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When others are in control

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DOI:
[10.33612/diss.671882730](https://doi.org/10.33612/diss.671882730)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2023

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):
Vrieling, L. (2023). *When others are in control: understanding public responses to externally controlled energy projects*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen. <https://doi.org/10.33612/diss.671882730>

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When others are in control

When others are in control

Understanding public responses to externally controlled energy projects

Leonie Vrieling

Leonie Vrieling



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t i t u u t





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 groningen

When others are in control

Understanding public responses to externally controlled energy projects

Proefschrift

ter verkrijging van de graad van doctor aan de
Rijksuniversiteit Groningen
op gezag van de
rector magnificus prof. dr. C. Wijmenga
en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op

donderdag 1 juni 2023 om 14.30 uur

door

Leonie Vrieling

geboren op 6 oktober 1992
te Groningen

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Chapter 1. General introduction

Energy is an essential part of people's lives as it is needed for many daily activities, such as washing, cooking, working and leisure activities. Various energy projects have been planned and implemented to provide households with energy, such as natural gas extraction, wind parks, solar parks, and geothermal energy projects. These energy projects may have various negative consequences for people, such as risks of reduced values of houses and quality of life of people living close to energy projects (e.g., due to visual impact, noise, risks of accidents), as well as positive consequences, such as limiting climate change in the case of renewable energy production. As such, energy projects and the associated consequences can elicit various responses from the public, including experiencing negative and positive emotions towards the energy project (Perlaviciute et al., 2018) and finding the project either more or less acceptable (Perlaviciute & Steg, 2014). Furthermore, people can engage in different ways of coping with the risks of energy projects. These public responses can in turn influence the implementation and continuation of energy projects. For example, strong negative emotions and low public acceptability may eventually lead to cancelation of projects, while positive emotions and high public acceptability may increase the chances that projects are implemented and continued (Boyd, 2017; Papazu, 2017; Shaw et al., 2015). Furthermore, the emotional responses towards energy projects and the way people cope with risks can influence people's well-being, as negative emotions could cause stress for instance (Lazarus, 1966). Hence, it is important to study how people respond to energy projects and what factors influence these responses.

In this PhD dissertation, we¹ propose that for understanding public responses to energy projects, it is critical to consider that people often have little control over these projects and their associated consequences, as energy projects are typically controlled by external parties such as governments and industry. This implies that the public needs to rely on external parties that are responsible for implementing and managing the project and their consequences, including mitigating any related risks. Such externally controlled energy projects are different from other risky activities that are within individuals' own control, namely internally controlled risks, such as risks from an unhealthy diet. They are also different from naturally occurring risky events over which nobody has full control, including natural hazards. As such, externally controlled activities and their consequences could evoke different responses in people that may be affected by different factors than those studied in the literature on internally controlled risks and natural hazards. We focus on two key questions in this dissertation: (1) what kind of responses are elicited by (the perceived consequences of) externally controlled energy projects, and (2) which factors play a role in eliciting these responses?

¹ Throughout this dissertation I use 'we' instead of 'I' as the research described in this dissertation is the result of the close collaboration between me and my PhD supervisors: Goda Perlaviciute and Linda Steg.

In this dissertation, we study three types of responses to externally controlled energy projects: emotions, coping intentions and acceptability judgements. We propose that responses towards energy projects over which people have little control depend on the extent to which people believe these projects will have positive and negative consequences, and on the extent to which people trust the responsible parties. We explain our reasoning in more detail below.

1.1. Negative emotions towards the risks of energy projects: The role of perceived risks and trust in responsible parties

Energy projects that pose risks can evoke negative emotions in people (Perlaviciute et al., 2018). To protect people's well-being and to develop energy projects that are socially acceptable, it is important to understand which factors affect the extent to which people experience negative emotions towards the risks of energy projects. According to appraisal theories of emotions, people's cognitive evaluation of a situation determines to what extent people experience different types of emotions (e.g., Lazarus, 1991; Roseman & Smith, 2001; Frijda, 2007; Ortony et al., 1988; Scherer, 1999; Smith & Ellsworth, 1985). Specifically, the transactional model of stress and coping suggests that risky activities elicit different emotional responses depending on two types of cognitive appraisal: primary appraisal and secondary appraisal (Lazarus & Folkman, 1984). Primary appraisal reflects the evaluation of how threatening the situation is for people. In case of risky energy projects, we theorize primary appraisal entails the extent to which people perceive the energy project as risky. The more people believe energy projects cause risks, the stronger negative emotions they may experience towards energy projects.

Secondary appraisal reflects the evaluation of one's ability to control the risks. Yet, people typically have little control over externally controlled energy projects, as these projects are typically implemented and managed by other parties, such as governments and industry. Hence, people who are exposed to the risks of energy projects, for example because they live close to energy production sites, usually can do little to reduce the occurrence and severity of such risks. Rather, they need to rely on responsible parties to mitigate the risks. This implies that in the case of externally controlled risks of energy projects, people's perception of their own ability to control the risks is less relevant for understanding responses towards risky energy projects, because people have little to no control over the risks. We propose that in such cases, the perceived likelihood that responsible parties can and will control and reduce the risks affects the extent to which people experience negative emotions towards energy projects. We therefore theorize that people's trust in responsible parties influences people's negative emotions towards externally controlled energy projects. The less people trust responsible parties, the stronger negative emotions they may experience towards energy projects.

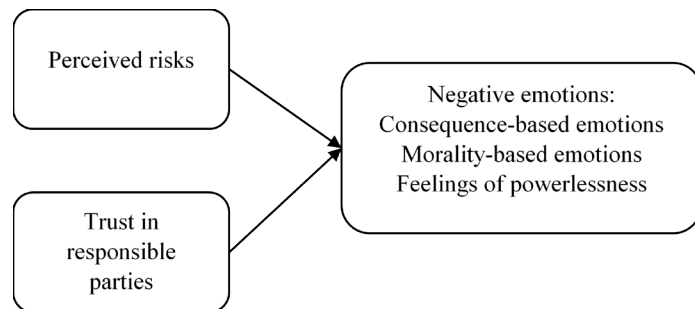
Depending on how much people perceive the projects as risky and how much trust they have in responsible parties, they may experience different types of negative emotions. Specifically, we argue that perceived risks are particularly likely to be associated with consequence-based emotions, because such emotions are focused on the potential negative consequences of the risks (Böhm & Pfister, 2000, 2005, 2017; Hendrickx & Nicolaij, 2004). Examples of consequence-based emotions are feeling fearful, uneasy, and terrible. We expect that the more people think an energy project is associated with risks, the more likely they are to experience consequence-based emotions. Second, we theorise that (lack of) trust in responsible parties is particularly likely to affect the strength of morality-based emotions, because such emotions are focused on whether the risks result from violations of moral values or norms, and thus the perceived morality of the responsible parties (Böhm & Pfister, 2000, 2005, 2017; Hendrickx & Nicolaij, 2004). Morality-based emotions include emotions such as anger, disappointment, and indignation. We expect that the less people trust responsible parties, the more likely they are to experience morality-based emotions. Third, trust in responsible parties may not only be associated with morality-based emotions, but might also be related with people feeling powerless, helpless and hopeless (i.e., feelings of powerlessness), because people have little control over the energy project and the risks themselves and have to rely on responsible parties to manage the risks (cf. Hendrickx & Nicolaij, 2004; Huijts, 2018; Perlaviciute et al., 2017). Whereas feelings of powerlessness have been described as important emotions towards energy projects, as yet, factors influencing such emotions have not been studied (Perlaviciute et al., 2017). We will extend the current literature by examining to what extent perceived risks and trust are related to feelings of powerlessness. We expect that feeling powerless is most strongly related to trust: people are more likely to feel powerless when they have less trust in the responsible parties.

In Chapter 2, we test the relationships between perceived risks of externally controlled energy projects and trust in responsible parties, on the one hand, and consequence-based emotions, morality-based emotions and feelings of powerlessness towards risks of the energy projects, on the other hand (see Figure 1). As a case in point, we study an energy project that has prominent risks over which people have little control, namely gas extraction in the province of Groningen, the Netherlands, which induces earthquakes in the region. The gas extraction and the risks of earthquakes are controlled by external parties, namely the Dutch Petroleum Company NAM and the Dutch government (see Perlaviciute et al., 2017). We test our model with trust in both these responsible parties. To further test the robustness of our findings, we study the predicted relationships (Figure 1) six times over the years between 2013 and 2019. Various critical events took place in the meantime that could have affected the perceived risks, trust in responsible parties and negative emotions. Examples include recurring gasquakes, heated policy and media debates about the gas extraction and its negative consequences, and various

actions taken by the NAM and the Dutch government to mitigate the risks. If we observe the hypothesized relationships at different points in time, despite possible changes in perceived risks, trust in responsible parties and negative emotions, this would provide evidence that the relationships are robust.

Figure 1.

Conceptual model of the relationships between perceived risks of energy projects, trust in responsible parties and negative emotions towards the risks of energy projects



1.2. Coping with risks of externally controlled energy projects

Coping refers to cognitive and behavioural responses aimed at managing or reducing risks (Lazarus & Folkman, 1984). The way people cope with risks can influence their emotional and physical well-being and support for energy projects. As yet, little is known about how people cope with risks from activities that are controlled by external parties, such as externally controlled energy projects. Two types of coping with risks have been distinguished: emotion-focused coping and problem-focused coping (Folkman & Lazarus, 1980, 1985; Folkman et al., 1986; Lazarus & Folkman, 1984). *Emotion-focused coping* entails that people try to prevent or reduce the negative emotions elicited by the risks, while not necessarily preventing or reducing the actual risks. For instance, people could prevent or reduce negative emotions by avoiding thinking or talking about the risks or denying that they are exposed to the risks.

Problem-focused coping implies that people take action to prevent or reduce the risks and/or the related negative consequences. Examples include reducing the behaviour that causes the risks (e.g., stop smoking to prevent health risks) or taking protective action to reduce the negative consequences of the risks (e.g., buy flood insurance).

We propose that another type of coping might be relevant when understanding how people deal with externally controlled risks. Specifically, extending previous theorising, we distinguish two types of problem-focused coping: self-focused coping and others-focused coping. On the one hand, people may take action themselves to reduce the negative consequences of risks caused by externally controlled energy projects, which we refer to as *self-focused*

coping. For example, people could secure heavy objects to walls to reduce damage caused by earthquakes induced by gas extraction or geothermal energy projects, or plan evacuation routes to protect themselves in the case of breaching dams from hydro-energy projects. On the other hand, people could urge responsible parties to act to reduce the risks, which we refer to *others-focused coping*. Examples include protesting or signing a petition to urge responsible parties to stop risky activities. There is some initial evidence that people facing environmental risks engage in actions towards responsible agents, such as punishing and/or harming the agent causing the risks (Böhm & Pfister, 2000, 2005, 2015). We extend this research by studying whether people also are likely to take actions towards responsible others aimed at preventing and/or reducing the risks (i.e., others-focused coping) besides self-focused coping and emotion-focused coping.

