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### Values in the backyard

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## Values in the backyard: the relationship between people's values and their evaluations of a real, nearby energy project

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## PAPER

## Values in the backyard: the relationship between people's values and their evaluations of a real, nearby energy project

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Goda Perlaviciute<sup>1</sup> , Robert Görsch<sup>1</sup>, Marieke Timmerman<sup>2</sup>, Linda Steg<sup>1</sup> and Leonie Vrieling<sup>1</sup><sup>1</sup> Expertise Group Environmental Psychology, Department of Psychology, Faculty of Behavioural and Social Sciences, University of Groningen, the Netherlands<sup>2</sup> Expertise group Psychometrics and Statistics, Department of Psychology, Faculty of Behavioural and Social Sciences, University of Groningen, the NetherlandsE-mail: [g.perlaviciute@rug.nl](mailto:g.perlaviciute@rug.nl)**Keywords:** NIMBY, public acceptability, values, nearby energy projects**Abstract**

Research on abstract and/or hypothetical energy projects (e.g., nuclear, wind, solar energy) has shown that people favour energy projects that support their core values, and disfavour energy projects that threaten their core values. The question is to what extent people consider the implications for their values once energy projects become concrete, have real consequences, and come to their backyard. In a community affected by earthquakes induced by gas extraction, we studied the relationships between people's values and their concerns about the earthquakes and acceptability of the gas extraction. The more strongly people endorsed biospheric values (i.e., caring about nature and the environment) and altruistic values (i.e., caring about others), the more negatively they evaluated gas extraction and the induced earthquakes. Stronger egoistic values (i.e., caring about personal resources) were associated with less negative evaluations of gas extraction and the earthquakes, possibly due to user and economic benefits associated with energy supply from natural gas. The findings were consistent across three local regions that vary in exposure to earthquakes and across five measurement points over six years, providing robust evidence that people consider the implications for their values when evaluating real, nearby energy projects. Furthermore, the results substantiate the critique of the NIMBY (Not-in-My-Backyard) explanation of local resistance to energy projects, which assumes that people are guided exclusively by immediate selfish concerns.

**1. Introduction**

The world's energy supply entails different energy sources, including fossil fuels (coal, oil, natural gas), nuclear energy, biofuels, and renewable energy sources (hydro, solar, wind energy) (IEA 2020). Energy supply from these sources is associated with different risks, costs, and benefits that influence public responses towards the use of these sources (IPCC 2018). Research on abstract and often hypothetical energy projects based on these different sources shows that people favour energy projects that support their core values and disfavour energy projects that threaten their core values (Bidwell 2013, De Groot *et al* 2013, Perlaviciute and Steg 2015). But, to what extent do people consider the implications for their values—and for which types of values—when evaluating energy projects that come close and have real, direct consequences to them? These are important questions, since particularly local energy projects can cause public resistance, leading to conflicts between developers and local communities, as well as delays and/or cancellations of the energy projects (Temper *et al* 2020). Understanding what influences perceptions of nearby energy projects is critical for developing socially responsible and acceptable energy supply.

**1.1. Values and public perceptions of energy projects**

Values reflect general, situation-transcendent ideals that serve as guiding principles in the life of a person, guiding individuals' decisions, attitudes, and behaviours (Schwartz 1992). Four types of values seem particularly

relevant for explaining people's perceptions of energy projects: egoistic values (i.e., wanting to safeguard personal resources such as money and status), hedonic values (i.e., seeking pleasure and comfort), altruistic values (i.e., caring about the well-being of others), and biospheric values (i.e., wanting to protect nature and the environment) (Steg and De Groot 2012, Perlaviciute *et al* 2018). These four types of values are considered universal, as people across the world endorse them to some extent (Steg and De Groot 2012) and these values hardly depend on socio-demographics like age, gender, income, education level, and household composition (Sargisson *et al* 2020).

The stronger people's egoistic values, the more acceptable they found nuclear energy and the less acceptable they find renewable energy sources (De Groot *et al* 2013, Perlaviciute and Steg 2015). This is presumably because people perceive nuclear energy as supporting their egoistic values (i.e., due to personal benefits such as cheap energy), while they see renewables as threatening their egoistic values (i.e., due to personal costs such as increased energy prices). Conversely, the stronger their biospheric values, the more acceptable people found renewable energy sources and the less acceptable they found nuclear energy (De Groot *et al* 2013, Perlaviciute and Steg 2015). This is explained by the idea that people consider renewables as relatively sustainable, which supports their biospheric values, while they consider nuclear energy as an environmental hazard, which threatens their biospheric values. Similarly, stronger biospheric and altruistic values are related to higher acceptability of wind energy (Bidwell 2013), probably due environmental and societal benefits associated with energy supply from renewables.

Values not only affect how acceptable people find energy projects, but also how they evaluate various characteristics of those energy projects. Specifically, people evaluate energy projects that support their values as having mostly benefits and few costs and risks, and vice versa for energy projects that threaten their values. Indeed, not only the acceptability of renewable energy sources, but also their effects on the economy and security and stability of energy supply were evaluated more positively by people with stronger biospheric values (Perlaviciute and Steg 2015) and stronger altruistic values (Bidwell 2013). For nuclear energy, stronger altruistic and biospheric values were associated with perceiving more risks, whereas stronger egoistic values were associated with perceiving more benefits (De Groot *et al* 2013). Thus, depending on their values, people may not only differ in how acceptable they find different energy projects, but also how they perceive the specific characteristics of those projects.

In the above-mentioned studies, people were asked about energy sources in general (e.g., renewable energy sources, nuclear energy; De Groot *et al* 2013, Perlaviciute and Steg 2015) or hypothetical energy projects (e.g., possibility to develop wind farms in or near their community; Bidwell 2013), rather than real energy projects in specific locations. Compared to such general and/or hypothetical scenarios, nearby energy projects are more specific and have real, direct consequences for people, which might lead people to taking other considerations into account when evaluating such projects (Bell *et al* 2005). Indeed, when thinking about solar power in general, people associated it with positive imagery (e.g., environmental friendliness) rather than considering specific drawbacks of the implementation of solar energy (e.g., toxic waste from photovoltaics, possible negative aesthetic impacts; Sütterlin and Siegrist 2017). The question is to what extent people consider the implications for their values—and for which types of values—when evaluating nearby energy projects. To tackle this question, we study whether, to what extent, and which values are associated with people's evaluations of a real, nearby energy project.

## 1.2. General versus specific entities

Values are abstract by nature, reflecting situation-transcendent ideals. The question is whether values, as general principles, can affect specific entities like people's perceptions of nearby energy projects. One argument in the literature is that general principles are poor predictors of evaluations of specific entities where concrete benefits and drawbacks are at play. For example, values had greater influence on how people plan their distant future than their near future, while behavioural intentions in the near future were primarily predicted by situational factors, such as convenient timing (Eyal *et al* 2009). While the effects of values on evaluations of real, nearby energy projects have not been studied, one study suggests that political ideology in the US was more strongly associated with support for unconventional oil and gas developments among people living farther away than closer by the unconventional oil and/or gas reserves (Clarke *et al* 2016). The weaker relationship between political ideology and support for nearby (versus remote) projects was interpreted as evidence of the popular assumption that general constructs (e.g., values, political ideology) are poor predictors of specific entities (e.g., perceptions of nearby energy projects; Clarke *et al* 2016).

