ( $p < .001, \text{Mean difference} = 0.98, 95\% \text{ CIs } [0.50, 1.45]$ ) but not high ( $p = .23, \text{Mean difference} = 0.27, 95\% \text{ CIs } [-0.18, 0.71]$ ).

In addition, when testing the full model illustrated in Fig. 2, decision-making process acceptability and project acceptability were positively related ( $b = 0.69, p < .001, 95\% \text{ CIs } [0.60, 0.78]$ ). Next, after including decision-making process acceptability in the model that examined the effects of competence- and integrity-based trust and their interaction on project acceptability, the direct effects of competence-

(footnote continued)

than the perceptions of competence in the low-competence condition ( $M = -2.25$ ), because of the experimental manipulations were not exactly symmetrical (e.g., "dishonest" in low-integrity conditions and "not a lot of knowledge" in low competence conditions). Yet, we tested and found that this was not the case. The difference between the two means is not statistically significant,  $t(160) = 1.14, p = .26, 95\% \text{ CIs } [-0.06, 0.23]$  (Derrick, Toher, & White, 2017). This suggests that perceived low integrity-based trust was not significantly lower in the low-integrity conditions than perceived low competence-based trust in the low-competence conditions in Study 1 (China). We came back to this point in the Discussion.

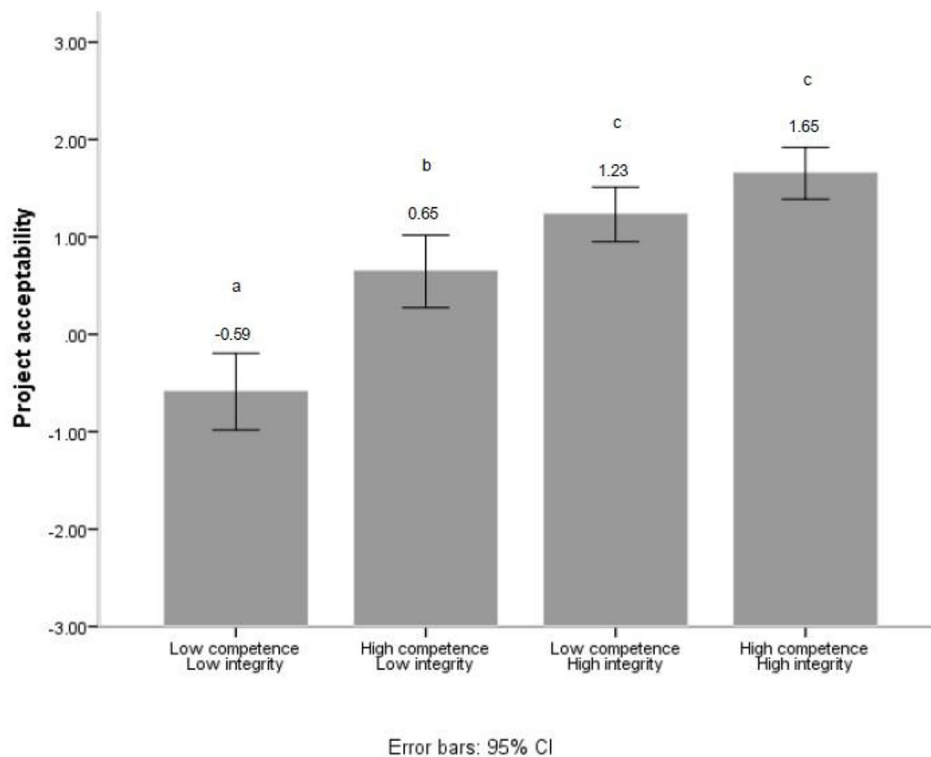


Fig. 1. Effects of competence- and integrity-based trust on project acceptability in China (Study 1).

Note: different letters (a, b, c) refer to significant differences in the mean scores ( $\alpha < 0.05$ ); the mean scores with the same letter do not significantly differ from each other.