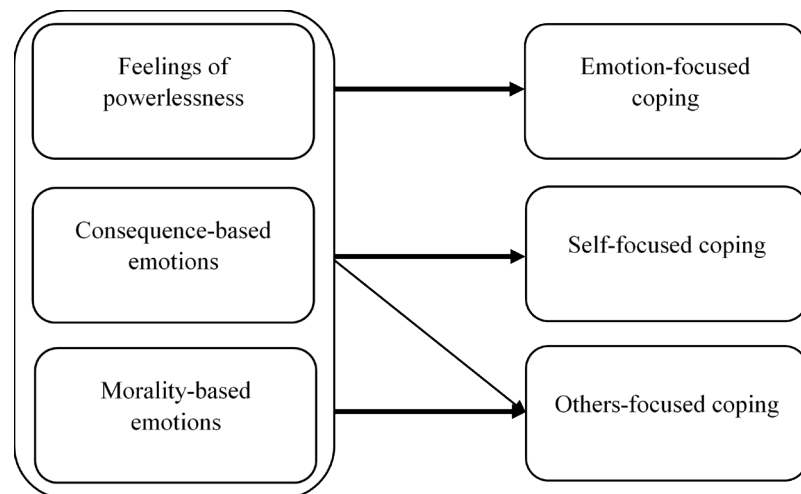
The likelihood that people engage in different coping strategies depends on which emotions are elicited by an energy project (Lerner & Keltner, 2000, 2001; Roseman et al., 1994; Frijda, 1986; Lazarus, 1991; Smith & Lazarus, 1990; Smith & Ellsworth, 1985). Specifically, we argue that people are most likely to engage in emotion-focused coping when they feel powerless towards reducing the risks of energy projects. When people feel powerless, they may think that their situation cannot be changed. They may therefore rather try to reduce their negative emotions, for example by trying not to think about the risks, as they believe they cannot do much to reduce the actual risks (cf. Lazarus & Folkman, 1984). Furthermore, we hypothesize that people are more likely to engage in self-focused coping when they experience negative consequence-based emotions. Consequence-based emotions are mostly elicited when people perceive that energy projects cause high risks, and self-focused coping is orientated towards reducing those risks. Research on internally controlled risks and naturally-occurring risks indeed shows that people are more likely to engage in emotion-focused coping when they feel powerless to deal with the risks (e.g., Barbour et al., 2012; Schmidt et al., 2010), while they are more likely to engage in self-focused coping when they experience stronger consequence-based emotions towards an activity (e.g., Babicky & Seebauer, 2019; Grothmann & Reusswig, 2006; Miceli et al., 2008, Takao et al., 2011; Tannenbaum et al., 2015). We will test whether these emotions are related to coping with externally controlled energy projects in a similar way.

Extending previous research, we will next examine to what extent different emotions are related to the likelihood that people engage in others-focused coping. We argue that people are most likely to engage in others-focused coping when they experience stronger morality-based emotions. This is because people may want to urge responsible parties to reduce the risks and thereby correct the moral violation that had likely evoked the negative morality-based emotions. At the same time, others-focused coping might also stem from negative consequence-based emotions, as engaging in others-focused coping could prevent or reduce the risks that cause adverse consequences.

We therefore expect that the more people experience consequence-based emotions, and especially the more they experience morality-based emotions, the more they are likely to intend to engage in others-focused coping.

In Chapter 3, we will first study whether we can indeed empirically distinguish others-focused coping from other coping strategies, namely self-focused coping and emotion-focused coping. Second, we will examine whether others-focused coping is a relevant coping strategy, by examining how likely people are to intend to engage in others-focused coping when they face the risks from externally controlled energy projects, besides self-focused coping and emotion-focused coping. Third, we will examine to what extent feeling powerless, consequence-based emotions, and morality-based emotions are related to the likelihood that people intend to engage in the three different types of coping (see Figure 2). As a case in point, we again test our reasoning by focusing on the natural gas extraction in the province of Groningen in the Netherlands. We again test the robustness of our findings by testing the predicted relationships at multiple time points. If we observe the hypothesized relationships between negative emotions and coping intentions at different points in time despite possible changes in mean levels of these variables, this would provide evidence that the relationships are rather robust.

Figure 2. The examined relationships between different types of negative emotions towards risks of energy projects and different types of coping with the risks of energy projects.



Note. The thickness of the lines represents the predicted strength of the relationships.

1.3. Negative and positive emotions towards renewable energy projects: The role of perceived consequences and trust in responsible parties

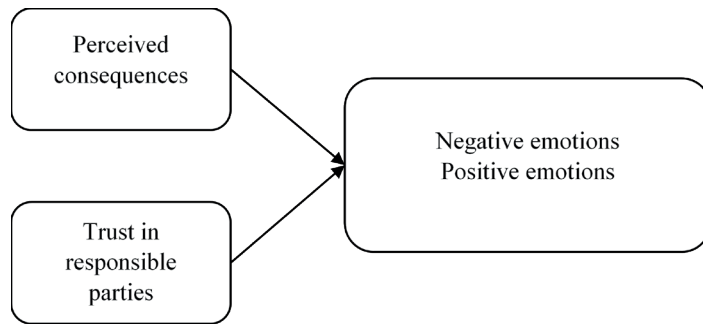
Externally controlled energy projects typically not only cause risks, which may evoke negative emotions in people, but also have positive outcomes, which could elicit positive emotions. For example, energy projects can create employment, provide access to affordable energy, and contribute to limiting climate change (Perlaviciute & Steg, 2015), which can lead to positive emotions such as feelings of joy, excitement and pride (Devine-Wright, 2011; Huijts et al., 2014; Huijts, 2018). Therefore, we examine to what extent perceived consequences (ranging from negative to positive) are related to both negative and positive emotions towards energy projects. The more people believe an energy project has positive (rather than negative) consequences, the more likely they are to experience positive emotions, and the less likely they are to experience negative emotions towards the energy project.

The question is whether, besides perceived positive consequences of energy projects, trust in responsible parties would also be related to positive emotions towards energy projects. On the one hand, energy projects may already elicit positive emotions because of its perceived positive consequences, and people may not consider the extent that they need to rely on responsible parties. This would mean that trust is not uniquely related to positive emotions when the perceived positive consequences are controlled for. On the other hand, people may still find it important that the project is implemented and managed properly, no matter the consequences the project has. In that case, trust would uniquely contribute to the explanation of positive emotions towards energy projects, next to the perceived consequences of energy projects. In that case, trust would have a unique additional effect on positive emotions besides perceived consequences: the more people trust responsible parties, the more they may experience positive emotions, and the less they may experience negative emotions towards energy projects.

In Chapter 4, we will test the extent to which perceived consequences (ranging from negative to positive) and trust in responsible parties are associated with both negative and positive emotions towards externally controlled energy projects. To test our reasoning, we study responses towards two externally controlled energy projects that people may associate with both negative and positive outcomes, namely a local heat network and a local wind park. We study trust in two parties that are mainly responsible for developing and implementing the heat network: the municipality of Groningen, which explores the option of implementing a heat network and decides which utility company will be hired to develop and manage the heat network, and grid company Enexis, which builds the infrastructure for the heat network. In the case of the wind park, we examine trust in the municipality of Groningen, which was the main responsible party for this project at the time of the study.

Figure 3.

The examined relationships between perceived consequences of energy projects, trust in responsible parties and negative and positive emotions towards energy projects.



1.4. The relationship between trust and public acceptability of externally controlled energy projects

We argue that trust is particularly important for understanding responses towards externally controlled energy projects, because people have little control over these projects and need to rely on responsible parties. In Chapter 5, we propose that trust in responsible parties may have more far-reaching effects on responses, namely besides emotions, trust can also be related to public acceptability of energy projects over which the public has little to no control. We define public acceptability as the extent to which people evaluate an energy project (un)favourably (Perlaviciute & Steg, 2015). Low public acceptability has been found to cause delays and even cancellations of energy projects (Boyd, 2017; Papazu, 2017; Shaw et al., 2015). Therefore, it is important to study to what extent and how different factors influence public acceptability of energy projects.

Two dimensions of trust have been identified in the literature as related to public acceptability of energy projects: competence-based trust and integrity-based trust (Braun et al., 2018; Graham et al., 2009; Liu et al., 2020a; Siegrist et al., 2012; Terwel et al., 2009). Competence-based trust reflects the extent to which people trust that responsible parties have the necessary knowledge and skills to implement and manage the project. Integrity-based trust reflects the extent to which people trust that responsible parties are open and honest about how they implement and manage the energy project and take public interests, such as people's safety, into account.

As yet, little is known about which dimension of trust is most strongly related to acceptability of energy projects. In other words, are both dimensions of trust equally important for acceptability of energy projects, or is one dimension of trust more important for acceptability than the other? Such knowledge would reveal what is most important to people when they have to

rely on responsible parties and thus what responsible parties need to focus on mostly when designing energy projects. So far, the understanding of this question is limited, as the effect of the two types of trust on acceptability are studied separately, and therefore the unique effects of each type of trust on acceptability has not been tested. To study the unique effects of both dimensions of trust at the same time is of particular importance, because integrity-based trust and competence-based trust are typically correlated (Siegrist et al., 2003; Yzerbyt et al., 2005). Studying one type of trust at a time does therefore not allow to conclude whether the observed effects are uniquely due to that one type of trust. Hence, the question remains whether and to what extent integrity-based trust and competence-based trust are uniquely related to acceptability of energy projects.

Initial evidence suggests that integrity-based trust might be more strongly related to acceptability than competence-based trust. Specifically, a study on real-life genetically modified field projects suggest that perceived morality of responsible agents is more strongly related to acceptability than perceived performance of responsible agents (Siegrist et al., 2012). This might be because perceived morality reflects an agent's good or bad intentions regarding public interests, which might be particularly important to people when making judgements about acceptability. Indeed, studies on procedural fairness show that the extent to which people think that their interests are taken seriously influences acceptability (Liu, 2020b). In the case of externally controlled energy projects – where people themselves have little or no control over the projects and their outcomes – it might be especially important for people that they can trust responsible parties to implement and manage the project in a way that protects public interests. Perceived performance, on the other hand, reflects whether the agent has sufficient knowledge and skills to manage the project (i.e., competence), which does not necessarily say much about whether public interests will be secured and as such might have less influence on acceptability (cf. De Bruin & Van Lange, 1999, 2000).

Higher importance of an agent's morality compared to its competence is also suggested in social cognition literature, which may reflect evolutionary tendencies. Namely, knowing whether an agent has good or bad intentions regarding harming or protecting you (i.e., integrity) is more important for survival than knowing how competent the agent is to act in line with their good or bad intentions (Fiske et al., 2007). Based on this reasoning and the initial findings, we propose that integrity-based trust is more strongly related to public acceptability of externally controlled energy projects than competence-based trust.

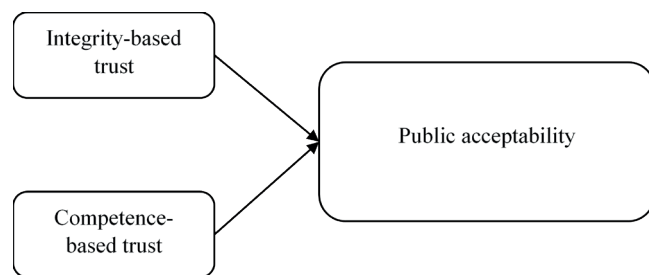
To our best knowledge, only one study so far has examined the relationships between each type of trust and acceptability of energy projects. Specifically, participants reported higher acceptability of a hypothetical wind energy project when they were told that the energy company responsible for the project is honest and open about its activities and considers public

interests (i.e., integrity-based trust) (Liu et al., 2020a). This was irrespective of whether the participants were told that the agent is either very competent or not very competent to implement and manage the project (i.e., competence-based trust). Higher competence-based trust only led to higher project acceptability when integrity-based trust was low, suggesting that integrity-based trust might be more important for acceptability than competence-based trust. However, participants in this study evaluated a hypothetical energy project that is being developed by a hypothetical energy company. Hence, the question remains whether similar results would be found for a real-life energy project, where people are actually exposed to the risks of the energy project. Research suggests that people may evaluate hypothetical and real energy projects differently, because people do not experience real threats from a hypothetical project (Brügger et al., 2015). People tend to evaluate responsible agents more positively and find the project more acceptable when they are hypothetical rather than real (Brügger et al., 2015). It is therefore important to test how important the different types of trust are for acceptability of real-life projects where responsible parties play a critical role in protecting people from the real acute risks.

In Chapter 5, we will test the extent to which integrity-based and competence-based trust are uniquely associated with public acceptability of a real-life energy project (see Figure 4). Again, as a case in point, we will focus on a gas extraction project in the province of Groningen, the Netherlands, to test our reasoning. Again, we test the robustness of our findings by analysing data collected at different measurement phases. If we observe that the relationships between the two dimensions of trust in the responsible agent (i.e., Dutch Petroleum Company; NAM) and public acceptability of natural gas extraction are similar across different points in time despite possible changes in levels of the two types of trust and acceptability, this would provide evidence that the relationships are rather robust.