Yet, we propose a different, novel reasoning to explain the relationship between people's values and their perceptions of nearby energy projects. Specifically, we argue that values can predict perceptions of nearby projects as well, as long as those projects have consequences that are important for those values. Our proposed reasoning is underpinned by a substantial body of research showing that values influence various specific

attitudes and behaviours, such as recycling (Geiger *et al* 2019), sustainable consumption (Thøgersen and Ölander 2002), environmental activism (Balunde *et al* 2019), and interest and actual participation in smart energy systems (van der Werff and Steg 2016). The reason is that these specific options can have positive or negative implications for what people value, and values therefore guide people's positive or negative evaluations of those options, respectively. For example, pro-environmental actions, such as recycling and sustainable consumption, are beneficial for the environment and the society, which can explain why biospheric and altruistic values are often positively related to such actions (Steg and De Groot 2012, Bouman *et al* 2021). Yet, pro-environmental actions may be costly and/or inconvenient, which may be why egoistic and hedonic values are negatively related to such actions (Steg and De Groot 2012, Bouman *et al* 2021). Nearby energy projects may also have implications for people's values, for example if they have effects on nature and the environment, including local flora and fauna (implications for biospheric values), other people and future generations (implications for altruistic values), energy price and energy security (implications for egoistic values), and the quality of living environment (e.g., aesthetic impact) and daily energy use (implications for hedonic values; Perlaviciute *et al* 2018). We therefore expect that, as long as a nearby energy project has negative or positive implications for certain values, those values will guide people's perceptions of the project.

Our novel reasoning offers an alternative interpretation of a null or weak relationship between values and perceptions of nearby projects—which would commonly be interpreted as evidence that abstract constructs are poor predictors of specific entities (e.g., Clarke *et al* 2016). In contrast, our theorising implies that a weak or null relationship does not necessarily mean that values have no effects on perceptions of nearby projects, but rather that they may simultaneously have both positive and negative effects that cancel each other out. This could happen when energy projects have both positive and negative consequences for the respective values. Indeed, the unconventional oil and gas developments in the above-mentioned study (Clarke *et al* 2016) might have had such mixed consequences for different political ideologies. Specifically, unconventional oil and gas developments may support the values of political conservatives (e.g., due to economic benefits and cheap fossil fuels), yet having such projects in one's backyard might threaten those very same values (e.g., due to reduced property values). Interestingly, as the distance to unconventional oil and gas reserves increased, particularly political conservatives and moderates reported higher support for unconventional oil and gas developments, whereas the proximity did not change the (low) support among liberals (Clarke *et al* 2016). We propose these findings can be explained by the fact that particularly for conservatives the nearby oil and gas developments may have both positive and negative consequences, resulting in ambivalence and thus a weaker overall relationship between their political ideology and acceptability of the projects nearby. In the current study, we will test how different values relate to perceptions of a nearby energy project, including values for which there may be mixed positive and negative implications.

### 1.3. Self-focused versus other-focused values

If our reasoning holds and values can indeed guide perceptions of nearby energy projects, a related question is to what extent different types of values—egoistic, hedonic, altruistic, and biospheric values—influence perceptions of nearby energy projects. In practice, it is often assumed that once energy projects come nearby, people no longer consider the consequences for others, society, the environment, and future generations, but merely consider the consequences of these projects for them personally. This is reflected in the NIMBY (Not-In-My-Backyard) conventional wisdom that people are mostly driven by immediate selfish motives (for the definition of NIMBY, see Bell *et al* 2005, Burningham *et al* 2015). NIMBY would imply that, if any, only values focused on the self (i.e., egoistic and hedonic values) drive public perceptions of nearby energy projects, but not values focused on others and the environment (i.e., altruistic and biospheric values). However, NIMBY has been criticized for not acknowledging that many people are concerned by issues beyond their immediate self-interest, such as concerns about nature, local communities, and the identity of the place (Wolsink 2000, Devine-Wright 2005, Kempton *et al* 2005, Devine-Wright 2009, Haggett 2011, Bidwell 2013). In line with this reasoning, we expect that people's perceptions of nearby energy projects may be rooted not only in their egoistic and hedonic values, but also their altruistic and biospheric values.

### 1.4. Current study

The real, local energy project in our study is gas extraction in the province of Groningen, the Netherlands. The Groningen gas field—the largest in Europe—was discovered in 1959; since the start of its operation in 1963, natural gas became immensely important for energy provision in the Netherlands (replacing coal) as well as in the neighbouring countries. Most Dutch households use gas as the primary energy source for cooking and heating, and the country has profited from years-long revenues from domestic gas use as well as exporting gas to other countries. However, the extraction of natural gas causes earthquakes in the province of Groningen. Earthquakes of  $\geq 1.5$  on the Richter scale have been documented in the area since 1991, yet it was not until the

Earthquake of 3.6 on the Richter scale in 2012 that it became rapidly clear that gas extraction was causing serious problems of soil subsidence (Vlek 2019). The induced earthquakes have direct negative implications to local inhabitants, such as damages to homes and reduced house values. We were able to study public perceptions of gas extraction and the induced earthquakes since about a year after the major earthquake in 2012. In the current research, we examined the relationships between people's values, on the one hand, and their concern about the induced earthquakes and acceptability of gas extraction, on the other hand. Hence, we investigated whether the previously found relationships between values and public acceptability and evaluations of specific consequences of general and/or hypothetical energy projects can be replicated for a real, nearby energy project.

#### 1.4.1. Implications for biospheric and altruistic values

People may consider gas extraction as not environmentally-friendly, because gas is a fossil fuel that emits CO<sub>2</sub> and is finite (Perlaviciute et al 2016). Extraction activities may furthermore be seen as interfering with and harming local natural environment (Partridge et al 2019). Hence, gas extraction may be seen as having negative implications for people's biospheric values. Similarly, using the fossil fuel gas may be seen as not sustainable for the society in general and future generations, which implies negative implications for people's altruistic values. Furthermore, people in the province of Groningen perceive high risks of earthquakes not only for themselves, but also for other people living in the area, sometimes even more than for themselves (Perlaviciute et al 2017), which can further threaten their altruistic values. Given these negative implications, we expect that both biospheric and altruistic values are associated with people being more concerned about the earthquakes and less accepting of gas extraction.

#### 1.4.2. Implications for egoistic and hedonic values

People in the province of Groningen are very concerned about the damages to their houses and possibly diminishing house values (Perlaviciute et al 2017), which could threaten both their egoistic and hedonic values. Yet, gas extraction may also have positive implications for egoistic and hedonic values, because gas is a relatively cheap and convenient energy source and the revenues from gas extraction contribute to the country's economic welfare (Perlaviciute et al 2016). Hence, there may be mixed implications for egoistic and hedonic values, leading to multiple possible outcomes. First, given the negative implications, egoistic and hedonic values may be associated with higher concern about the earthquakes and lower acceptability of gas extraction. Second, given the positive implications, egoistic and hedonic values may be associated with lower concern about the earthquakes and higher acceptability of gas extraction. Third, the positive and the negative implications for egoistic and hedonic values may cancel each other out, resulting in a null overall relationship between these values and concern about the earthquakes and acceptability of gas extraction. We will test which of these outcomes is most likely.