( $b = 0.56, p = .002, 95\% \text{ CIs } [0.20, 0.92]$ ) and integrity-based trust ( $b = 0.58, p = .002, 95\% \text{ CIs } [0.22, 0.94]$ ) on project acceptability were still significant, while the interaction of both dimensions of trust on project acceptability was no longer significant ( $b = 0.32, p = .18, 95\% \text{ CIs } [-0.80, 0.15]$ ). These results indicate that the effects of competence- and integrity-based trust on project acceptability were partially mediated by decision-making process acceptability. In addition, competence- and integrity-based trust interacted with each other in influencing decision-making process acceptability, while not in influencing project acceptability after controlling decision-making process acceptability. Hence, the moderated mediation analysis revealed that integrity-based trust always affected project acceptability via decision-making process acceptability, while competence-based trust affected project acceptability via decision-making process acceptability only when integrity-based trust was low.

### 3.3. Discussion

Study 1 showed that both competence- and integrity-based trust enhanced project acceptability in China. As predicted, the positive effect of integrity-based trust on project acceptability was stronger when compared to that of competence-based trust. Higher trust in the integrity of the energy company led to higher project acceptability irrespective of the level of trust in the competence of the energy company. Yet, higher trust in the competence of the energy company only led to higher project acceptability when trust in the integrity of the energy company was low. In addition, as expected, the effect of integrity-based trust on project acceptability was mediated by decision-making process acceptability, again irrespective of the level of competence-based trust. The positive effect of competence-based trust on project acceptability was also mediated by decision-making process acceptability, but only when integrity-based trust was low. Study 2 aimed at testing whether the results would be comparable in a Western European rather than an East-Asian country, namely the Netherlands.

## 4. Study 2: effects of competence- and integrity-based trust on project acceptability in the Netherlands

### 4.1. Participants

In the Netherlands, we received 188 valid responses for further analyses.<sup>8</sup> In total 111 were male and 64 were female (13 respondents did not indicate their gender), with a mean age of 59 years ( $SD = 13.40$ ). Respondents were diverse in terms of income, regions and education. See Supplementary Information A for detailed demographic information.

### 4.2. Results

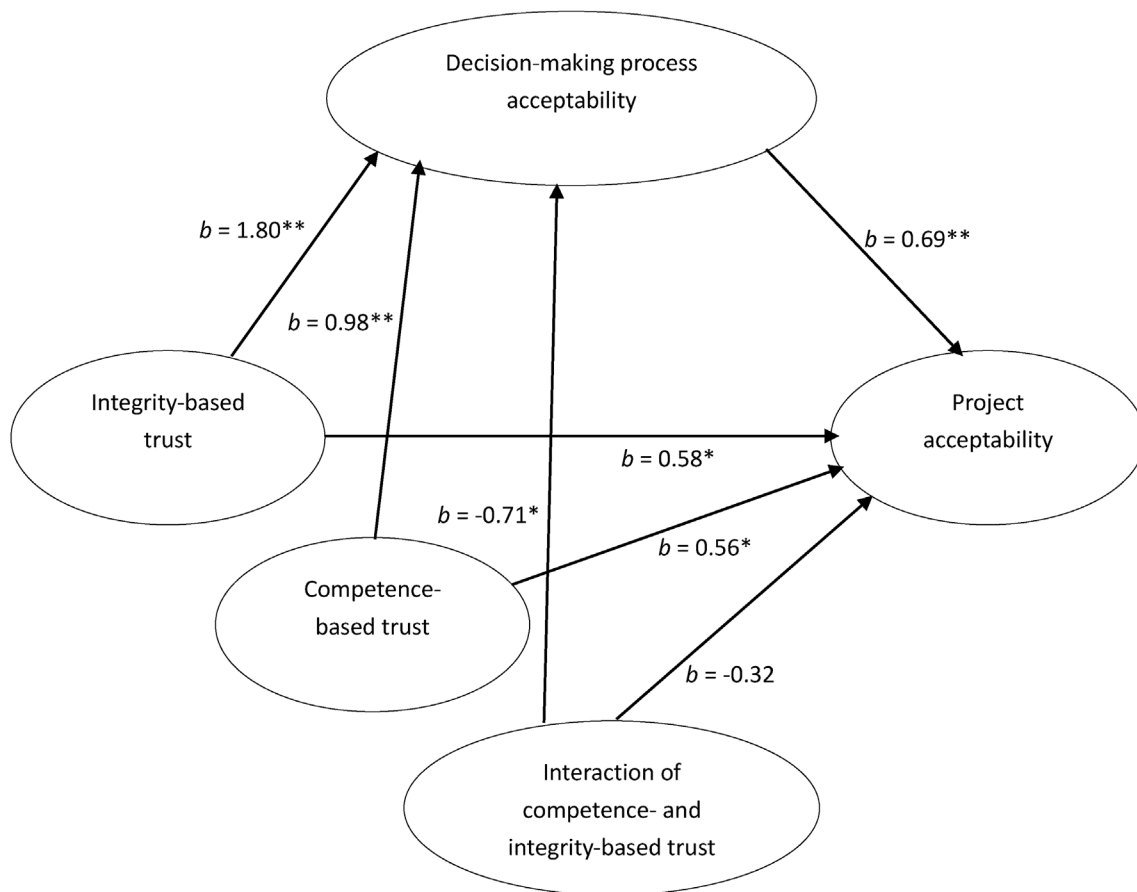
#### 4.2.1. <sup>9</sup>Manipulation check