Figure 4.

The examined relationships between integrity-based trust, competence-based trust and public acceptability of energy projects



Chapter 6 will discuss and summarize the main findings of the studies reported in this PhD dissertation and elaborate on practical and theoretical implications, limitations and directions for future research.



Chapter 2. Afraid, angry or powerless? Effects of perceived risks and trust in responsible parties on emotions towards gasquakes in the Netherlands

Chapter 2 is based on: Vrieling, L., Perlaviciute, G., & Steg, L. (2021). Afraid, angry or powerless? Effects of perceived risks and trust in responsible parties on emotions towards gasquakes in the Netherlands. *Energy Research & Social Science*, 76, 102063.

2.1. Abstract

Energy projects can pose serious risks that can elicit negative emotions in people, threatening their well-being and fueling public resistance. As energy projects are oftentimes controlled by governments and industry, people have to rely on responsible parties for preventing and reducing the risks. We introduced the TEAR model and examined to what extent trust in responsible parties, in addition to perceived risks, is related to people's negative emotions towards energy projects. So far, the effects of risk perceptions and trust on emotions have been studied in isolation, which hinders the understanding of their unique effects on emotions. We tested in a longitudinal field survey to what extent perceived risks and trust in responsible parties relate to different types of negative emotions elicited by gas extraction and induced earthquakes, including consequence-based emotions (e.g., fear), morality-based emotions (e.g., anger) and feelings of powerlessness. The results consistently showed that the higher risks people perceived, the more they experienced all types of negative emotions. Trust in responsible parties was particularly strongly associated with morality-based emotions and feelings of powerlessness. The assumed relationships between the constructs in the TEAR model were generally stable across time, in spite of other ongoing developments, such as recurring earthquakes, increasingly heated public debates about the risks of gas extraction, and some prevention and mitigation measures taken by responsible parties.

Keywords: risk perceptions, trust, emotions, energy projects

2.2. Introduction

Energy projects can pose serious risks to society. For example, nuclear energy can pose health and environmental risks due to radioactive waste and nuclear accidents, and shale gas may cause tremors and water contamination. People often experience strong negative emotions towards the risks of energy projects, which can negatively influence people's well-being (Lazarus, 1966), and can fuel public resistance to the energy projects (Huijts et al., 2014; Peters & Slovic, 1996); Truelove, 2012). Negative emotions, albeit often dismissed by

decision makers as arbitrary and irrational (Perlaviciute et al., 2018), can provide valuable insight into which aspects of energy projects people are particularly concerned. For example, fear might indicate concerns about negative consequences of risks, while anger might reflect concerns about moral issues of risks (Roeser, 2006; Roeser, 2011).

To protect people's well-being and to develop energy projects that are socially acceptable, it is important to understand which factors influence negative emotions towards the risks of energy projects. Building on and extending appraisal theories of emotions (e.g., Frijda, 2007; Lazarus, 1991; Ortony et al., 1988; Roseman, 2001; Scherer, 1999; Smith & Ellsworth, 1985), we propose that negative emotions depend on people's perceptions of the risks of energy projects, as well as their trust in the parties responsible for these projects and the associated risks.

2.2.1. Trust and Emotional Appraisal of Risks (TEAR)

Appraisal theories have been recognized as useful frameworks for understanding negative emotions towards environmental risks (Keller et al., 2012). Appraisal theories of emotions suggest that people's cognitive evaluation of a situation determines whether and which emotions people experience, and how strongly (e.g., Frijda, 2007; Lazarus, 1991; Ortony et al., 1988; Roseman, 2001; Scherer, 1999; Smith & Ellsworth, 1985). Specifically, the transactional model of stress and coping suggests that two types of cognitive appraisal precede negative emotions to environmental stressors: primary appraisal and secondary appraisal (Lazarus & Folkman, 1984). Primary appraisal is the evaluation of how threatening the situation is for people, while secondary appraisal is the evaluation of one's ability to control the situation.

Yet, one's own ability to control the situation may be less relevant in the case of energy projects, where people typically can do little to control the risks. Specifically, people who are exposed to the risks of energy projects, for example because they live close to energy production sites, usually have *no* control over the occurrence and severity of these risks. This is because energy projects are mostly externally controlled by other parties, such as governments and industry, who are responsible for causing and mitigating the risks.

Because energy projects and the associated risks are externally controlled, we argue that people's trust in responsible parties may reflect perceived control over the situation (i.e., secondary appraisal). Specifically, in the case of externally controlled risks, we argue that the extent to which people perceive they can control the risks might have less to do with one's own ability to reduce the risks, but more with the perception of the likelihood that responsible actors will control and reduce the risks. As such, secondary appraisal would reflect a general sense that the risks will be controlled by responsible parties, and trust in those responsible parties might therefore influence people's negative emotions towards the risks. Extending appraisal theories of

emotions (e.g., Frijda, 2007; Lazarus, 1991; Ortony et al., 1988; Roseman, 2001; Scherer, 1999; Smith & Ellsworth, 1985), we introduce the Trust and Emotional Appraisal of Risks (TEAR) model to explain negative emotional responses to risks of externally controlled energy projects. The TEAR model proposes that the higher the perceived risks of energy projects and the lower the trust in responsible parties, the stronger negative emotions people will experience towards the risks of energy projects.

While we expect that both perceived risks and trust are important factors for experiencing negative emotions, their effects may not be independent of each other. Indeed, the transactional model of stress and coping suggests that primary appraisal (perceived risks) and secondary appraisal (which we conceptualise as trust) can interact in shaping emotional responses (Lazarus & Folkman, 1985). On the basis of this, we propose that effects of trust on negative emotions may be contingent on the extent to which people perceive risks. Specifically, trust in parties responsible for mitigating the risks might be less relevant for experiencing negative emotions, especially when people perceive no or very few risks that need to be mitigated in the first place. Therefore, trust may be particularly likely to elicit negative emotions when people perceive high risks. We will test whether this is the case for externally controlled energy projects.

There is some evidence to suggest that both perceived risks and trust in responsible parties are important predictors of negative emotions towards externally controlled risky activities, such as a hydrogen fuel station (Böhm & Pfister, 2017; Huijts, 2018; Huijts et al., 2014; Merk & Pönitzsch, 2007; Mid-den & Huijts, 2009). However, perceived risks and trust were typically studied separately, hence the question remains whether both factors are important unique predictors of negative emotions towards energy projects. This is particularly relevant as some studies suggest that people's trust in responsible parties influences how much risk they perceive (e.g., Siegrist, 2000). This would suggest that trust predicts perceived risks, and eventually emotions. However, this effect was shown for emerging technologies (e.g., carbon dioxide capture and storage), a case in which people may not be familiar with the risks and may use trust as a heuristic to infer risk. Yet, in the case of established energy projects, people are usually familiar with the risks, because they or others have been exposed to the risks already. In such cases, we argue that both perceived risks and trust are likely to be important unique predictors of negative emotions, with perceived risks reflecting primary appraisal of and trust reflecting secondary appraisal of energy projects. Specifically, we will test the TEAR model for an established energy project with well-known risks.

2.2.2. Consequence-based emotions, morality-based emotions and feelings of powerlessness

Appraisal theories of emotions point out that different appraisals can elicit different types of emotions (e.g., Frijda, 2007; Lazarus, 1991; Ortony et al.,

1988; Roseman, 2001; Scherer, 1999; Smith & Ellsworth, 1985). The question remains to what extent the two types of appraisal, in our case perceived risks and trust, are related to different types of negative emotions towards the risks of energy projects. We propose that taking both perceived risks and trust into account can help explain different types of negative emotions towards the risks of energy projects. Environmental risks, including the risks of energy projects, have been found to elicit consequence-based emotions and morality-based emotions (Bohm & Pfister, 2000, 2005, 2017; Hendrix & Nicolaij, 2004). Consequence-based emotions are focused on the potential negative consequences of risks, for example feeling fearful, uneasy, and terrible. Morality-based emotions are focused on whether the risks result from violations of moral values or norms, and thus the morality of the responsible parties. Morality-based emotions include emotions such as anger, disappointment, and indignation. While these types of emotions have been distinguished, the relative importance of perceived risks and trust in eliciting these different types of emotions has not been systematically tested yet. We propose that perceived risks will be particularly strongly related to consequence based emotions, because such emotions are focused on the negative consequences of the risks: the higher people's perceived risks, the more they experience consequence-based emotions. We further propose that trust in responsible parties will be most strongly related to morality based emotions, because such emotions are focused on the perceived morality of responsible parties. Hence, we hypothesise that people are particularly more likely to experience morality based emotions when they have less trust in the responsible parties.

Trust in responsible parties may not only be related to morality-based emotions, but can also affect the likelihood that people feel powerlessness, helpless and hopeless (i.e., feelings of powerlessness), because people have little control over the energy project and the risks themselves and have to rely on responsible parties to manage the risks (cf. Hendrickx & Nicolaij, 2004; Huijts, 2018; Perlaviciute et al., 2017). Whereas feelings of powerlessness have been described as important emotions towards the risks of energy projects, as yet, factors influencing such emotions have not been studied (Perlaviciute et al., 2017). We will extend the current literature by examining to what extent perceived risks and trust are related to feelings of powerlessness. We expect that feeling powerless is most strongly related to trust: people are more likely to feel more powerless when they have less trust in the responsible parties.

2.2.3. Current study

As a case in point, we study negative emotions towards the earthquakes induced by gas extraction (henceforth: gasquakes) in the province of Groningen, the Netherlands. Gas extraction causes recurring gasquakes; the strongest gasquake so far was 3.6 on the Richter scale, namely the Huizinge gasquake in August 2012. Inhabitants of the province of Groningen face various risks caused by these gasquakes, such as damage to houses and a decline in housing values, physical injury, and reduced quality of living. The Dutch Petrole-

um Company (NAM) and the Dutch government are responsible for the gas extraction and the risks of the gasquakes. Notably, the NAM operates the gas extraction and the Dutch government decides how much gas is being extracted (see also Perlaviciute et al., 2017). The NAM and the Dutch government are also responsible for mitigating the risks, including financing the reinforcement and repairing of houses that were or may have been damaged by the gasquakes. Research suggests that people experience different types of negative emotions towards the gasquakes, such as fear (a consequence-based emotion), anger (a morality-based emotion) and powerlessness (Perlaviciute et al., 2017). We will test the TEAR model in this context, namely the extent to which these different negative emotions can be explained by the perceived risks of gasquakes, on the one hand, and people's trust in the NAM and the Dutch government, on the other hand.

We conducted a longitudinal questionnaire study on the public's opinion about gas extraction and the subsequent gasquakes in the province of Groningen in the period of November 2013 – May 2019, in six measurement phases. The longitudinal design gives a unique opportunity to test the TEAR model over time. Various critical events took place in the meantime that could have affected the perceived risks, trust in responsible parties and negative emotions. Examples include recurring gasquakes, heated policy and media debates about the gas extraction and its negative consequences, and various actions taken by the NAM and the Dutch government to mitigate the risks (see Table 1 for a timeline and a description of critical events). We will test whether the relationships between key variables in the TEAR model are robust and remain despite possible changes in the levels of perceived risks, trust and negative emotions over time.

2.3. Method

2.3.1. Respondents and procedure

Trained research assistants approached people at their homes in different regions in the province of Groningen which vary in exposure to the gasquakes, asking them to participate in the study by filling in a questionnaire (see Perlaviciute et al., 2017 for detailed information about the procedure of the study). Across the six phases, 1151 participants answered the questions relevant for the aims of this study. Some respondents were follow-up participants from previous phase(s), while we also recruited new participants in all phases to keep the sample sizes comparable (see Table 1 for the sample size per phase). The sample is representative of the general population in the province of Groningen (see Appendix for demographic characteristics).

Table 1.