This study is the first attempt to systematically examine the relationships between different values and people's perceptions of a real, nearby energy project. If, as we expect, biospheric and/or altruistic values are associated with negative evaluations of gas extraction and the induced earthquakes (i.e., higher concern about the earthquakes and lower acceptability of gas extraction), this would provide the first evidence that people consider the implications for their general values when evaluating local energy projects. If egoistic and/or hedonic values are not related to concern about the earthquakes and acceptability of gas extraction, this would not necessarily mean that there are no implications for those values or that people do not consider them, but rather that there may be positive and negative implications that cancel each other out. Yet, if none of the values are associated with concern about the earthquakes and acceptability of gas extraction, this would falsify our prediction that general values matter for people's perceptions of nearby energy projects.

We test the relationships between values and concern about the earthquakes and acceptability of gas extraction in three regions in the province of Groningen that vary in their exposure to the earthquakes, that was assessed on the basis of magnitude, intensity, and frequency of earthquakes at the time when the research started in 2013 (based on the data from the Dutch Royal Meteorological Institute; [www.knmi.nl](http://www.knmi.nl)):

- Region 1 (municipality of Loppersum), which has been most exposed to earthquakes and where the strongest earthquake in 2012 took place;
- Region 2 (municipalities of Bedum, Appingedam, and Slochteren), which has been less exposed to earthquakes;
- Region 3 (municipalities of Zuidhorn, Groningen, and Delfzijl), which has been least exposed to earthquakes<sup>3</sup>.

<sup>3</sup> The names of the municipalities are the original names from the time when this research started in 2013. The names have changed in the meantime: Loppersum is now Eemsdelta, Bedum is now Hogeland, Appingedam is now Eemsdelta, Slochteren is now Midden-Groningen, Zuidhorn is now Westerkwartier, and Delfzijl is now Eemsdelta.

We reason that if nearby energy projects are too specific for values to influence perceptions of those projects, then—if anywhere—we expect to find associations between values and concern about earthquakes and acceptability of gas extraction only in Region 3. If, however, our reasoning is valid and values can influence perceptions of real, nearby energy projects, we would expect relationships between values and concern about earthquakes and acceptability of gas extraction in all three regions, including those most exposed to the earthquakes. Furthermore, our study is longitudinal and comprises five measurement phases spread over six years, enabling us test the above relationships over time. If the expected relationships between values and concern about earthquakes and acceptability of gas extraction occur over and again across the multiple measurement phases, we could conclude with more confidence that people consider implications for their general values when evaluating real, nearby energy projects.

## 2. Method

### 2.1. Design

We analyse data from a longitudinal questionnaire study conducted among residents in the province of Groningen in three regions with varying exposure to earthquakes (for more information, see Perlaviciute *et al* 2017). We included five measurement phases conducted after the strongest induced earthquake in 2012 and before the Dutch government decided in 2018 to stop gas extraction in Groningen by 2030. In this period, gas extraction evoked a lot of debate because of the risks of earthquakes, while at the same time it was still playing a major role in the energy supply and economic welfare in the Netherlands. The first measurement phase took place in 2013, followed by two measurement phases in the middle and the end of 2014, one in 2016, and one in 2018. The same participants were invited to participate in subsequent phases and new participants were recruited throughout all phases to counteract drop out<sup>4</sup>. Hence, the study has a mixed longitudinal and cross-sectional design.

### 2.2. Procedure

This was a paper-and-pencil questionnaire study (in Dutch) and we used a door-to-door method for data collection. Research assistants approached people at home inviting them to participate in the study by filling in a questionnaire. We randomly selected streets and houses within those streets to approach participants. The questionnaires were later picked up upon appointment; in the fourth and the fifth study phases participants could also send the completed questionnaires back in a freepost envelope. Participants received a 10 euros voucher for a local bakery as compensation for their time and effort. For further details about the procedure, see (Perlaviciute *et al* 2017).

### 2.3. Participants

The total sample consists of 1063 respondents (when indicated, 46.1% were female, 53.9% male, Age<sub>min</sub> = 18, Age<sub>max</sub> = 92; demographics for each measurement phase are provided in table A1 in appendix A). Table 1 displays the number of respondents per region (Region 1 being most exposed and Region 3 being least exposed to the earthquakes, see above) and for each measurement phase, and identifies how many new participants were recruited at each phase after Phase 1<sup>5</sup>.

**Table 1.** Number of participants per region and per measurement phase, and number of new respondents in phases 2 to 5.

	Phase 1	Phase 2	Phase 3 <sup>a,b</sup>	Phase 4 <sup>a</sup>	Phase 5
Total	390 (100%)	429 (100%)	413 (100%)	329 (100%)	349 (100%)
Of which new participants		255 (59%)	159 (39%)	129 (39%)	130 (37%)
Region 1	141 (36%)	139 (32%)	159 (39%)	107 (33%)	109 (31%)
Region 2	126 (32%)	144 (34%)	149 (36%)	115 (35%)	129 (37%)
Region 3	123 (32%)	146 (34%)	101 (25%)	102 (31%)	111 (32%)

<sup>a</sup> The number of participants per region does not add up to the total number per phase because region information was missing for 4 cases in Phase 3 and 5 cases in Phase 4.

<sup>b</sup> Perlaviciute *et al* 2017 reported missing region information for 6 cases in Phase 3. However, inspection of unique participant codes allowed us to assign region information to two more respondents.

<sup>4</sup> To match participants' responses across the research phases and guarantee anonymity, we asked the participants to generate a unique code. Sometimes, however, respondents provided incomplete or slightly different unique codes in different phases, or another person in the household participated and indicated a different unique code. We were not able to match such responses and could only treat them as independent rather than follow-up responses.

<sup>5</sup> The response rate was not recorded. The response rate in other studies with the door-to-door data collection in this region varies from about 40% to about 70% (Perlaviciute and Squintani 2019; Perlaviciute and Steg 2012).

## 2.4. Measures

The questionnaire comprised questions about people's values, perceptions and evaluations of gas extraction and the induced earthquakes in the province of Groningen, and socio-demographics<sup>6</sup>. The key variables for this paper, namely participants' values, concern about earthquakes, and acceptability of gas extraction, were measured as follows.

### 2.4.1. Values

As values are believed to be relatively stable across time (Bardi *et al* 2014), we measured values once for each participant, namely when a participant entered the research for the first time (which could be in any of the measurement phases). We used an established and validated brief version of Schwartz's (1992) values scale that contains 16 items, where participants receive a list of values with short descriptions and rate the importance of each value as a guiding principle in their life on a 9-point scale ranging from  $-1$  *opposed to my guiding principles*,  $0$  *not important*, to  $7$  *extremely important*; respondents read that usually a person has no more than two values that are assigned a 7 (Steg *et al* 2014, Bouman *et al* 2018). Respondents are asked to try to distinguish as much as possible between the importance of the values by using different numbers. The importance ratings of the respective items were averaged to form reliable composite scales of biospheric (Cronbach's  $\alpha = .86$ ,  $M = 4.7$ ,  $SD = 1.4$ ), altruistic (Cronbach's  $\alpha = .73$ ,  $M = 5.3$ ,  $SD = 1.1$ ), egoistic (Cronbach's  $\alpha = .78$ ,  $M = 2.2$ ,  $SD = 1.4$ ), and hedonic (Cronbach's  $\alpha = .81$ ,  $M = 4.5$ ,  $SD = 1.5$ ) values.