As expected, perceived competence-based trust was higher in the high competence-based trust condition ( $M = 1.66, SD = 1.38$ ) than in the low competence-based trust condition ( $M = -1.34, SD = 1.74; t(174) = -13.08, p < .001, \text{Cohen's } d = 1.91$ ). In addition, perceived integrity-based trust was higher in the high integrity-based trust condition ( $M = 1.32, SD = 1.46$ ) than in the low integrity-based trust condition ( $M = -1.59, SD = 1.60; t(186) = -13.06, p < .001, \text{Cohen's } d = 1.90$ ). This suggests that our manipulations were successful.<sup>10</sup>

<sup>8</sup> In total 203 respondents only filled out a small part of the questionnaire and 55 respondents did not pass attention check question. We analysed the data with the 55 respondents who did not pass attention check, which revealed that the results did not change. Yet, these data were excluded from our data analysis reported in Study 2 in this paper.

<sup>9</sup> The pattern of the results did not change when we included gender, age, education and income as covariates. Therefore, we report the results without including these as covariates.

<sup>10</sup> Same to results in Study 1 (China), we found that perceived low integrity-



\* $p < .05$ , \*\* $p < .001$

Fig. 2. Moderated mediation model of competence- and integrity-based trust, decision-making process acceptability and project acceptability in China (Study 1).

#### 4.2.2. Effects of competence- and integrity-based trust on project acceptability

An ANOVA only showed a statistically significant main effect of integrity-based trust,  $F(1, 184) = 5.47, p = .02, \eta^2 = 0.029$ , on project acceptability. As depicted in Fig. 3, participants in the high integrity-based trust condition evaluated the project as more acceptable than participants in the low integrity-based trust condition. The main effect of competence-based trust on project acceptability was not statistically significant,  $F(1, 184) = 0.00, p = 1.00$ . The interaction effect of competence- and integrity-based trust on project acceptability was not statistically significant either,  $F(1, 184) = 0.02, p = .88$ .

#### 4.2.3. Mediation analysis

To test mediation, we first checked how competence- and integrity-based trust relate to the mediator. A two-way ANOVA only showed main effect of integrity-based trust,  $F(1, 184) = 16.68, p < .001, \eta^2 = 0.083$ , on decision-making process acceptability. The main effect of competence-based trust on decision-making process acceptability was not statistically significant,  $F(1, 184) = 0.71, p = .40$ . The interaction effect of competence- and integrity-based trust on decision-making process acceptability was not statistically significant either,  $F(1, 184) = 0.007, p = .93$ . Therefore, we followed Hayes's Process procedures to test whether the positive effect of integrity-based trust on

project acceptability was mediated by decision-making process acceptability in the Netherlands.

As indicated above, the effect of integrity-based trust on project acceptability ( $b = 0.58, p = .02, 95\% \text{ CIs } [0.10, 1.06]$ ) was significant. In addition, the effect of integrity-based trust on decision-making process acceptability was significant ( $b = 0.96, p < .001, 95\% \text{ CIs } [0.51, 1.40]$ ). Moreover, we found a significant relationship between decision-making process acceptability and project acceptability ( $b = 0.67, p < .001, 95\% \text{ CIs } [0.55, 0.80]$ ). The direct effect of integrity-based trust on project acceptability was no longer statistically significant ( $b = -0.06, p = .76, 95\% \text{ CIs } [-0.46, 0.34]$ ) after including decision-making process acceptability in the model (Sobel  $z = 3.94, p < .001$ ), indicating a full mediation. As depicted in Fig. 4, these results suggest that the relationship between integrity-based trust and project acceptability was mediated by decision-making process acceptability in the Netherlands.<sup>11</sup>

#### 4.3. Discussion

The effect of integrity-based trust on project acceptability in Study 2 was comparable to that in Study 1. Specifically, integrity-based trust in the energy company enhanced project acceptability in the Netherlands as well, and this relationship was mediated by decision-making process acceptability. Competence-based trust, however, did not at all have a unique positive effect on project acceptability in the Netherlands.