Timeline of the six study phases, number of participants and description of critical events

16 August 2012	The strongest gasquake took place in Huizinge (3.6 on Richter scale).
November - December 2013	Phase 1 ($N = 390$) The Dutch government implemented several measures to mitigate the risks of gasquakes, including reduction of gas extraction in the most affected region, reinforcing houses, and compensating owners for drop in house values.
June - July 2014	Phase 2 ($N = 429$; follow-up: 174, new: 255) The Dutch government decided to compensate inhabitants for the damage to their houses. Inhabitants could receive a maximum of €4000 to invest in energy saving measures and/or installing sustainable energy production technologies to increase the value of their house.
December 2014	Phase 3 ($N = 413$; follow-up: 254, new: 159) The Dutch government decided that inhabitants no longer have to prove when claiming damages to their houses that the damages were caused by gasquakes. Damages are considered to be caused by gasquakes unless the NAM proves otherwise. An extensive debate took place between the Dutch government and the local governments regarding how much gas to extract in the coming years. Local governments wanted to reduce gas extraction more than the Dutch government. Local governments appealed to the Council of State who decided that the Dutch government had to reduce gas extraction more.
December 2016	Phase 4 ($N = 329$; follow-up: 200, new: 129) More than 10.000 people in Groningen protested to urge responsible parties to stop the gas extraction. Another extensive debate took place between the Dutch government and the local governments regarding how much gas to extract. A second appeal by local governments to further reduce gas extraction took place, again granted by the Council of State.

8 January 2018

February - March 2018

February - May 2019

The second strongest gasquake took place in Zeerijp (3.4 on the Richter scale).

Phase 5 ($N = 349$; follow-up: 219, new: 130)
A new organisation was founded for handling damage claims that is fully independent from the NAM and the Dutch government.
The Dutch government decided to stop the gas extraction by 2030.

Phase 6 ($N = 352$; follow-up: 264, new: 88)

2.3.2. Measures

The means, standard deviations, and reliability of the relevant measures are given in Table 2.

2.3.2.1. Perceived risks of gasquakes

In all phases, respondents reported to what extent they think it is likely that the gasquakes pose various risks for them, including damage to houses, decline in housing values, physical injury, and reduced quality of living, on a 7-point scale from 1 *very unlikely* to 7 *very likely*. We computed mean scores for these items for each measurement phase; higher scores represent higher perceived risks.

2.3.2.2. Trust in responsible parties

Respondents indicated to what extent they agreed with the statement: 'When it comes to gas extraction in the province of Groningen, I can trust the NAM' (phase 1) and 'When it comes to the earthquakes induced by the gas extraction in the province of Groningen, I can trust the NAM' (phases 2-6) on a 7-point scale from 1 *totally disagree* to 7 *totally agree*. In all phases, respondents indicated to what extent they agreed with the statement: 'When it comes to earthquakes induced by the gas extraction in the province of Groningen, I can trust the Dutch government' on a 7-point scale from 1 *totally disagree* to 7 *totally agree*.

2.3.2.3. Negative emotions

In all phases, respondents reported to what extent they experience different negative emotions when thinking about the earthquakes induced by gas extraction in the province of Groningen, on a 7-point scale from 1 *not at all* to 7 *very strongly*, with 4 *moderately* as the midpoint. In all phases, three items reflected consequence-based emotions: fearful, uneasy, and terrible. In phases 1, 2, and 3, two items reflected morality-based emotions: angry and disappointed; we added an additional item in phases 4, 5 and 6: indignant. To measure feelings of powerlessness, in phases 1, 2 and 3, we included one item: feeling powerless, and in phases 4, 5 and 6 we added two items: hopeless and helpless. We computed mean scores for each type of negative emotions in each measurement phase; higher scores represent stronger negative emotions.

Table 2.

Means, standard deviations and Cronbach's alphas for perceived risks of gasquakes, trust in the NAM and the Dutch government, and different types of negative emotions towards the gasquakes

	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Phase 6	
	<i>M</i> (<i>SD</i>)	α	<i>M</i> (<i>SD</i>)	α	<i>M</i> (<i>SD</i>)	α	<i>M</i> (<i>SD</i>)	<i>A</i>	<i>M</i> (<i>SD</i>)	α	<i>M</i> (<i>SD</i>)	α
Perceived risks	4.72 (1.65)	.89	4.70 (1.54)	.87	5.11 (1.26)	.82	4.59 (1.50)	.87	4.95 (1.52)	.88	5.00 (1.45)	.87
Trust NAM	3.70 (1.54)		3.03 (1.41)		2.92 (1.43)		2.30 (1.32)		1.96 (1.34)		1.87 (1.32)	
Trust Dutch government	3.07 (1.50)		2.76 (1.43)		2.64 (1.37)		2.69 (1.26)		2.72 (1.50)		2.09 (1.32)	
Negative Emotions:												
Consequence-based	3.41 (1.66)	.85	3.44 (1.64)	.85	3.68 (1.57)	.84	3.49 (1.63)	.87	3.98 (1.60)	.82	3.86 (1.75)	.82
Morality-based	3.99 (1.84)	.83	4.08 (1.80)	.83	4.59 (1.72)	.82	4.74 (1.68)	.88	5.26 (1.47)	.85	5.36 (1.54)	.85
Feelings of powerlessness	5.02 (1.97)		4.91 (2.07)		5.38 (1.80)		4.07 (1.74)	.87	4.65 (1.70)	.88	4.77 (1.76)	.88

Table 3.

Results of Multiple Group Method for different types of negative emotions

	Phase 1		Phase 2		Phase 3		Phase 4			Phase 5			Phase 6		
	C	M	C	M	C	M	C	M	P	C	M	P	C	M	P
<i>Consequence-based emotions (C)</i>															
Fearful	.63	.52	.64	.55	.63	.50	.67	.50	.62	.59	.41	.53	.65	.45	.54
Uneasy	.67	.55	.65	.57	.65	.57	.69	.53	.65	.59	.48	.59	.65	.53	.60
Terrible	.68	.57	.65	.62	.62	.50	.70	.56	.72	.62	.55	.68	.66	.54	.65
<i>Morality-based emotions (M)</i>															
Angry	.58	.71	.58	.72	.56	.70	.59	.72	.62	.54	.71	.59	.57	.70	.62
Disappointed	.51	.71	.58	.72	.49	.70	.49	.72	.58	.44	.64	.50	.48	.67	.54
Indignant							.51	.72	.61	.45	.66	.54	.47	.66	.55
<i>Feelings of powerlessness (P)</i>															
Powerless							.56	.66	.66	.54	.59	.66	.54	.65	.66
Hopeless							.71	.59	.72	.65	.55	.76	.64	.55	.73
Helpless							.71	.57	.72	.62	.49	.74	.61	.52	.71

Note. Highest correlations for each emotion item are printed in bold. We did not conduct MGM analyses in phases 1, 2, and 3 for feelings of powerlessness as we only have one item to measure feelings of powerlessness in those phases.

We examined whether these three types of negative emotions can be distinguished empirically via the multiple group method (MGM) (Stuive et al., 2009), which is a type of confirmatory factor analysis that examines whether the grouping of the items in the three scales is in line with the theoretically pre-defined constructs. In the MGM, we first defined the factors (i.e., emotion types) based on theory (Nunally, 1978). For this purpose, we first computed mean scores for each emotion type. Next, correlations between the emotion items and the three emotion types were inspected, while correcting for self-correlation (i.e., items strongly correlate with the factor which they are part of). It is assumed that the factor structure (i.e., the grouping of emotion items in three emotion types) is supported when items correlate strongest with the factor they are assigned to on the basis of theory (see Nunally, 1978). The results supported the distinction between consequence-based emotions, morality-based emotions, and feelings of powerlessness, as each emotion correlated most strongly with its respective scale (Table 3). Only feeling terrible correlated slightly stronger with feelings of powerlessness than with consequence-based emotions in phases 4 and 5. Yet, the differences in correlations were small and may be incidental; we therefore consistently included feeling terrible in the scale of consequence-based emotions.

2.3.3. Data analysis

We used multilevel modelling for repeated measures (Snijders & Bosker, 2011) to assess the relationships between perceived risks, trust in responsible parties and different types of negative emotions while accounting for possible differences across measurement phases. Multilevel modelling allows us to include all participants across the phases of our longitudinal study in the model, as it treats each measurement as a different observation of the same variable and omits missing measurements from the analysis assuming they are missing at random (see Maas & Snijders, 2003). We used MLwiN (Version 3.05) (Charlton et al., 2020) to build two-level models for each type of negative emotions where the measurement phases (level 1) were nested within individuals (level 2). Measurement phase was added as an uncentered predictor, whereas perceived risks and trust in responsible parties, and their interaction, were added using grand mean centering. To test possible changes in the relationships in the TEAR model over time, we added interaction effects for measurement phase and perceived risks, as well as measurement phase and trust in responsible parties. Effects were tested with approximate t-tests, applying a significance level of $\alpha = .05$. We conducted the analyses separately with trust in the NAM or trust in Dutch government in the model, in order to see whether the results are similar for both responsible parties.

2.4. Results

2.4.1. Bivariate correlations between perceived risks, trust in responsible parties, and negative emotions

Table 4 depicts bivariate correlations between perceived risks, trust in responsible parties, and the three types of negative emotions for each phase. In

all phases, higher perceived risks and lower trust in responsible parties were associated with stronger negative emotions.

Table 4.

Bivariate correlations between perceived risks, trust in responsible parties, and the three types of negative emotions

		<i>Trust NAM</i>	<i>Trust govern- ment</i>	<i>Consequence- based emotions</i>	<i>Morality- based emotions</i>	<i>Feelings of powerless- ness</i>
Phase 1	Perceived risks	-.28	-.22	.62	.58	.56
	Trust NAM		.44	-.21	-.34	-.28
	Trust government			-.19	-.30	-.31
	Consequence-based emotions				.68	.63
	Morality-based emotions					.59
Phase 2	Perceived risks	-.26	-.21	.62	.55	.44
	Trust NAM		.60	-.22	-.40	-.25
	Trust government			-.22	-.31	-.25
	Consequence-based emotions				.71	.61
	Morality-based emotions					.61
Phase 3	Perceived risks	-.33	-.23	.57	.50	.42
	Trust NAM		.63	-.28	-.50	-.27
	Trust government			-.22	-.35	-.25
	Consequence-based emotions				.65	.59
	Morality-based emotions					.55
Phase 4	Perceived risks	-.27	.24	.62	.50	.58
	Trust NAM		.55	-.30	-.42	-.33
	Trust government			-.27	-.33	-.30
	Consequence-based emotions				.66	.82
	Morality-based emotions					.74

Phase 5	Perceived risks	-.25	-.22	.56	.48	.53
	Trust NAM		.37	-.20	-.36	-.21
	Trust government			-.19	-.25	-.18
	Consequence-based emotions				.64	.78
	Morality-based emotions					.67
Phase 6	Perceived risks	-.16	-.14	.55	.39	.41
	Trust NAM		.46	-.19	-.32	-.23
	Trust government			-.18	-.32	-.27
	Consequence-based emotions				.61	.73
	Morality-based emotions					.73

Note. All correlations in the table are significant at $p < .001$

2.4.2. Explaining negative emotions towards the gasquakes

Results of the multilevel models, including perceived risks of gasquakes and trust in the NAM (Model 1) or the Dutch government (Model 2) for consequence-based emotions, morality-based emotions and feelings of powerlessness, are reported in Table 5, 6 and 7 respectively. Measurement phase had a significant positive effect on consequence-based emotions and morality-based emotions in both Model 1 and 2. Namely, consequence-based and morality-based emotions increased over time. Feelings of powerlessness, on the other hand, decreased over time in both Model 1 and 2. Yet, this might be (partly) due to adding new items 'hopeless' and 'helpless' to the feelings of powerlessness scale from phase 4 onwards. Indeed, when only the first item 'feeling powerless' was included in Model 2, measurement phase had a significant and positive effect on feelings of powerlessness. In Model 1, the effect of measurement phase on feelings of powerlessness was not significant².