### 2.4.2. Concern about earthquakes

In each measurement phase, we asked to what extent respondents think that the earthquakes induced by gas extraction from the Groningen gas field are severe, worrisome, and dangerous on a 7-point scale ranging from *not at all* (1) to *very much* (7) (Cronbach's  $\alpha$  across the five phases:  $.87 < \alpha < 0.90$ ; for means see figure 1 in the results and table B1 in appendix B).

### 2.4.3. Acceptability of gas extraction

In each measurement phase, we asked, on four 7-point scales, to what extent respondents find gas extraction from the Groningen gas field *not at all acceptable* (1)—*very acceptable* (7), *very useless* (1)—*very useful* (7), *very bad* (1)—*very good* (7), and *not at all necessary*—*very necessary* (7) (Cronbach's  $\alpha$  across the five phases:  $.88 < \alpha < .90$ ; for means see figure 1 in the results and table B1 in appendix B).

## 2.5. Data analyses

Given the repeated-measures structure of the data and the participants' data being clustered in measurement phases, we used multilevel modelling (e.g., Snijders and Bosker 2012) to test our hypotheses about the relationships between values and the dependent variables while accounting for possible trends across measurement phases and region effects. For each dependent variable, we built five two-level models with measurement phase as a level 1 predictor and the region where people live in and people's values as level 2 predictors, in a stepwise way, using MLwiN (Version 3.05; Charlton *et al* 2020). Fixed effects were tested with approximate t-tests, and random effects were tested using the deviance test, applying a significance level of  $\alpha = .05$ . Hypothesized effects were kept included in the model, while exploratory effects were retained only when significant, adjusted for each cluster of effects for multiple hypothesis testing using the Bonferroni correction. Below we describe how the models for each dependent variable were built.

The baseline model (M0) was built to account for trends across measurement phases and region effects. That is, linear and quadratic functions of measurement phases were tested as fixed and random effects, and region effects were tested as fixed effects using dummy variables. Random effects were tested exploratorily, with a Bonferroni correction.

Next, we set up two parallel models in order to test our hypotheses about the relationships between altruistic and biospheric values (M1A) and egoistic and hedonic values (M1B) and the two dependent variables, including the respective types of values as fixed effects level 2 predictors to the M0. This allowed us to assess how much explained variance is added to M0 by including the other-focused values, namely altruistic and biospheric values (M1A), and the self-focused values, namely egoistic and hedonic values (M1B). Next, the effects of all four types of values were modelled jointly in M2, to see whether adding all values increases the explained variance and model fit.

Lastly, we tested whether the strength of the relationship between values and the dependent variables differed across regions and measurement phases, respectively. That is, we included all statistically significant effects of values in M2 in an exploratory test of two-way interactions with measurement phase and region, yielding M3.

The sample size was largely determined by resources available for the door-to-door data collection. Hox (2010) notes that in models with only a random intercept and no random slopes, we can use Cohen's (1992) procedures to estimate statistical power. For level-two explanatory variables, the effective sample size is equal to the number of individuals. Results obtained with G\*Power3 (Faul *et al* 2007) show that with our  $N = 1063$ , the power to detect a small significant correlation  $r = .10$  with  $\alpha = .05$  is  $.91$ . Hence, we deem our study powered sufficiently well.

<sup>6</sup>The complete questionnaire can be requested from the corresponding author.

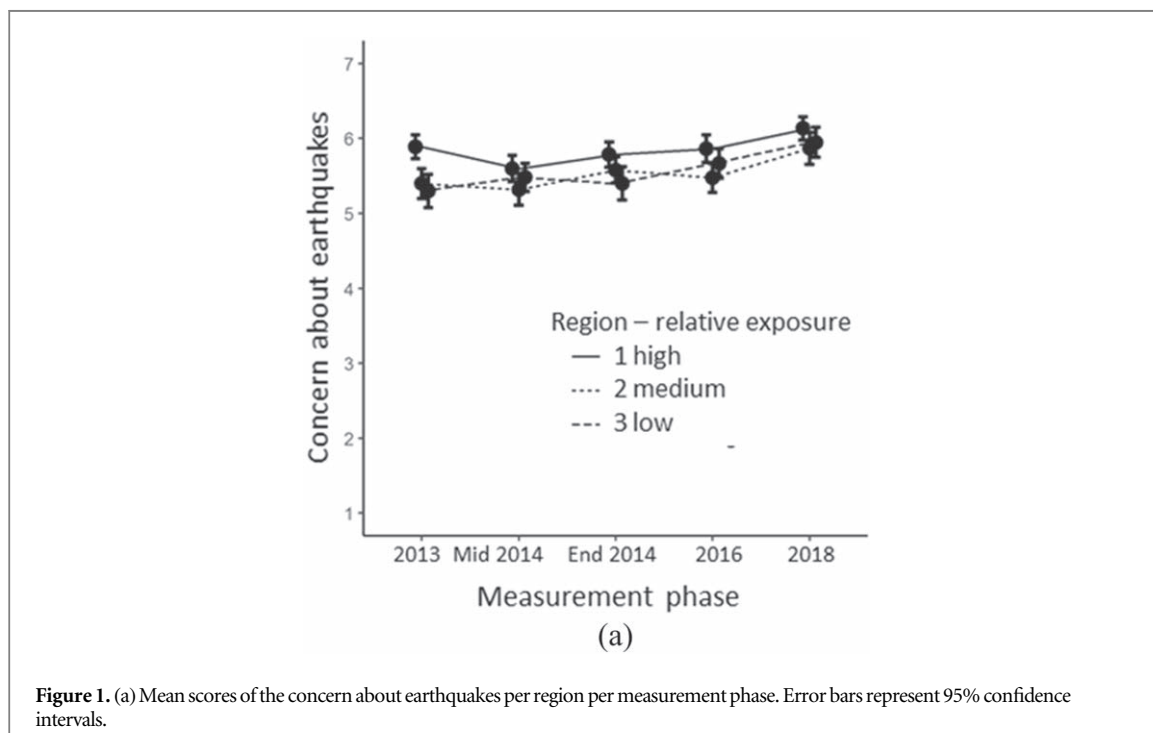


### 3. Results

We examined the relationships between values and each dependent variable when controlling for the effects of other values, trends across measurement phases, and region effects. Bivariate correlations between different values, and between values and the dependent variables in each measurement phase are provided in tables C1-C3 in appendix C.

#### 3.1. Relationships between values and concern about earthquakes

The mean concern about earthquakes is visualised in figure 1(a); numeric values of the means and standard deviations are provided in table B1 in appendix B. The model M0 in table 2 shows that across the measurement phases people's concern about earthquakes increases overall, after a slight drop in the beginning. Moreover, concern about earthquakes is higher in the most exposed region 1 (reference category) compared to both other regions ( $p$ 's < .001).



M1A shows that altruistic and biospheric values both are statistically significantly related to concern about earthquakes ( $p_{\text{altruistic}} = .041$ ,  $p_{\text{biospheric}} < .01$ ). As expected, stronger altruistic and stronger biospheric values were related to a higher concern about earthquakes, suggesting that people are concerned about earthquakes because of the negative impacts on others and the environment. Adding altruistic and biospheric values (M1A) explained additional variance in concern about earthquakes over and above the measurement phase and the region effects (M0;  $\Delta R^2 = 9.2\%$ ).