(footnote continued)

based trust ( $M = -1.59$ ) was not significantly lower in the low-integrity conditions than perceived low competence-based trust ( $M = -1.34$ ) in the low-competence conditions in Study 2 (the Netherlands),  $t(107) = 1.37, p = .25, 95\% \text{ CIs } [-0.11, 0.62]$ . We came back to this point in the Discussion.

<sup>11</sup> The pattern of results did not change when we include competence-based trust as a covariate in the mediation analysis, so we report results without including the covariate.

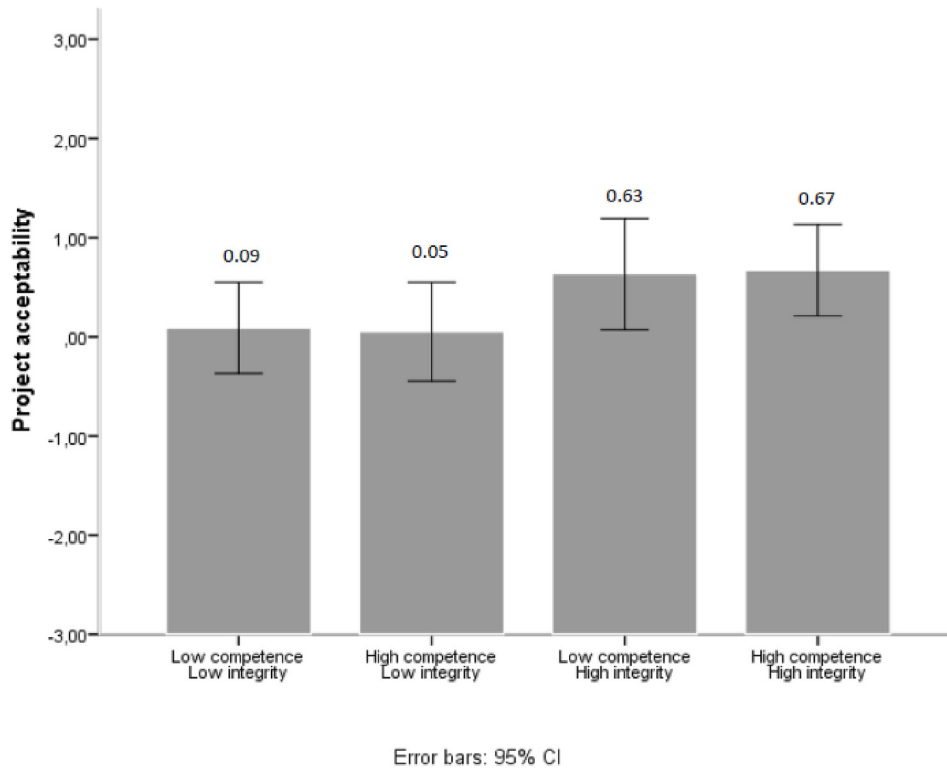


Fig. 3. Effects of competence- and integrity-based trust on project acceptability in the Netherlands (Study 2).

Moreover, there was no significant interaction effect of competence- and integrity-based trust on project acceptability in the Netherlands.

5. General discussion

We studied the effects of competence- and integrity-based trust in agents responsible for renewable energy projects on public acceptability of these projects in China and the Netherlands. We extended previous research by (a) conducting an experimental study to test the main effects and to explore the interaction effect of competence- and integrity-based trust in responsible agents on project acceptability

(Hypothesis 1 and 2; Exploratory Hypothesis 3), (b) testing whether decision-making process acceptability particularly mediates the effect of integrity-based trust on project acceptability (Hypothesis 4), and (c) testing the effects of competence- and integrity-based trust on project acceptability in an East-Asian country (i.e., China) and a Western European country (i.e., the Netherlands), in order to test the robustness and the generalizability of the results (Hypothesis 5).