2.4.2.1 Consequence-based emotions

As expected, higher perceived risks of gasquakes were significantly associated with stronger consequence-based emotions in both Model 1 and 2 (see Table 5). Trust was not significantly associated with consequence-based emotions in both Model 1 and 2. The interaction effects of perceived risks and trust,

² By adding 'hopeless' and 'helpless' to the feelings of powerlessness scale the mean of this scale decreased from 5.14 to 4.07 in phase 4, from 5.50 to 4.65 in phase 5, and from 5.63 to 4.77 in phase 6. Complete results of the multilevel analyses of phases 4, 5 and 6 with only the first item of feeling powerless included, can be obtained from the first author.

measurement phase and perceived risks, and measurement phase and trust were not significant in Model 1 nor in Model 2.

2.4.2.2. Morality-based emotions

Table 6 shows that, as expected, higher perceived risks and lower trust were significantly associated with stronger morality-based emotions in both Model 1 and 2. Interestingly, the interaction effect of measurement phase and perceived risks was negative and significant in both Model 1 and 2, meaning that the effect of perceived risks on morality-based emotions decreased over time. The interaction effects of perceived risks and trust, and of measurement phase and trust were not significant in Model 1 nor in Model 2.

2.4.2.3. Feelings of powerlessness

Table 7 shows that, as expected, higher perceived risks and lower trust were significantly associated with stronger feelings of powerlessness in both Model 1 and 2. The interaction effects of perceived risks and trust, measurement phase and risks, and measurement phase and trust were not significant in Model 1 nor in Model 2.

Table 5.

Results of multilevel regression models testing the relationships between perceived risks, trust in responsible parties and consequence-based emotions across time

	Model 1 (NAM)				Model 2 (Dutch government)			
	Est.	SE	p	95% CI	Est.	SE	p	95% CI
<i>Fixed effects</i>								
Intercept	3.50	.06	<.001	[3.39,3.61]	3.47	.05	<.001	[3.37;3.58]
Phase	.04	.02	.03	[<.01,.07]	.06	.02	<.001	[.03,.09]
Risks	.55	.03	<.001	[.48,.62]	.54	.03	<.001	[.47,.60]
Trust	-.04	.03	.23	[-.10,.03]	-.06	.03	.06	[-.12,<.01]
Risks x trust	-.01	.01	.40	[-.04,.02]	<.01	.01	.88	[-.02,.03]
Phase x risks	-.01	.01	.32	[-.03,.01]	-.01	.01	.62	[-.02,.02]
Phase x trust	-.02	.01	.05	[-.04,.00]	<-.01	.01	.69	[-.03;.02]
<i>Random effects</i>								
Level-2 variance τ_0^2	.94	.07			.95	.07		
Level-1 variance σ^2	.91	.04			.90	.04		
R ²	31.73%				32.13%			
Deviance	7143.11				7110.69			

Note. Est. = Estimate. Phase was coded 0 = 1st phase, ascending.

Table 6.

Results of multilevel regression models testing the relationships between perceived risks, trust in responsible parties and morality-based emotions across time

	Model 1 (NAM)				Model 2 (Dutch government)			
	Est.	SE	p	95% CI	Est.	SE	p	95% CI
<i>Fixed effects</i>								
Intercept	4.18	.06	<.001	[4.06,4.30]	4.03	.06	<.001	[3.92,4.41]
Phase	.17	.02	<.001	[.13,.20]	.24	.02	<.001	[.20,.27]
Risks	.52	.04	<.001	[.45,.60]	.54	.03	<.001	[.48,.61]
Trust	-.23	.03	<.001	[-.29,-.16]	-.20	.04	<.001	[-.27,-.13]
Risks x trust	.01	.01	.36	[-.01,.04]	.01	.01	.36	[-.01,.04]
Phase x risks	-.04	.01	<.01	[-.06,-.02]	-.04	.01	<.001	[-.06,-.02]
Phase x trust	-.01	.01	.28	[-.03,.01]	.01	.01	.52	[-.02,.03]
<i>Random effects</i>								
Level-2 variance τ_0^2	.95	.07		1.05	.08			
Level-1 variance σ^2	1.07	.05		1.04	.04			
R ²	37.42%				35.09%			
Deviance	7380.54				6230.98			

Note. Est. = Estimate. Phase was coded 0 = 1st phase, ascending.

Table 7.

Results of multilevel regression models testing the relationships between perceived risks, trust in responsible parties and feelings of powerlessness across time

	Model 1 (NAM)				Model 2 (Dutch government)			
	Est.	SE	p	95% CI	Est.	SE	p	95% CI
<i>Fixed effects</i>								
Intercept	5.18	.07	<.001	[5.04,5.32]	5.13	.06	<.001	[5.00,5.26]
Phase	-.17	.02	<.001	[-.21,-.13]	-.15	.02	<.001	[-.19,-.11]
Risks	.55	.04	<.001	[.46,.64]	.54	.04	<.001	[.46,.62]
Trust	-.11	.04	<.001	[-.19,-.04]	-.20	.04	<.001	[-.28,-.12]
Risks x trust	.02	.02	.35	[-.02,.05]	.02	.02	.15	[-.01,.06]
Phase x risks	-.01	.01	.67	[-.02,.02]	<-.01	.01	.69	[-.03,.02]
Phase x trust	-.01	.01	.49	[-.03,.01]	.01	.01	.70	[-.02,.03]
<i>Random effects</i>								
Level-2 variance τ_0^2	1.10	.10			1.07	.09		
Level-1 variance σ^2	1.66	.07			1.64	.07		
R ²	25.49%				26.92%			
Deviance	8155.64				8155.09			

Note. Est. = Estimate. Phase was coded 0 = 1st phase, ascending.

2.5. Discussion

To protect people's well-being and to develop socially acceptable energy projects, it is important to understand which factors influence people's negative emotions towards the risks of energy projects. Building on appraisal theories of emotions (e.g., Frijda, 2007; Lazarus, 1991; Ortony et al., 1988; Roseman, 2001; Scherer, 1999; Smith & Ellsworth, 1985), we developed and tested the TEAR model that proposes that perceived risks (reflecting primary appraisal) and trust in responsible parties (reflecting secondary appraisal) influence negative emotions towards the risks of externally controlled energy projects. We hypothesised that higher perceived risks are associated with stronger negative emotions, in particular consequence-based emotions. Next, because people themselves have little to no control over energy projects and the associated risks, we argued that lower trust in responsible parties is associated with stronger negative emotions, in particular morality-based emotions and feelings of powerlessness. We additionally tested whether trust is more likely to influence negative emotions when the perceived risks are high. We used the unique opportunity to test the robustness of the relationships in the TEAR model in a longitudinal study on public responses to reoccurring gasquakes in the province of Groningen, the Netherlands.

In line with the TEAR model and previous studies (Böhm & Pfister, 2017), higher perceived risks were related to stronger consequence-based emotions. Interestingly, and extending previous work, we found that higher perceived risks were also related to stronger morality-based emotions and feelings of powerlessness. Perceived risks are therefore a key predictor of a wide scope of negative emotions towards the risks of externally controlled energy projects. It is important to note that our participants perceived rather high risks from gasquakes. Hence, it could be that perceived risks predict all kinds of negative emotions in case of such controversial and risky energy projects. Future studies could test whether perceived risks are more predictive of consequences-based emotions, rather than morality-based emotions and powerlessness, when people perceive relatively low risks (e.g., in the case of wind energy projects).

In line with the TEAR model, higher trust in responsible parties was associated with stronger morality-based emotions and feelings of powerlessness. This supports our reasoning that trust in responsible parties is an important predictor of negative emotions when people themselves have little control over energy projects and the risks. Yet, trust was not significantly related to consequence-based emotions, which were solely driven by the (high) perceived risks. This suggests that higher trust may particularly reduce morality-based emotions and feelings of powerlessness. This is an important finding, because morality-based emotions and feelings of powerlessness could motivate people to take action (e.g., protest), eventually forcing responsible parties to mitigate the risks. Future studies are needed to test this possibility.

Interestingly, there were no interaction effects of perceived risks and trust in responsible parties, suggesting that they both have important – and independent – effects on negative emotions towards the risks of energy projects. Again, this could be because the risks in this study were already perceived as rather high, making people more likely to consider the role of responsible parties in preventing and mitigating these risks. Future studies could test whether perceived risks and trust do interact to influence negative emotions when most people do not perceive relatively high risks.

Overall, our findings support the TEAR model we introduced. We show that, in contrast to emerging technologies where trust in responsible parties seems to influence perceived risks (e.g., Siegrist, 2000), for established energy projects perceived risks and trust in responsible parties are not strongly related to each other and both seem to be important unique predictors of negative emotions. This suggests that, in cases of established energy projects where people are familiar with risks, people may not infer risks from trust in responsible parties, but rather that both perceived risks and trust independently affect negative emotions. This is in line with appraisal theories of emotions (e.g., Frijda, 2007; Lazarus, 1991; Ortony et al., 1988; Roseman, 2001; Scherer, 1999; Smith & Ellsworth, 1985), which state that negative emotions follow from people's primary appraisal (perceived risks) and secondary appraisal (which we conceptualise as trust) (Lazarus & Folkman, 1984).

Furthermore, we found that the TEAR model is robust, even though perceived risks, trust and negative emotions might have changed over time due to critical events. Indeed, we found that negative emotions fluctuated over time; specifically consequence- and morality-based emotions increased over time. Interestingly, we did find that the relationship between perceived risks and morality-based emotions slightly weakened over time. An explanation could be that, as the public debate remained heavily focused on the responsible parties over time, it was slightly less focused on the extent to which the risks as such are threatening for people. Hence, perceived risks may have become a slightly less important predictor of morality-based emotions over time. Future studies are needed to test this. Future research could also test whether our TEAR model can explain negative emotions towards other externally controlled energy projects, such as nuclear energy, geothermal energy, shale gas and wind power.

Our findings have important implications for policy aimed at reducing negative emotions towards the risks of externally controlled energy projects. Given that perceived risks were consistently and strongly related to all types of negative emotions, one obvious strategy is to reduce the (perceived) risks of energy projects as much as possible. For example, the (perceived) risks of physical injury due to gasquakes could be reduced by reinforcing houses and making them earthquake-proof, while the (perceived) risks of decreasing housing values could be reduced by offering financial compensation. Yet,

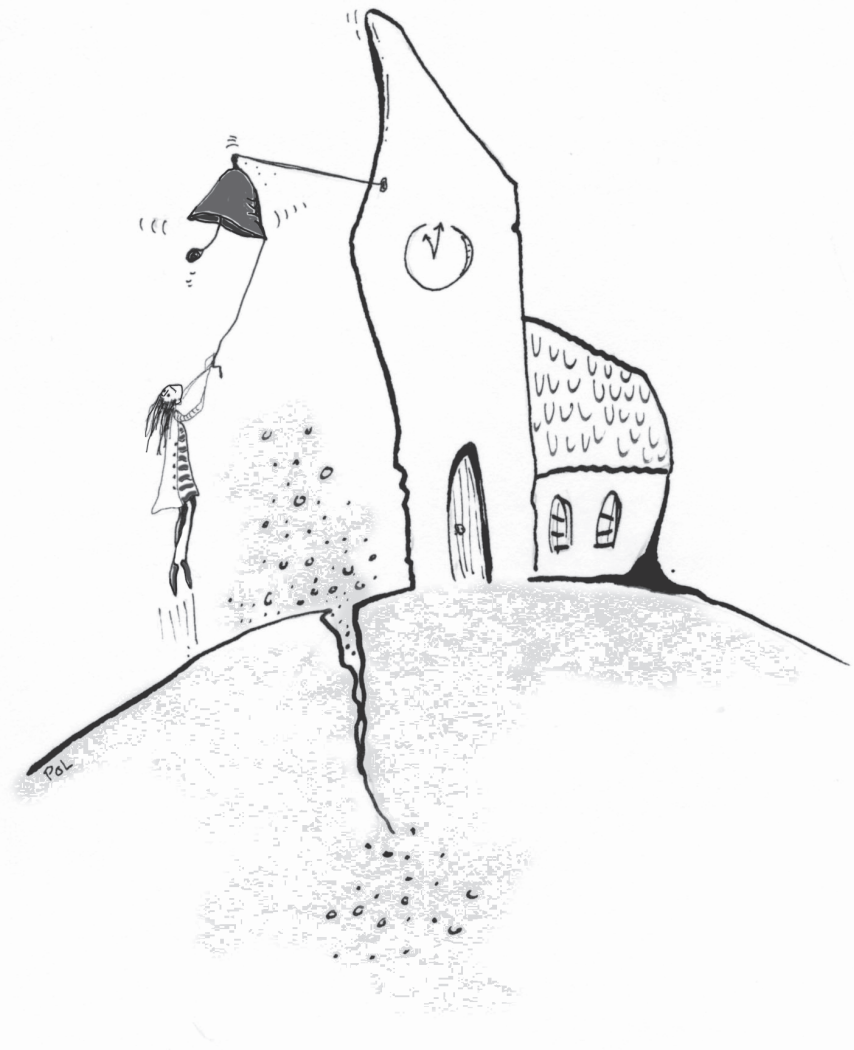
many energy projects are likely to bring certain risks. This implies that it is also important to address other factors that explain negative emotions, particularly trust in responsible parties. For example, responsible parties could try to enhance trust by showing that they are moral in their decision-making and procedures regarding risk mitigation to the public. If responsible parties manage to demonstrate that they are trustworthy regarding risk mitigation, this could reduce the public's negative emotions and thereby ensure people's well-being, even though some risks would remain. Increasing trust and reducing morality-based emotions and feelings of powerlessness might be critical for responsible parties to have a social license to operate, because such emotions can particularly lead to resistance.