M1B shows that hedonic and egoistic values also are statistically significantly related to concern about earthquakes, yet in different directions. Specifically, stronger hedonic values were associated with a higher concern about earthquakes ( $p = .019$ ). In contrast, stronger egoistic values were associated with a lower concern about earthquakes ( $p = .018$ ). Adding egoistic and hedonic values (M1B) explained a modest amount of additional variance in concern about earthquakes on top of the effects of the measurement phase and region (M0;  $\Delta R^2 = 4.6\%$ ).

M2 shows that with all four types of values included, stronger altruistic and stronger biospheric values were again related with higher concern, while stronger egoistic values were related with lower concern about earthquakes (see figure 2). Yet, the effects of hedonic values on concern about earthquakes were no longer significant ( $p = .37$ ). Adding all four values improves the model fit and more variance in the data is explained compared to the previous models<sup>7</sup> (M2 versus M0  $\Delta R^2 = 12.2\%$ ; M2 versus M1A  $\Delta R^2 = 3\%$ ; M2 versus M1B  $\Delta R^2 = 7.6\%$ ).

We additionally tested the interaction effects between measurement phase and values and region and values, to see if the observed relationships between values and concern about earthquakes differed per region and/or measurement phase. As expected, none of interaction effects were statistically significant (all  $p > .05$ ),

<sup>7</sup> We checked multilevel modelling assumptions and found mild heteroscedasticity and non-normally distributed residuals for our final model. We conducted an analysis under transformation of the dependent variable, which decreased the assumption violations. All fixed effects that were significant in the initial analysis remained so in the analysis of transformed scores, and their relative sizes were almost identical across the two analyses. We therefore report our results without transforming the data, as these are easier to interpret, namely in terms of the original scales.

indicating that the relationships between values and concern were robust and pertained in all regions, from the least to the most exposed to earthquakes, and did not change over time.

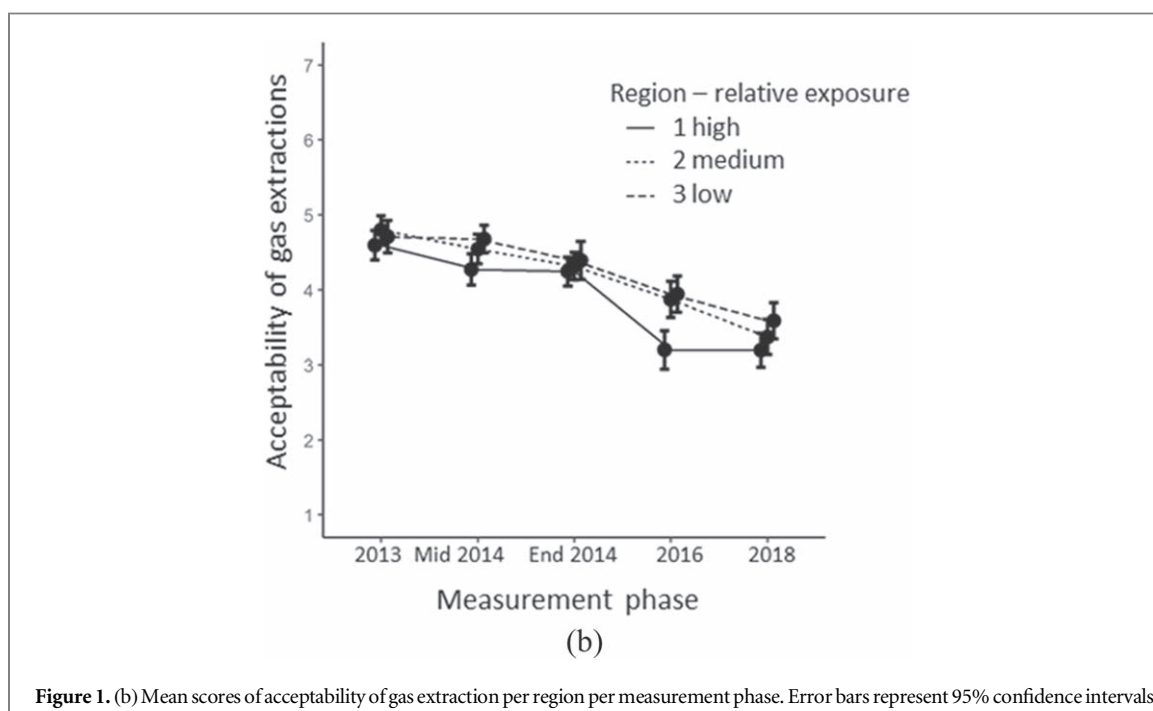
**Table 2.** Multilevel regression model for the relationships between values and concern about earthquakes.

	M0		M1A		M1B		M2	
	Estimate	(SE)	Estimate	(SE)	Estimate	(SE)	Estimate	(SE)
<i>Fixed effects</i>								
Intercept	5.73	(0.07)	5.72	(0.08)	5.74	(0.08)	5.75	(0.08)
<i>Level 1 variables</i>								
Phase	-0.10	(0.05)	-0.12*	(0.06)	-0.10	(0.06)	-0.11*	(0.06)
Phase <sup>2</sup>	0.05***	(0.01)	0.06***	(0.01)	0.05***	(0.01)	0.06***	(0.01)
<i>Level 2 variables</i>								
Region_2	-0.31***	(0.08)	-0.25**	(0.09)	-0.29**	(0.09)	-0.30**	(0.09)
Region_3	-0.30***	(0.08)	-0.37***	(0.09)	-0.37***	(0.09)	-0.41***	(0.09)
Altruistic values			0.09*	(0.04)			0.11*	(0.05)
Biospheric values			0.12**	(0.04)			0.11**	(0.04)
Egoistic values					-0.07*	(0.03)	-0.09**	(0.03)
Hedonic values					0.07*	(0.03)	0.03	(0.03)
<i>Random effects</i>								
Level-2 variance $\tau_0^2$	0.72	(0.05)	0.66	(0.05)	0.67	(0.06)	0.63	(0.05)
Level-1 variance $\sigma^2$	0.71	(0.08)	0.70	(0.08)	0.74	(0.08)	0.71	(0.08)
<i>Random slopes</i>								
Phase	1.09	(0.46)	1.01	(0.44)	1.08	(0.48)	0.94	(0.44)
Phase <sup>2</sup>	0.06	(0.02)	0.05	(0.02)	0.06	(0.02)	0.04	(0.02)
<i>Covariances* intercept</i>								
Phase	-0.42	(0.19)	-0.45	(0.18)	-0.45	(0.20)	-0.43	(0.18)
Phase <sup>2</sup>	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
<i>Other covariances</i>								
Phase*Phase <sup>2</sup>	-0.24	(0.09)	-0.20	(0.09)	-0.23	(0.10)	-0.18	(0.09)
R <sup>2</sup>	3.8%		13.0%		8.4%		16.0%	
Deviance	4921.1		3728.1		3835.7		3567.3	

Note. For level 1 and 2 variables: \*p < .05, \*\*p < .01, \*\*\*p < .001, two-tailed. 95% confidence intervals can be calculated with the formula  $[CI_{High} CI_{Low}] = b \pm 1.96 * SE$ , where  $b$  is the estimated regression weight and SE its standard error.