In both countries, we found that higher levels of integrity-based trust enhanced project acceptability irrespective of the level of trust in the competence of responsible agents. Competence-based trust only influenced project acceptability in China and only when trust in the

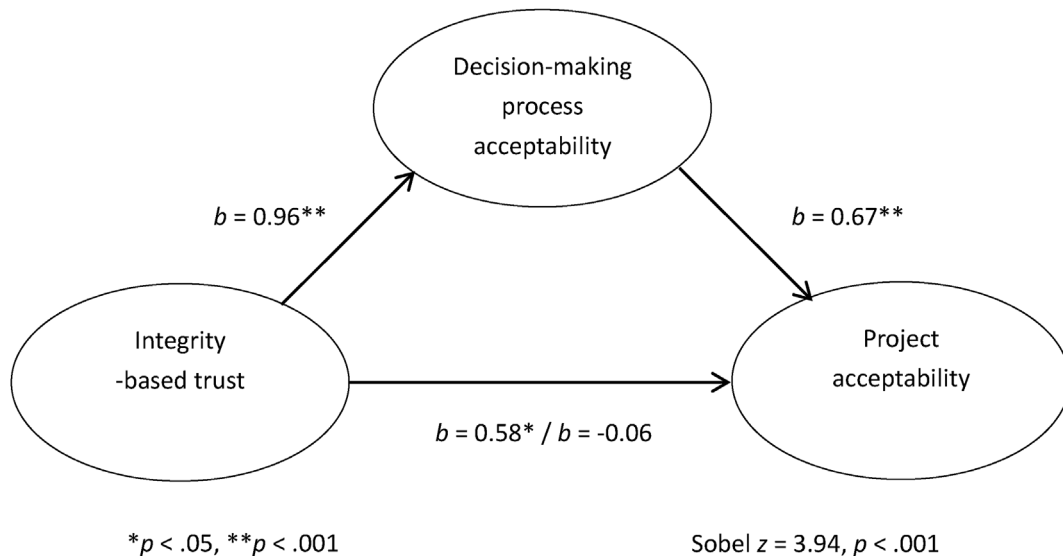


Fig. 4. Mediation model of integrity-based trust, decision-making process acceptability and project acceptability in the Netherlands (Study 2). The first coefficient below the horizontal arrow indicates the direct effect without controlling for decision-making process acceptability; the second coefficient below the horizontal arrow indicates the direct effect when controlling for decision-making process acceptability.



integrity of agents was low. Hence, integrity-based trust, as reflected perceiving a responsible agent is honest, transparent and caring for public interests, seems to have a more profound effect in influencing project acceptability than competence-based trust, as reflected perceiving a responsible agent as experienced, knowledgeable and having expertise. This finding extends previous correlational studies that showed a stronger association between perceived morality of a responsible agent and project acceptability than between perceived performance of the agent and project acceptability (Earle & Siegrist, 2006; Siegrist et al., 2012), by teasing apart the cause and effect relationship in an experimental design. In addition, our study extends previous social cognition literature which theorised that the integrity of an agent is more prominent than the competence of the agent in evaluating the agent as such (Fiske et al., 2002), by establishing that the same pattern applies for evaluating activities performed by the agent (public acceptability of renewable energy projects in our study).

Moreover, we found that acceptability of the decision-making process partially mediated the relationship between integrity-based trust and project acceptability in China and fully mediated this relationship in the Netherlands. These results suggest that in both countries, the more people trust the agent will be transparent about its activities and will consider public interests, the more they find the decision-making process acceptable, which in turn leads to higher acceptability of the renewable energy project. This corresponds previous literature that argues people evaluate decision-making process favourably particularly when it is fair, transparent and represents different interests (Leventhal, 1980; McComas et al., 2008; Tyler et al., 2016; Visschers & Siegrist, 2012; Zoellner et al., 2008). In China, acceptability of the decision-making process also partially mediated the relationship between competence-based trust and project acceptability, but only when integrity-based trust was low. Thus, in China, when people do not trust the agent as integer, seeing the agent as competent leads to higher acceptability of the decision-making process and in turn to higher acceptability of the project. This finding suggests that, although particularly perceived procedural fairness has been proposed to be related to evaluation of decision-making process in the context of renewable energy projects, other aspects of the decision making that could be influenced by competence-based trust could also be important for acceptability of decision making. Indeed, literature from different research lines suggests that people's evaluation of decision-making process also depends on whether the decision making is well-structured (Bujar, McAuslane, Walker, & Salek, 2017) and incorporates accurate knowledge (Bharati & Chaudhury, 2004). Future research could examine how different dimensions of trust influence people's evaluation of different aspects of the decision making, and how this further relates to project acceptability.