Due to the correlational design of our study, we cannot draw firm conclusions about the causal relationship between perceived risks, trust and negative emotions towards the risks of energy projects. It cannot be ruled out that causality might go in another direction, for example that negative emotions may influence perceived risks (Finucane et al., 2000; Merk & Pönitzsch, 2017; Midden & Huijts, 2009; Montijn-Dorgelo & Midden, 2008; Loewenstein, 2001; Slovic et al., 2007). Given such prevalent high risks in this study, we expect that perceived risks are an important reason for people to experience negative emotions and not the other way around. Yet, the way people cope with these risks could eventually change risk perceptions. For example, when people experience negative emotions due to high risks and they feel that nothing can be done about the risks, they can reappraise the situation as less risky as a way to cope with the risks and the elicited negative emotions (i.e., emotion-focused coping) (Lazarus, 1984). This could suggest that there are feedback loops in the TEAR model, namely that perceived risks influence emotions, and emotions in turn can influence perceived risks. Future studies could take the above mentioned potential feedback loops into account by controlling for any coping strategies that people have already engaged in when assessing the relationship between perceived risks and emotions (Bubeck et al., 2012). Furthermore, experimental studies could be conducted to systematically test the causal relationships in the TEAR model. For example, it could be tested whether emotions differ across hypothetical scenarios in which perceived risks and trust are systematically varied. Alternatively, causal relationships in the TEAR could be tested in quasi field experiments in which groups that are exposed to risks are compared to groups that have not been exposed to risks (yet). Moreover, longitudinal studies could be conducted in which the TEAR model is tested before and after being exposed to risks to better understand the causal relationships in the model.

Furthermore, future research could examine the role of trust in more detail. Two dimensions of trust have been distinguished, namely integrity-based trust (i.e., trust in good intentions, honesty and transparency of responsible agents) and competence-based trust (i.e., trust in knowledge and expertise of responsible agents) (e.g., Liu et al., 2020a). For example, we would expect that integrity-based trust is particularly important for morality-based emotions, as integrity-based trust relates to the perceived morality of responsible

parties, namely their good or bad intentions, and whether they take public interests into account.

In conclusion, we found support for the TEAR model, namely that perceived risks and trust in responsible parties are important factors influencing negative emotions towards the risks of externally controlled energy projects. While perceived (high) risks can elicit a wide scope of emotions, including consequence-based emotions, morality-based emotions and feelings of powerlessness, trust seems to be particularly important for morality-based emotions and feelings of powerlessness. These relationships were robust and remained present over time.



2.6. Appendix

Table 1.
Socio-demographic characteristics of the participants in all phases

		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Gender	Female	43%	46%	43%	44%	44%	49%
	Male	54%	52%	56%	55%	55%	50%
	Missing	2%	2%	1%	1%	1%	1%
Age (in years)	<i>M (SD)</i>	52.15 (14.91)	52.66 (14.59)	54.81 (13.71)	55.93 (14.13)	57.65 (13.79)	57.69 (13.65)
	Minimum	19	18	20	18	21	22
	Maximum	90	84	84	91	92	93
	Missing values	12	10	6	2	8	2
Highest completed education	Primary school	2%	1%	0%	5%	1%	2%
	Lower vocational education	9%	12%	10%	8%	8%	6%
education	Secondary (vocational) education	36%	40%	51%	33%	37%	45%
	Higher (vocational) education	36%	33%	27%	41%	42%	38%
	Scientific education (university)	12%	10%	4%	10%	10%	6%
Income per month	Other	2%	1%	6%	0%	1%	2%
	Missing values	3%	4%	2%	3%	1%	2%
	< €1000	4%	4%	5%	7%	2%	3%
	€1000-€2000	25%	30%	29%	23%	17%	20%
	€2000-€3000	28%	30%	28%	25%	33%	36%
	€3000-€4000	20%	15%	21%	30%	25%	28%
	€4000-€5000	8%	5%	6%	5%	10%	6%
>€5000	4%	2%	1%	5%	5%	3%	
Length of residence (in years)	Missing values	11%	13%	11%	7%	8%	17%
	<i>M (SD)</i>	30.52 (19.68)	31.32 (18.97)	36.51 (13.71)	32.25 (19.54)	35.02 (19.31)	28.92 (16.41)
	Minimum	.50	1	1	1	.50	1
	Maximum	83.00	83.00	80	83	84	71
	Missing values	8	7	2	1	3	0

Note. Gender and age were asked to all participants in all phases. Education, income and length of residence were only asked to new participants in phases 2, 3, 4 and 6.

Chapter 3. When others control risks: Others-focused coping with risks from energy projects.

This chapter is based on: Vrieling, L., Perlaviciute, G. & Steg, L. (2023). When others control risks: others-focused coping with risks from energy projects. *Risk Analysis*.

3.1. Abstract

Energy projects can cause various risks over which people have little control, because they are usually developed, implemented, and managed by external parties, such as governments and industry. This study aims to examine how people cope with such externally controlled risks from energy projects, in particular earthquakes induced by gas extraction in their region. Specifically, we studied which factors influence people's intentions to engage in emotion-focused coping aimed at reducing negative emotions, and problem-focused coping aimed at reducing the risks and/or their negative consequences. Extending previous studies, we distinguish two types of problem-focused coping that may be relevant when facing externally controlled risks, namely self-focused coping, in which individual themselves take action to reduce the negative consequences of the risks, and others-focused coping, in which case individuals urge responsible parties to take actions to reduce the risks. Our results show that the three types of coping can be distinguished empirically, and people are likely to engage in other-focused coping. Further, people are most likely to engage in others-focused coping when they experience strong morality-based emotions towards the risks from energy projects, whereas they are most likely to engage in self-focused coping and emotion-focused coping when they experience strong negative consequence-based emotions towards the risks from energy projects.

Keywords: problem-focused coping, emotion-focused coping, energy risks, emotions

3.2. Introduction

Energy projects can come with various risks, such as risks of accidents in nuclear energy plants, risks of breaking dams and floods from hydro-energy projects, and risks of seismic activity from geothermal energy projects. Such risks can negatively affect people's well-being, depending on how people cope with these risks. Research on how people cope with risks has focused on internally controlled risks that people can control themselves (e.g., health risks caused by smoking) or naturally occurring risks over which nobody has much control (e.g., natural hazards). Yet, little is known about how people cope with risks from activities that are caused and controlled by external parties, such as governments and industry, as is often the case with risks from

energy projects; we refer to this as externally controlled risks. We address this gap by examining how people cope with externally controlled risks from energy projects, and which factors influence people's intentions to engage in different types of coping. Extending previous research, we introduce a novel type of coping, namely others-focused coping, which we argue is likely to be relevant for externally controlled risks, such as the risks from energy projects. We further propose that the likelihood that people engage in different types of coping, including others-focused coping, depends on individuals' emotional responses to externally-controlled energy projects.

3.2.1. Coping with externally controlled risks

Coping refers to cognitive and behavioural responses aimed at managing or reducing a risky situation (Lazarus & Folkman, 1984). It is generally assumed that people may engage in two types of coping when faced with risks: emotion-focused coping and problem-focused coping (Folkman & Lazarus, 1980, 1985; Folkman et al., 1986; Lazarus & Folkman, 1984). *Emotion-focused coping* implies that people try to prevent or reduce the negative emotions elicited by the risks, while not necessarily preventing or reducing the actual risks. People could prevent or reduce negative emotions by avoiding thinking or talking about the risks or denying that they are exposed to the risks.

Problem-focused coping implies that people take action to prevent or reduce the risks and/or the related negative consequences. Examples include reducing the behaviour that causes the risks (e.g., stop smoking to prevent health risks) or engaging in protective behaviour to reduce the negative consequences of the risks (e.g., buy insurance to prevent negative consequences of flooding).

Emotion-focused and problem-focused coping have so far mostly been studied for internally controlled risks (e.g., health risks caused by smoking) and naturally-occurring risks over which nobody has much control (e.g., natural hazards). For these types of risks, emotion-focused coping could entail distracting oneself from thinking about the risks (e.g., by sleeping or watching TV to distract oneself from thinking about self-imposed health risks; Graven et al., 2014), or denying the fact that one is exposed to risks (e.g., denying that one lives in an area that has a high risk of floods; Babicky & Seebauer, 2019).

Problem-focused coping for internally controlled and naturally-occurring risks has typically been conceptualised as people taking action themselves to prevent or reduce the risks and/or the related negative consequences, which we call self-focused coping. For example, people could cope with self-imposed health risks by changing their lifestyle and seeking treatment (Graven et al., 2014) or people could purchase flood insurance when faced with risks of potential floods (Babicky & Seebauer, 2019).

Yet, we propose that people may cope in a different way with externally controlled risks, such as the risks from energy projects that are developed,

implemented and managed by other parties. Unlike for internally controlled risks, people can do little to prevent or reduce externally controlled risks themselves (i.e., self-focused coping). At most, people can take actions to reduce the negative consequences of such risks, for example by securing heavy objects to walls in case of earthquakes induced by geothermal energy projects, or plan evacuation routes in case of breaking dams from hydro-energy projects.

At the same time, however, risks from energy projects are not like naturally-occurring risks, where *nobody* can do anything to prevent or reduce the risks. Rather, externally controlled risks from energy projects can be prevented or reduced by external parties, such as governments and industry. As such, externally controlled risks open the possibility that people engage in a different type of problem-focused coping that has mostly been overlooked in the literature. Notably, given that responsible parties control the risks, a possible coping strategy is to urge responsible parties to take action to prevent or reduce the risks. This would still entail a problem-focused coping strategy, as it is aimed at reducing the actual risks, yet it is not oriented towards people taking action themselves, but towards urging responsible others to take action. We therefore call this type of problem-focused coping *others-focused coping*. Examples of others-focused coping with risks from energy projects are participating in protests or signing a petition to urge responsible parties to stop risky activities. There is some initial evidence to suggest that people facing environmental risks engage in actions towards responsible agents, such as punishing and/or harming the agent causing the risks (Böhm & Pfister, 2000, 2005, 2015); we extend this research by studying whether people also are likely to take actions towards responsible others to urge them to prevent and/or reduce the risks.

Specifically, in the current research, we will study whether we can empirically distinguish others-focused from self-focused coping and emotion-focused coping, respectively. Moreover, we examine how likely it is that people engage in others-focused coping, next to self-focused coping and emotion-focused coping, when facing the risks from energy projects.