### 3.2. Relationships between values and acceptability of gas extraction

The mean acceptability of gas extraction is visualised in figure 1 (b); numeric values of the means and standard deviations are provided in table B1 in appendix B. The model M0 in table 3 shows that across the measurement phases acceptability of gas extraction diminishes. The region effects were also significant, indicating that acceptability of gas extraction was higher in regions 2 and 3 compared to the most exposed region 1 ( $p_{region\_2} < .01, p_{region\_3} < .001$ ).



**Figure 1.** (b) Mean scores of acceptability of gas extraction per region per measurement phase. Error bars represent 95% confidence intervals.

M1A shows that, as expected, stronger biospheric values were significantly related to lower acceptability of gas extraction ( $p < .01$ ). There was, however, no significant relationship between altruistic values and acceptability of gas extraction ( $p = .80$ ). Adding biospheric and altruistic values (M1A) increased the explained variance modestly on top of the effects of the measurement phase and region (M0;  $\Delta R^2 = 4.1\%$ ).

M1B shows that only stronger egoistic values were related with higher acceptability of gas extraction ( $p < .001$ ), while the effect of hedonic values on acceptability of gas extraction was not significant ( $p = .076$ ). Adding egoistic and hedonic values increased the explained variance to a small amount compared to adding only the measurement phase and the region (M0;  $\Delta R^2 = 3.4\%$ ).

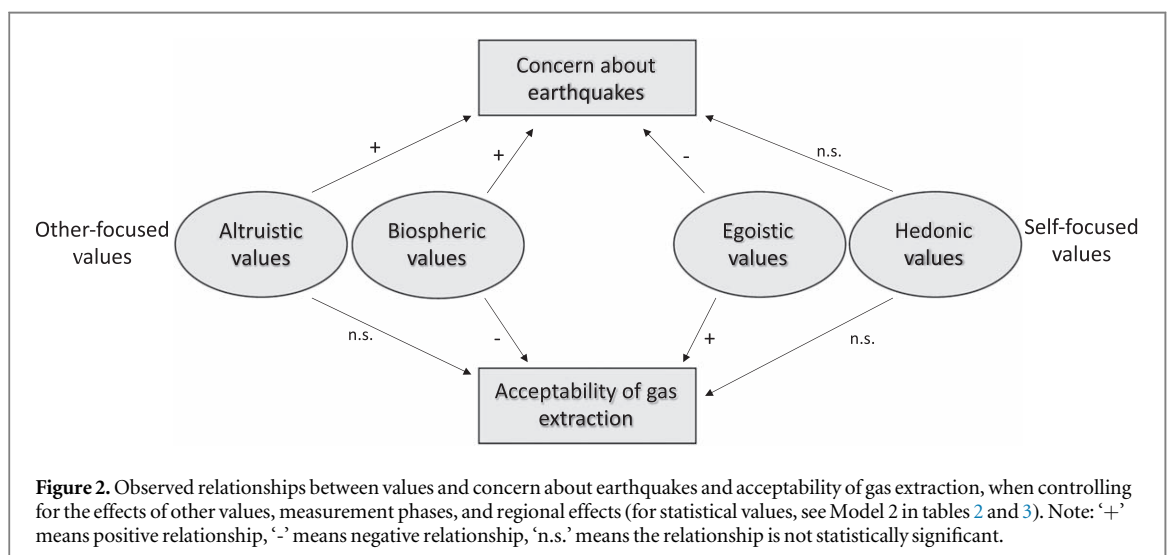
When including all four values (M2), again biospheric values were negatively associated and egoistic values were positively associated with acceptability of gas extraction (see figure 2). There was a modest increase in explained variance compared to the previous models (M2 versus M0  $\Delta R^2 = 5,3\%$ ; M2 versus M1A  $\Delta R^2 = 1,2\%$ ; M2 versus M1B  $\Delta R^2 = 2\%$ ).

We additionally examined interaction effects between measurement phase and values and region and values. As expected, none of the interaction effects were statistically significant (all  $p$ 's  $> .05$ ), suggesting that the relationships between values and acceptability of gas extraction were robust and did neither differ across the three regions nor across the measurement phases.

**Table 3.** Multilevel regression model for the relationships between values and acceptability of gas extraction.

	Model 0		Model 1A		Model 1B		Model 2	
	Estimate	(SE)	Estimate	(SE)	Estimate	(SE)	Estimate	(SE)
<i>Fixed effects</i>								
Intercept	4.49	(0.08)	4.55	(0.08)	4.57	(0.08)	4.55	(0.08)
<i>Level 1 variables</i>								
Phase	-0.13*	(0.06)	-0.11	(0.06)	-0.10	(0.06)	-0.11	(0.06)
Phase <sup>2</sup>	-0.07***	(0.02)	-0.07***	(0.02)	-0.07***	(0.01)	-0.07***	(0.02)
<i>Level 2 variables</i>								
Region_2	0.24**	(0.09)	0.15	(0.10)	0.13	(0.10)	0.18	(0.10)
Region_3	0.36***	(0.09)	0.31**	(0.10)	0.27**	(0.10)	0.33**	(0.10)
Altruistic values			0.01	(0.05)			0.00	(0.05)
Biospheric values			-0.11**	(0.04)			-0.13**	(0.04)
Egoistic values					0.11**	(0.03)	0.10**	(0.03)
Hedonic values					-0.06	(0.03)	-0.01	(0.03)
<i>Random effects</i>								
Level-2 variance $\tau_0^2$	0.86	(0.06)	0.80	(0.07)	0.83	(0.07)	0.79	(0.07)
Level-1 variance $\sigma^2$	0.66	(0.03)	0.65	(0.04)	0.63	(0.03)	0.64	(0.03)
R <sup>2</sup>	14.1%		18.2%		17.4%		19.4%	
Deviance	5563.2		4310.4		4307.2		4123.4	

Note. For level 1 and 2 predictors: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , two-tailed. 95% confidence intervals can be calculated with the formula  $[CI_{High}, CI_{Low}] = b \pm 1.96 \cdot SE$ , where  $b$  is the estimated regression weight and SE its standard error.



## 4. Discussion

Values have been found to influence people's evaluations of general and/or hypothetical energy projects (Bidwell 2013, De Groot *et al* 2013, Perlaviciute and Steg 2015). Yet, given the abstract nature of values, the question is whether and to what extent they influence people's evaluations of real, nearby energy projects where many specific concerns may play a role. We argued that also when evaluating real, nearby energy projects, people consider the implications of these projects for what they value, and values can therefore influence evaluations of such projects. Furthermore, in contrast to the NIMBY conventional wisdom, we reasoned that when evaluating such projects people consider not only values focused on the self (i.e., egoistic and hedonic values), but also values focused on others and the environment (i.e., altruistic and biospheric values).

To test our hypotheses, we examined the relationships between people's values and their evaluations of gas extraction and the induced earthquakes in their region. Specifically, we selected a real energy project that has direct implications for local residents, rather than an abstract and/or hypothetical energy project. Our participants were indeed highly concerned about the induced earthquakes and over time became less accepting of gas extraction. When comparing the three regions that were all affected—but to a different extent—by the earthquakes, respondents in the most affected region were most concerned and least accepting of gas extraction. This enabled us to test the relationships between people's values and their evaluations of a real, nearby energy project, including people most directly and negatively affected by the project.