Interestingly, competence-based trust only had a significant effect on acceptability of decision making and acceptability of the project in China, but not in the Netherlands. One possible reason could be that in China, some serious technical problems happened with the development of large renewable energy projects in the past. For example, the famous hydro-energy project Three Gorges Dam in China has been claimed to be related to local environment degradation, such as water loss (Guo, Hu, Zhang, & Feng, 2012). Such cases might have led the public to consider the competence of responsible agents as very important (and not always given) when evaluating acceptability of renewable energy projects, particularly when they have little trust in the integrity of agents. This may be less the case in the Netherlands and people may assume (or take it for granted) that energy companies are anyway competent in developing renewable energy projects (Vian, 2006). Future cross-country comparison studies are needed to examine why the differences in the effect of competence-based trust on project acceptability in China and the Netherlands occurred, and explore whether country-specific factors and/or cultural factors (e.g., collectivistic culture versus individualistic culture) can explain these differences. Importantly, this was the only difference found between China

and the Netherlands, and in general, the patterns of the results were very similar across the two countries.

Our findings have important practical implications. Many energy companies are trying to improve their image as caring about public interests, for example, through promotions in the media (ExxonMobil, n.d.-a; Shell Global, n.d.-a), and to communicate their competence in the energy domain (ExxonMobil, n.d.-b; Shell Global, n.d.-b). The former strategy seems particularly important, as our results suggest that (perceived) integrity of these energy companies might be more important for public acceptability of their projects than (perceived) competence. An important next question is how project acceptability can be improved when perceived integrity-based trust in these agents is low. Our results suggest that investing in the decision-making process could help in gaining project acceptability. For example, incorporating different values and interests in the decision-making process and improve the transparency of the decision-making process may enhance public acceptability of renewable energy projects. As, the pattern of results found in China and the Netherlands was similar, such approaches are likely to be effective in different countries and cultures. Moreover, research suggests that improving public perception of the decision-making process might also help to improve public perception of the agents' integrity (Jahansoozi, 2006); future research could test this possibility.

It worth noticing that our participants were asked to evaluate acceptability of the decision making when they were provided limited information about the decision-making process. We employed such approach as we wanted to see whether trust would serve as a kind of heuristic to evaluate the decision-making process when people have very limited information about the decision-making process (cf. Siegrist, 2019). Indeed, the differences observed across experimental conditions suggest that our manipulations of the two dimensions of trust affected acceptability of the decision-making process. Future studies could test whether and how different dimensions of trust influence acceptability of the decision-making process, and how this further influences project acceptability when people have more information about or have experienced the decision-making process. In addition, other factor could influence acceptability of the decision-making process, such as who participates and how much decision-making power the public has (Avery & Quiñones, 2002). Future studies could examine to what extent providing information on such factors might affect acceptability of decision making, besides trust. Moreover, future research could test how trust work together with other factors in influencing acceptability of the decision-making process.

It should be noted that the manipulations of low competence- (e.g., not a lot of knowledge) and low integrity-based trust (e.g., dishonest) were not exactly symmetrical. We did not use an extremely strongly negative framing in our manipulation of low competence-based trust for the following reasons. First, we wanted to make the scenario more realistic. Notably, it might not be credible to participants that an extremely incompetent company can be in charge of a wind energy project. Second, we were concerned that an extremely strongly negative framing of competence-based trust might interfere too much with the manipulation of integrity-based trust. That is, the fact that the company takes up the project without having any knowledge on this topic might be perceived as a sign that the company is not integer, and competence-based trust might be a pre-requisite for integrity-based trust. Indeed, the two dimensions of trust are found to be correlated in previous studies, with a positive association in some studies (Siegrist, Earle, & Gutscher, 2003), and a negative association in other studies (Fiske, Xu, Cuddy, & Glick, 1999; Judd, James-Hawkins, Yzerbyt, & Kashima, 2005; Yzerbyt, Provost, & Corneille, 2005). We controlled this by explicating both dimensions of trust in all conditions. Future research could employ experimental design to test whether and how the level of perceived one dimension of trust would affect perception of the other dimension of trust. Importantly, the manipulation check results (see Footnote 7 and Footnote 10) suggest our manipulations were successful