H1: *Others-focused coping can be empirically distinguished from self-focused and emotion-focused coping.*

H2: *People are likely to engage in others-focused coping besides self-focused and emotion-focused coping when facing externally controlled risks.*

3.2.2. Emotions and coping

The next question is which factors affect the likelihood that people engage in different types of coping. We propose that distinct negative emotions that people experience towards externally-controlled energy projects that pose risks can play an important role in the extent to which people engage

in different types of coping. According to the appraisal-tendency framework, an emotion's underlying appraisal determines the influence of that emotion on subsequent action (Lerner & Keltner, 2000, 2001). This framework is based on two assumptions: (1) people may experience different types of negative emotions, depending on their appraisals of a situation (cf. Lazarus, 1991; Smith & Ellsworth, 1985; Vrieling et al., 2021), and (2) distinct emotions lead to distinct changes in actions tailored to respond to the situation that evoked the emotion (cf. Roseman et al., 1994; Frijda, 1986; Lazarus, 1991; Smith & Lazarus, 1990; Smith & Ellsworth, 1985).

In particular, feeling powerless is likely to stem from the appraisal that the situation is out of control and nobody can do anything to prevent the risks and their negative consequences (Lazarus & Folkman, 1984). When individuals feel powerless towards risks, they have appraised that their exposure to the risky situation cannot be changed: they believe that the causes of the risks cannot be changed and that they can do little or nothing to reduce the negative consequences of the risks. Therefore, we argue that people are most likely to engage in emotion-focused coping when they feel powerless towards the externally controlled risks. Indeed, research on internally controlled risks has shown that the more students felt powerlessness about the outcome of their high school final exams, the more they engaged in avoidance strategies, such as suppressing their negative emotions and trying not to think about the exams (Schmidt et al., 2010). Similarly, research found that when people felt helpless about health risks they face, they tended to avoid hearing or talking about those risks (Barbour et al., 2012).

Furthermore, we argue that people are more likely to engage in self-focused coping when they experience consequence-based emotions. Consequence-based emotions, such as feeling fearful, uneasy, and terrible, are elicited when people feel the situation has potential negative consequences (Böhm & Pfister's, 2000, 2005, 2015; Böhm, 2003; Hendrickx & Nicolaij, 2004; Vrieling et al., 2021). Feeling such negative emotions towards the consequences of risky activities might motivate people to take action to prevent or reduce those negative consequences, by engaging in self-focused coping. Indeed, studies on health risks show that fear can motivate people to take health-protective behaviours, such as getting vaccinated (Tannenbaum et al., 2015). Similarly, studies on natural hazards show that fear motivates people to engage in self-protective behaviours, such as purchasing flood insurance (Babcicky & Seebauer, 2019; Grothmann & Reusswig, 2006; Miceli et al., 2008; Takao et al., 2011;).

The question remains which negative emotions are related to others-focused coping. We expect that consequence-based emotions may also be associated with others-focused coping, but only to a limited extent, as such actions would also prevent or reduce the negative consequences that people appraised and may feel fearful, uneasy, or terrible about. Yet, we propose that

morality-based emotions are likely more strongly associated with others-focused coping than consequence-based emotions. Morality-based emotions are elicited when responsible parties are perceived as violating moral norms and values by causing the risks. Examples are anger, disappointment, and indignation (Böhm & Pfister's, 2000, 2005, 2015; Böhm, 2003; Hendrickx & Nicolaj, 2004, Vrieling et al., 2021). People experiencing negative morality-based emotions, such as anger, are more likely to believe that responsible parties can do something about the causes of the risks – urging responsible others to change their actions could then be a way for people to prevent or reduce the risks (cf. Lazarus & Folkman, 1984; Lerner & Keltner, 2000, 2001). On the basis of this, we argue that morality-based emotions are most likely to result in others-focused coping aimed at urging others to act. There is some initial evidence to suggest that morality-based emotions towards environmental risks can indeed motivate people to take action directed at responsible parties, particularly aimed at retaliating or punishing the responsible parties (Böhm & Pfister, 2000, 2005, 2015). We will test whether morality-based emotions are also associated with actions aimed at urging responsible others to prevent or reduce the risks.

In sum, we will examine to what extent feeling powerless, consequence-based emotions, and morality-based emotions are related to the likelihood that people engage in different types of coping, including emotion-focused coping, self-focused coping, and others-focused coping. On the basis of the above, we hypothesise (see Figure 1):

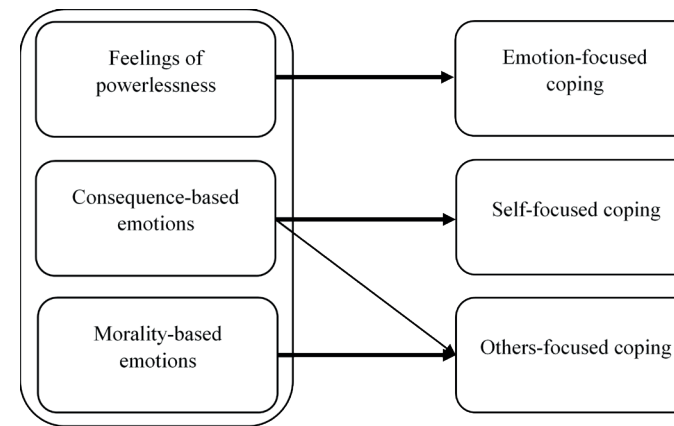
H3: Stronger feelings of powerlessness are associated with stronger intentions to engage in emotion-focused coping.

H4: Stronger consequence-based emotions are associated with stronger intentions to engage in self-focused coping.

H5: Stronger morality-based emotions, and to a lesser extent, stronger consequence-based emotions, are associated with stronger intentions to engage in others-focused coping.

Figure 1.

Visual representation of the predicted relationships between different types of emotions and different types of coping.



Note. The thickness of the lines represents the predicted strength of the unique relationships.

3.2.3. Current study

As a case in point, we study people's negative emotions towards and intentions to cope with the risks from earthquakes induced by natural gas extraction (henceforth: gasquakes) in the province of Groningen in the Netherlands. Natural gas extraction poses the risk of recurring gasquakes. The strongest gasquake so far in the province of Groningen was 3.6 on the Richter scale, namely the Huizinge gasquake in August 2012. Inhabitants of the province of Groningen believe the gasquakes have various negative consequences, primarily for their properties and for the image of their province, and experience different types of negative emotions towards the gasquakes, such as fear (a consequence-based emotion), anger (a morality-based emotion) and feeling powerless (Perlaviciute et al., 2017).

The current research is part of a large-scale longitudinal study on public opinions about natural gas extraction and the induced gasquakes in the province of Groningen that consisted of six research phases. Here, we report the results from the most recent research phases 5 and 6 that both included questions on intentions to cope with the risks from gasquakes. Various critical events took place between these two phases that could have affected the extent to which people experience negative emotions towards gasquakes and intentions to engage in coping strategies in the two phases (see Table 1 for the timeline). The aim of this study is to test the robustness of the relationships between emotions and coping intentions irrespective of changes in these variables over time due to critical events taking place. We expect that the proposed relationships between negative emotions towards and intentions to cope with the risks are robust and pertain despite possible changes in the extent

to which people experience negative emotions and/or intend to engage in different coping strategies over time. In the following sections, we will discuss the methods and results of both phase 5 and phase 6 together because both research phases had the same study design.

Table 1.

Timeline of gasquakes (above 3.0 on the Richter scale) and critical events taking place around the time of the research

16 August 2012	The strongest gasquake took place in Huizinge (3.6 on Richter scale).
7 February 2013	A relatively strong gasquake took place in Zandweer (3.2 on the Richter scale).
8 January 2018	The second strongest gasquake took place in Zeerijp (3.4 on the Richter scale).
February – March 2018	Data collection phase 5
19 March 2018	A new organisation was founded for handling damage claims that is fully independent from the agents responsible for gas production (i.e., the gas extraction company NAM and the Dutch government).
29 March 2018	The Dutch government decided to stop the gas extraction by 2030.
February – May 2019	Data collection phase 6

3.3 Method

3.3.1. Participants and procedure

In different regions in the province of Groningen, the Netherlands, that vary in exposure to the gasquakes, inhabitants were approached at their home by trained research assistants and were asked to participate in the study. Part of the respondents of this study were follow-up participants from previous phase(s). We recruited some new participants in phase 5 and 6, so that sample sizes are comparable across the phases. A total of 349 people participated in phase 5. In phase 6, 341 people participated, of which 201 (58%) have also taken part in phase 5. In general, the samples of both phases represent the general population in the province of Groningen reasonably well; socio-demographic characteristics are displayed in the Appendix. Yet, our sample is slightly older than the average age of the population in the province of Groningen (which was 42 years in 2018; De Staat van Groningen, 2021). This might be due to most of our sample being from municipalities in the province of Groningen more exposed to the earthquakes, where mean age is higher than in the city and municipality of Groningen (where population density is higher and a large part of the population is student).

3.3.2. Measures

3.3.2.1. Emotions

In both phases, participants reported to what extent they experience the three types of negative emotions when thinking about the gasquakes in the province of Groningen on a 7-point scale ranging from 1 *not at all* to 7 *very strongly*, with 4 *moderately* as the midpoint. Three items measured feelings of powerlessness: feeling powerless, hopeless, and helpless; three items measured consequence-based emotions: fearful, uneasy, and terrible; and three items measured morality-based emotions: angry, disappointed, and indignant.

We used the the multiple group method (MGM; Stuive, Kiers & Timmerman, 2009) to test whether we can empirically replicate the distinction between the three types of emotions, in line with previous research (Böhm & Pfister, 2005, 2005, 2017; Hendrickx & Nicolaij, 2004; Vrieling et al., 2021). The MGM is a well-established type of confirmatory factor analysis that aims to examine whether the grouping of the emotion items into the respective scales is in line with theory (e.g., De Groot & Steg, 2007, 2008; Holzinger, 1944; Nunnally, 1978; Stuive, 2007; Ten Berge & Siero, 2001; Van der Werff, Steg, & Keizer, 2013). In the MGM, we first defined the factors (i.e., types of emotions) based on theory and computed mean scores for the three types of emotions. Next, correlations between the single emotion items and the three types of emotions were inspected, while correcting for self-correlation (as items will strongly correlate with the factor which they are assigned to based on theory). Finally, we verified that the emotion items indeed correlated strongest with the type of emotions to which they were assigned on theoretical grounds. It is assumed that the grouping of the emotion items into the three types of emotions is supported when the emotion items correlate strongest with the emotion type they are assigned to on theoretical grounds (see Nunnally, 1978). The results of the MGM supported the distinction between consequence-based emotions, morality-based emotions, and feelings of powerlessness, as each emotion item correlated most strongly with its respective scale (see Table 2). The only exception was that, in phase 5, feeling terrible correlated slightly stronger with feelings of powerlessness ($r = .68$) than with consequence-based emotions ($r = .65$), while in phase 6, it correlated equally strongly with consequence-based emotions and feelings of powerlessness (both $r = .65$). Given that the differences in correlations were very small to zero, we chose to keep the item feeling terrible in the scale of consequence-based emotions, as initially assigned based on theory³. The three types of negative emotions formed reliable scales (see Table 3). Participants most strongly experienced morality-based emotions, followed by feelings of powerlessness and consequence-based emotions.

³ When we remove the item 'feeling terrible' from consequence-based emotions scale, results of the regression analyses reported below are very similar. Detailed results of this analysis can be obtained from the first author.

3.3.2.2. Coping intentions

We based our measures of coping intentions on Böhm and Pfister's (2000, 2005, 2005) measures of action tendencies in response to environmental risks. Participants reported to what extent they consider engaging in several behaviours when thinking about the risks from gasquakes in the province of Groningen ('When I think about the risks from gasquakes in the province of Groningen, I would like to...'), on a scale ranging from 1 *totally disagree* to 7 *totally agree*. Three items measured emotion-focused coping: escape; not think about it; and move to another place. Three items reflected self-focused coping: take protective measures at home to prevent damage or injury from gasquakes; seek help to limit damage or injury from gasquakes; and seek information about how to reduce the risks from gasquakes. Three items reflected others-focused coping: accuse those who are responsible; participate in protests to urge responsible parties to reduce risks caused by gasquakes; and become a member of an organization that urges responsible parties to reduce risks caused by gasquakes.