We found that people's concern about the earthquakes and acceptability of gas extraction were indeed associated with their values. Notably, the stronger their biospheric and altruistic values, the more concerned people were about the earthquakes. Inducing earthquakes through gas extraction can be seen as interfering with nature (Partridge *et al* 2019), which might threaten people's biospheric values. Moreover, people may worry about other people in their region who are exposed to the risk of earthquakes (Perlaviciute *et al* 2017), which might threaten their altruistic values. The findings therefore support our reasoning that people take their values into account when evaluating real, nearby energy projects. Moreover, the findings counter the NIMBY-based assumption that people are primarily selfish when evaluating local energy projects. Specifically, even when faced with concrete risks for themselves, participants seemed to consider the implications of gas extraction for their altruistic and biospheric values—which transcend their self-interest.

Biospheric values were also negatively associated with acceptability of gas extraction, as expected. This is probably because gas is a fossil fuel and people associate fossil fuels with environmental hazards (for a review, see Perlaviciute and Steg 2014), which threatens biospheric values. Using the fossil fuel gas might also threaten altruistic values, as it causes climate change that has negative impacts for the society and future generations (IPCC 2018) and people may fear risks from nearby fossil-fuel extraction for human health and social life in the community (Eaton and Kinchy 2016). Yet, altruistic values were not significantly associated with acceptability of gas extraction when other values were controlled for. One reason could be that people associate gas extraction not only with negative but also with positive implications for their altruistic values. Indeed, people associate fossil fuels with affordable energy, employment, and welfare for people, including local communities (e.g., Eaton and Kinchy 2016, Hurlbert *et al* 2020; for a review, see Perlaviciute and Steg 2014). Future studies could examine which negative and positive consequences people perceive energy projects to have for their values, and how this affects the relationship between values and acceptability of those energy projects.

Interestingly, stronger egoistic values were associated with lower concern about earthquakes and higher acceptability of gas extraction. Natural gas may be perceived as having benefits for people's egoistic values, for example because it is seen as relatively cheap and readily available, and the revenues from gas extraction contribute to economic welfare (Perlaviciute *et al* 2016). Previous studies have shown that people with stronger egoistic values, and more conservative voters, are more favourable towards fossil fuels (e.g., Whitmarsh *et al* 2015) and nuclear energy (e.g., De Groot *et al* 2013, Perlaviciute and Steg 2015)—both these energy sources are typically seen as providing relatively cheap and stable energy and fostering economic growth. We find that similar patterns remain when people evaluate real energy projects in their backyard. Research has shown that people's attitudes towards energy sources in general (e.g., renewables) are positively correlated with their attitudes towards deploying those energy sources nearby (e.g., wind and solar energy projects) (Jones and Eiser 2009, Larson and Krannich 2016, Hoen *et al* 2019). The current findings extend this evidence by suggesting that both types of evaluations have a common determiner, namely people's values and the implications that people expect energy sources and projects to have for these values. As such, values seem relevant for understanding both the so-called socio-political acceptance (i.e., public acceptability of energy sources and technologies in general) and community acceptance (i.e., local acceptability of siting decisions and concrete energy projects; Wüstenhagen *et al* 2007). Future studies could further explore which considerations with respect to which values play a role in evaluations of energy projects nearby and far away.

Interestingly, while earthquakes pose acute risks for people personally (damages to homes, reduced house values), this did not result in negative relationships between egoistic values and evaluations of gas extraction and

the earthquakes, nor did it cancel out the positive relationships. It could be because damages to homes and reduced house values are prominent concerns for all people in this region (Perlaviciute *et al* 2017), and that everyone is worried about these implications irrespective of how strongly they endorse egoistic values. As such, egoistic values may not increase the concern about earthquakes, nor have a negative effect on acceptability of gas extraction. Future research could test the effects of egoistic values on evaluations of energy projects with less severe consequences for these values, which would matter primarily for people who strongly endorse these values.

While stronger hedonic values were associated with higher concern about earthquakes, this relationship was no longer statistically significant when controlling for the other values and the effects of the measurement phase and region. The reason for this could be that the perceived risks of induced earthquakes go far beyond the personal discomfort and inconvenience (i.e., implications for hedonic values) and encompass worries about human health and the quality of local environment more generally (i.e., implications for altruistic and biospheric values), as observed for perceptions of local shale gas extractions (Eaton and Kinchy 2016). Hedonic values were furthermore not significantly associated with acceptability of gas extraction. This is likely because besides negative implications, natural gas may also have positive implications for people's hedonic values, for example because it is seen as a convenient and easy to use energy source (Perlaviciute *et al* 2016). Most importantly, our findings suggest that the non-significant effects of hedonic values do not mean that people do not consider the implications for their values, as they seemed to consider the negative implications for biospheric and altruistic values, as well as the positive implications for egoistic values. Rather, the negative and the positive implications for hedonic values may have cancelled each other out; future studies could examine how people deal with such ambiguous implications for their values and under which conditions they may prioritize either the negative or the positive implications.

We found similar relationships between people's values and their evaluations of gas extraction and the induced earthquakes across three regions varying in exposure to earthquakes. In other words, higher exposure to earthquakes did not weaken the relationships between people's values and their perceptions of the nearby gas extraction. This finding challenges the previous proposition that general antecedents, such as values and political affiliation, are poor predictors of evaluations of energy projects close by versus far away (Clarke *et al* 2016). Our findings support our alternative explanation of such previously observed weaker relationships, namely that people do not stop considering the implications for their values as the projects come close by—but that there may be conflicting implications for certain values that cancel each other out, as also suggested by our findings for hedonic values. Furthermore, we found similar relationships between values and concern about earthquakes and acceptability of gas extraction across five measurement phases, suggesting that the relationships were robust over time and further solidifying the evidence that values can guide evaluations of real, nearby energy projects.

Our findings speak against the NIMBY assumption that people's evaluations of energy projects are guided solely by their immediate selfish concerns, in accordance with previous criticism of NIMBY (Wolsink 2000, Devine-Wright 2005, Devine-Wright 2009, Haggitt 2011, Bidwell 2013). Notably, if NIMBY was correct, then only values focused on the self (i.e., egoistic and hedonic values) would guide people's evaluations of nearby energy projects. We demonstrated, however, that even when people themselves were negatively affected by the nearby energy project, they nevertheless considered the values focused on others and the environment (i.e., altruistic and biospheric values) when evaluating the project. Furthermore, NIMBY would not predict that besides considering immediate negative consequences for themselves, people also consider the possible societal benefits of the energy source, for example for the energy supply and economic welfare. Yet, we show people take these different considerations into account, as implied by the relationships between stronger egoistic values and more positive evaluations of gas extraction. Together, our results provide solid, evidence-based grounds to disqualify NIMBY and give support for a more comprehensive, value-based approach to explain public acceptability of nearby energy projects.