to a similar extent: In both studies, perceived low integrity-based trust was not significantly lower in the low-integrity conditions than perceived low competence-based trust in the low-competence conditions. Yet, to make the experimental manipulations more symmetrical, future research could apply a less strongly negative manipulation of low integrity-based trust (e.g., not always honest, not always open and transparent about its activities, and not always considered local interests in the past), to match the less strongly negative manipulation of low competence-based trust.

Other factors could influence the effect of trust on project acceptability, such as place-related factors on where a project is being developed. We indicated in the scenario that the renewable energy project will be implemented in the area the participants live in, as we are particularly interested in public acceptability of renewable energy projects that typically come close to people's homes. Since the place-related information was identical across the experimental conditions, it is unlikely that the patterns of the results were due to any differences across the conditions. Yet, there is some evidence to suggest that people with a stronger place attachment, care more about local projects and are more willing to engage in local projects (Stefaniak, Bilewicz, & Lewicka, 2017). This suggests that trust may play a more important role in influencing project acceptability when people have higher place attachment. Future research could test this possibility and further examine whether place-related factors, such as place identify and place attachment, moderate the effects of both dimensions of trust on project acceptability. In addition, future studies could examine whether similar effects will be found when not referring to a local context.

We studied acceptability of a wind energy project, which may be perceived to be less risky than some other types of renewable energy projects, such as geothermal projects (Carr-Cornish & Romanach, 2014; Swofford & Slattery, 2010). An interesting question is whether competence-based trust becomes more important when a renewable energy project is perceived to be associated with more risks, such as earthquakes associated with geothermal or flood in case of hydro power, or whether in such cases integrity-based trust becomes even more important, namely that the responsible agent is trusted to take the decisions that best incorporate public interests. Future research is needed to address this question.

As indicated in the Introduction, different factors have been suggested to influence public acceptability of renewable energy projects next to trust in responsible agents, including individual factors (e.g., people's values) and contextual factors (e.g., costs and benefits of the project, the way costs and benefits are distributed, and how much influence people have over decision making) (see reviews Devine-Wright, 2009; Perlaviciute & Steg, 2014). Trust is likely to be related to and to influence other factors affecting project acceptability, such as perceived costs and benefits (cf. Kim, Ferrin, & Rao, 2008). Future research could examine how both dimension of trust would interact with other factors in influencing project acceptability, and whether both dimensions of trust would affect project acceptability via other factors.

To conclude, this research is the first to experimentally study the unique and interaction effects of competence- and integrity-based trust in agents responsible for renewable energy projects on public acceptability of these projects. Our study yields two important findings. First, as expected, integrity-based trust was key to enhancing project acceptability in China and the Netherlands, whereas competence-based trust only enhanced project acceptability in China, and only when integrity-based trust was low. Second, in line with our hypothesis, the effect of integrity-based trust on project acceptability was mediated by decision-making process acceptability in both countries. When integrity-based trust was low, the effect of competence-based trust on project acceptability was also mediated by decision-making process acceptability in China. This provides first empirical evidence that integrity-based trust is likely to be of primary importance for project acceptability across countries and cultures, compared to competence-based trust. International policies aiming at implementing renewable

energy projects that would be widely supported by the public, could particularly consider the integrity of agents responsible for renewable energy projects next to other factors (see reviews Devine-Wright, 2009; Perlaviciute & Steg, 2014), to secure acceptability of such projects, as to promote a worldwide sustainable energy transition.

#### Author statement

Lu Liu took the lead of the development of the paper, including study design, data collection, data analysis, writing up and revising the paper. Thijs Bouman, Goda Perlaviciute and Linda Steg significantly contributed to and provided feedback for every stage of the development of the paper.

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#### CRedit authorship contribution statement

**Lu Liu:** Formal analysis, Writing - original draft. **Thijs Bouman:** Writing - original draft, Formal analysis. **Goda Perlaviciute:** Writing - original draft, Formal analysis. **Linda Steg:** Writing - original draft, Formal analysis.

#### Declaration of competing interest

None.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvp.2020.101390>.

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