We studied gas extraction and theorized that it has mostly negative implications for people's other-focused values (i.e., altruistic and biospheric values) and mixed negative and positive implications for people's self-focused values (i.e., egoistic and hedonic values). The findings overall support our presumption that values can influence evaluations of nearby energy projects, based on the implications of those projects for the respective values. Future studies could test whether the findings can be replicated for other energy projects that have different implications for those values. Renewable energy projects in particular, such as wind parks, may be seen as having negative implications for people's self-focused values, as people may be concerned about the visual impact, noise, and shadow flicker from the turbines, intermittent energy supply, and increased energy costs (e.g., Rand and Hoen 2017). Further, some energy projects may be mixed implications for other-focused values. For example, wind energy can be seen as having positive consequences for combating climate change, but negative effects on local ecosystems and inhabitants (e.g., Neri *et al* 2019, Wolsink 2007). Accordingly, future studies could examine whether there is a negative relationship between self-focused values and evaluations of local wind energy projects, and a negative, a positive, or no relationship between other-focused values and evaluations of such projects.

Our key aim was to establish whether there is a relationship between people's general values and their specific perceptions of nearby energy projects, namely acceptability of nearby gas extraction and concern about the induced earthquakes. This correlational study was not designed to tease out causal relationships between values, concern about earthquakes, and acceptability of gas extraction, which could follow multiple pathways. For example, values could influence how concerned people are about the earthquakes, which might in turn influence acceptability (values -> perceived risks -> acceptability). Yet, there is also evidence that people's overall acceptance of a project can 'colour' their evaluations of the various risks and benefits of that project (Perlaviciute and Steg 2015), which would imply a different pathway (values -> acceptability -> perceived risks). Experimental studies could test which causal pathway is most likely and when. Researchers could vary different consequences of nearby energy projects and test how this affects people's perceptions of the projects, including overall acceptability and evaluations of various costs and benefits. For example, if people have relatively strong egoistic values and their acceptability judgements are negatively affected by increases in energy price, this might also negatively 'colour' their evaluations of other consequences of the project, such as its environmental impact.

Our findings have important implications for energy policy. We found that people are highly concerned about the earthquakes, which highlights the urgency of preventing the risks and/or reducing the eventual damages, for example by reducing gas extraction, reinforcing buildings, and compensating local people for damages and reduced house values. Yet, while it is often assumed in practice that local people *only* care about the direct consequences for themselves (i.e., NIMBY), our findings show that people have other concerns rooted in their other-focused values. Policy that overlooks the implications of gas extraction for altruistic and biospheric values may face public resistance because people think that their important values are not addressed. Policy makers could deliberately incorporate different values in decision making on mitigating the risks of energy production, for example when developing mitigation measures and possibly alternative energy projects that could better accommodate the different values (Correljé et al 2015, Oosterlaken 2015, Perlaviciute et al 2018). One way to do this is by addressing these different values in public participation procedures and discussing with local communities how to best accommodate different values (Perlaviciute 2019).

All in all, our results provide first evidence that people's general values are associated with their perceptions of real, nearby energy projects. Stronger altruistic and biospheric values were consistently related to people's higher concern about the induced earthquakes from gas extraction in their backyard, and stronger biospheric values additionally led to lower acceptability of gas extraction. In contrast, stronger egoistic values were associated with lower concern about earthquakes and higher acceptability of gas extraction, suggesting that people consider the benefits of gas extraction even when faced with the negative consequences of earthquakes. Considering people's values can therefore help develop more socially responsible and acceptable energy projects. Importantly, in doing so, not only values focused on the self should be considered, as often assumed in practice, but also values focused on others and the environment.

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## Data availability statement

The data generated and/or analysed during the current study are not publicly available for legal/ethical reasons but are available from the corresponding author on reasonable request.

## Ethical statement

Ethical approval from the Ethics board of the University of Groningen was received for this research.

## Appendix A

**Table A1.** Reported demographic characteristics of respondents in the five measurement phases

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
<b>Gender</b>					
Females (%)	44.1	44.8	43.1	46.4	44.4
Males (%)	55.9	55.2	56.9	53.6	55.6
Mean age (years)	52.2	52.7	54.8	55.9	57.7
<b>Education (%)</b>					
Primary school	2.1	1.4	0.9	2.0	1.2
Lower vocational education	9.0	10.2	8.9	7.6	8.4
Secondary	37.5	39.4	44.6	38.4	37.2
Higher	37.2	37.2	34.9	38.8	42.2
Masters or PhD	12.7	10.7	8.0	11.6	10.5
Other	1.6	1.1	2.7	1.6	0.6
<b>Net household income (%)</b>					
< 1000€/month	4.9	4.1	3.8	3.8	2.2
1000–2000€/month	28.2	33.2	30.1	27.1	19.1
2000–3000€/month	31.3	31.5	30.4	27.9	35.6
3000–4000€/month	22.7	21.2	24.0	30.4	26.9
4000–5000€/month	8.9	7.9	10.3	7.9	10.9
> 5000€/month	4.0	2.1	1.3	2.9	5.3

Note. During phases 1–4 data on education and income was only asked once when respondents entered the study. Education and income data were asked again from all respondents in phase 5.

## Appendix B

**Table B1.** Means and standard deviations for the concern about earthquakes and acceptability of gas extraction per measurement phase and region

DV	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<b>Concern</b>										
Region 1	5.89	0.93	5.60	1.04	5.78	1.07	5.86	.96	6.13	0.83
Region 2	5.40	1.13	5.32	1.29	5.58	1.08	5.47	1.08	5.87	1.22
Region 3	5.30	1.21	5.48	1.15	5.40	1.13	5.66	1.02	5.95	1.08
Total N	352		377		369		308		329	
<b>Acceptability</b>										
Region 1	4.59	1.18	4.27	1.24	4.24	1.21	3.20	1.34	3.22	1.20
Region 2	4.80	1.10	4.54	1.18	4.31	1.15	3.87	1.31	3.39	1.35
Region 3	4.71	1.20	4.68	1.13	4.39	1.29	3.94	1.25	3.61	1.29
Total N	367		415		392		322		339	

Total N = number of responses across the three regions.

## Appendix C

**Table C1.** Bivariate correlations between personal values.

	Altruistic values	Biospheric values	Egoistic values	Hedonic values
Altruistic Values	—			
Biospheric Values	0.623***	—		
Egoistic Values	0.162***	0.142***	—	
Hedonic Values	0.325***	0.326***	0.403***	—

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**Table C2.** Bivariate correlations between values and concern about earthquakes for each measurement phase.

	Concern about earthquakes phase 1	Concern about earthquakes phase 2	Concern about earthquakes phase 3	Concern about earthquakes phase 4	Concern about earthquakes phase 5
Altruistic Values	0.193***	0.202***	0.130*	0.087	0.134*
Biospheric Values	0.203***	0.175**	0.247***	0.140*	0.112
Egoistic Values	-0.036	0.005	-0.081	-0.123	-0.039
Hedonic Values	0.083	0.049	0.130*	0.063	0.012

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .



**Table C3.** Bivariate correlations between values and acceptability of gas extraction for each measurement phase.

	Acceptability of gas extraction phase 1	Acceptability of gas extraction phase 2	Acceptability of gas extraction phase 3	Acceptability of gas extraction phase 4	Acceptability of gas extraction phase 5
Altruistic Values	-0.032	-0.092	-0.153**	-0.124	-0.070
Biospheric Values	-0.050	-0.097	-0.147*	-0.181*	-0.130*
Egoistic Values	0.127*	0.087	0.124*	0.078	0.111
Hedonic Values	-0.001	-0.086	0.001	-0.041	-0.022

Note. \* p < .05, \*\* p < .01, \*\*\* p < .001.

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