Table 2. Results of multiple group method (MGM) for the three types of negative emotions

	Phase 5			Phase 6		
	P	C	M	P	C	M
<i>Feelings of powerlessness (P)</i>						
Powerless	.66	.54	.59	.65	.53	.65
Hopeless	.76	.65	.55	.73	.63	.55
Helpless	.74	.62	.49	.72	.62	.52
<i>Consequence-based emotions (C)</i>						
Fearful	.53	.59	.41	.54	.65	.45
Uneasy	.59	.59	.48	.60	.64	.53
Terrible	.68	.62	.55	.65	.65	.54
<i>Morality-based emotions (M)</i>						
Angry	.54	.71	.61	.57	.70	
Disappointed	.50	.44	.64	.54	.47	.67
Indignant	.54	.45	.66	.56	.47	.68

Note. Highest correlations, corrected for self-correlation, of each emotion item per phase are printed in bold.

Table 3.

Mean scores, standard deviations, and Cronbach's alpha of the different types of emotions

	Phase 5		Phase 6	
	M (SD)	α	M (SD)	α
Feelings of powerlessness	4.65 (1.70)	.88	4.80 (1.76)	.87
Consequence-based emotions	3.98 (1.60)	.82	3.83 (1.67)	.85
Morality-based emotions	5.26 (1.47)	.85	5.37 (1.54)	.87

3.4. Results

3.4.1. Can we empirically distinguish three types of coping?

We first tested whether we can empirically distinguish others-focused coping from self-focused coping and emotion-focused coping using the MGM (Stuive, Kiers & Timmerman, 2009). The results of the MGM validated the theory-based distinction of the three types of coping, supporting Hypothesis 1. Specifically, as expected, each coping item correlated strongest with the scale to which it was assigned to based on theory (see Table 4). Therefore, we computed mean scores to form reliable scales for each of the three types of coping; higher scores represent stronger intentions to engage in each type of coping (see Table 5).

Next, we examined to what extent people are likely to engage in other-focused coping, next to emotion-focused coping and self-focused coping (Hypothesis 2). People are most likely to engage in self-focused coping and others-focused coping, and to a lesser extent in emotion-focused coping, suggesting other-focused coping is a common strategy (see Table 5). A repeated measures ANOVA with post hoc tests using the LSD correction indicates that people are significantly more willing to engage in self-focused coping and others-focused coping compared to emotion-focused coping (phase 5: $F(2,688) = 132.52, p < .001$; phase 6: $F(2,692) = 156.30, p < .001$). There was no significant difference between the extent to which people intend to engage in self-focused coping and others-focused coping.

Table 4.

Results of multiple group method (MGM) for the different types of coping

	Phase 5			Phase 6		
	E	S	O	E	S	O
<i>Emotion-focused coping (E)</i>						
Escape	.52	.29	.27	.51	.32	.29
Not think about it	.42	.25	.33	.32	.19	.23
Move to another place	.49	.22	.21	.47	.22	.21
<i>Self-focused coping (S)</i>						
Take protective measures at home to prevent damage or injury from gasquakes	.26	.64	.30	.24	.67	.30
Seek help to limit damage or injury from gasquakes	.32	.66	.39	.27	.73	.40
Seek information about how to reduce the risks from gasquakes	.19	.62	.28	.23	.69	.32
<i>Others-focused coping (O)</i>						
Accuse those who are responsible	.31	.33	.52	.23	.33	.50
Participate in protests to urge responsible parties to reduce risks caused by gasquakes	.22	.27	.61	.24	.27	.56
Become a member of an organization that urges responsible parties to reduce risks caused by gasquakes	.28	.37	.62	.26	.41	.56

Note. Highest correlations, corrected for self-correlation, of each emotion item per phase are printed in bold.

Table 5.

Mean scores, standard deviations, and Cronbach's alpha of the different types of coping intentions

	Phase 5		Phase 6	
	M (SD)	α	M (SD)	α
Emotion-focused coping	3.31 ^a (1.57)	.73	3.20 (1.54) ^a	.70
Problem-focused coping:				
Self-focused coping	4.55 ^b (1.63)	.84	4.70 (1.58) ^b	.87
Others-focused coping	4.78 ^b (1.71)	.80	4.64 (1.71) ^b	.78

Note. Different superscripts (a, b) within each study phase indicate that means differ at $p < .001$

3.4.2. Relationships between negative emotions and coping intentions

We first inspected the bivariate correlations between the three types of negative emotions and the three types of coping with the risks of gasquakes induced by gas extraction (see Table 6). In both phases, stronger negative emotions were associated with stronger intentions to engage in all three types of coping. Moreover, the three types of emotions were positively correlated, suggesting that people experience different types of emotions towards risks at the same time. Similarly, although weaker, positive correlations were found between the three types of coping, suggesting that people are likely to intend to engage in different types of coping at the same time.

Table 6.

Bivariate correlations between negative emotions and coping intentions

	Phase 5						Phase 6					
	FP	CE	ME	EC	SC	OC	FP	CE	ME	EC	SC	OC
Feelings of powerlessness (FP)												
Consequence-based emotions (CE)	.77						.77					
Morality-based emotions (ME)	.67	.64					.72	.66				
Emotion-focused coping (EC)	.41	.46	.40				.39	.48	.40			
Self-focused coping (SC)	.34	.29	.60	.36			.33	.36	.33			
Others-focused coping (OC)	.48	.49	.38	.44	.33		.46	.37	.46	.33		

Note. All correlations are significant at the .01 level.

We used multilevel modelling for repeated measures (e.g., Charlton et al., 2020) to examine to what extent each type of emotions is associated with the three types of coping when controlling for the other types of emotions (see Table 7). Multilevel modelling allows us to include all participants across the two phases of our longitudinal study in the model, as it treats each measurement as a different observation of the same variable and omits missing measurements from the analysis assuming they are missing at random (see Maas & Snijders, 2003). We used MLwiN (Version 3.05; Charlton et al., 2020) to build a two-level model for each type of coping where the measurement phases (level 1) were nested within individuals (level 2). Measurement phase was added as an uncentered predictor, whereas the different types of emotions were added using grand mean centering. Effects were tested with approximate t-tests, applying a significance level of $\alpha = .05$.

Results of the multilevel models for the three types of coping are reported in Table 7. Measurement phase had a significant negative effect on others-focused coping indicating that others-focused coping decreased from phase 5 to phase 6. Measurement phase had no significant effect on self-focused coping and emotion-focused coping.

3.4.2.1. Emotion-focused coping

Contrary to what we expected, Table 7 shows that only stronger consequence-based emotions were uniquely and significantly related to people's intentions to engage in emotion-focused coping in both phases. Different to what we expected in hypothesis 3, feelings of powerlessness were not significantly related to emotion-focused coping intentions when the other emotions were included in the analysis. Morality-based emotions were also not uniquely and significantly related to emotion-focused coping intentions.

3.4.2.2. Self-focused coping

Table 7 shows that, as expected (Hypothesis 4), stronger consequence-based emotions were uniquely and significantly related to stronger intentions to engage in self-focused coping in both phases. Furthermore, morality-based emotions and feelings of powerlessness were not significantly associated with self-focused coping intentions when the other emotions were included in the analysis.

3.4.2.3. Others-focused coping

Lastly, Table 7 shows that in line with hypothesis 5, stronger consequence-based emotions were uniquely and significantly related to stronger intentions to engage in others-focused coping. Yet, as expected, stronger morality-based emotions were most strongly related to stronger intentions to engage in others-focused coping. Furthermore, in both phases, feelings of powerlessness were not significantly associated with others-focused coping intentions when the other emotions were included in the analysis.

	Self-focused coping				Others-focused coping				Emotion-focused coping			
	Est.	SE	p	95% CI	Est.	SE	p	95% CI	Est.	SE	p	95% CI
<i>Fixed effects</i>												
Intercept	4.421	.158	<.001	[4.105;4.737]	4.953	.128	<.001	[4.697;5.209]	3.360	.139	<.001	[3.082;3.638]
Phase	.143	.097	.074	[-.051;2.083]	-.182	.076	.017	[-.334;-.030]	-.055	.084	.516	[-.223;.113]
Consequence-based emotions	.297	.055	<.001	[.187;.407]	.163	.048	<.001	[.067;.259]	.373	.050	<.001	[.273;.473]
Morality-based emotions	.095	.054	.079	[-.013;.203]	.528	.048	<.001	[.432;.624]	.067	.050	.181	[-.033;.167]
Feeling powerless	.037	.055	.503	[-.073;.147]	.025	.048	.603	[-.068;.118]	.054	.050	.281	[-.046;.154]
<i>Random effects</i>												
Level-2 variance τ_0^2	.760	.144			.984	.112			.874	.122		
Level-1 variance σ^2	1.352	.130			.748	.073			.964	.093		
R ²	17.564%				40.827%				23.955%			
Deviance	2457.086				2275.682				2333.324			

Note. Est. = Estimate. Phase was coded 0 = 1st phase, ascending.

Table 7.

Results of multilevel regression models testing the relationships between consequence-based emotions, morality-based emotions, feeling powerless and coping intentions

3.5. Discussion

Energy projects can pose various risks, which are typically controlled by external parties that are responsible for developing, implementing and managing energy projects (e.g., governments and industry). The aim of this study was to examine how people cope with such externally controlled risks from energy projects, and what motivates people to engage in different types of coping strategies. Extending previous literature, we proposed that it is important to consider others-focused coping as a distinct type of problem-focused coping with risks of energy projects. As expected, we found that others-focused coping can be distinguished empirically from self-focused coping and emotion-focused coping (Hypothesis 1), and that others-focused coping is a common coping strategy people are likely to engage in when faced with externally controlled risks from energy projects (Hypothesis 2). Moreover, as expected, we found that people are more likely to engage in others-focused coping when they experience stronger morality-based emotions towards responsible parties, and to a lesser extent, when they experience stronger consequence-based emotions towards the risks of energy projects (Hypothesis 5). Further, people are more likely to engage in self-focused coping when they experience stronger consequence-based emotions (Hypothesis 4). Different from what we expected (Hypothesis 3), we found that feelings of powerlessness were not significantly related to emotion-focused coping intentions when we controlled for the other emotions. Rather, stronger consequence-based emotions were uniquely associated with stronger emotion-focused coping intentions. We discuss these findings in more detail below.

3.5.1. Three ways to cope with externally controlled risks

Our results showed that others-focused coping could indeed be empirically distinguished from self-focused coping and emotion-focused coping, supporting Hypothesis 1. These findings suggest that we can theoretically and empirically distinguish two types of problem-focused coping, including actions people themselves can do (i.e., self-focused coping) and actions to urge responsible parties (i.e., other-focused coping) to reduce the risks. While there has been initial evidence that people act to retaliate or punish responsible parties for the risks they pose (Böhm & Pfister, 2000, 2005, 2015), we found that people may also engage in actions aimed to urge responsible parties to engage in actions to prevent or reduce the risks.

Furthermore, we found that people were rather likely to engage in others-focused coping when facing the risks from an energy project, to a similar extent as they intended to engage in self-focused coping, while they were less likely to engage in emotion-focused coping, supporting Hypothesis 2.

These findings again suggest that it is important to consider others-focused coping as a strategy to deal with risks of energy projects. Interestingly, we found that the three types of coping are positively correlated with each other. This is in line with the coping literature that shows that people often simultaneously engage in multiple coping strategies (e.g., Folkman & Lazarus, 1980, 1985).

3.5.2. Emotions and coping

We studied which emotions are related to the likelihood that people engage in different types of coping. Different from what we expected (Hypothesis 3), we found that feelings of powerlessness were not most strongly related to emotion-focused coping. Rather, consequence-based emotions were most strongly and positively related to intentions to engage in emotion-focused coping. It has been suggested that consequence-based emotions might lead to emotion-focused coping when such emotions stem from the appraisal of uncertainty (Lerner & Keltner, 2000, 2001). Our results are in line with some previous studies that suggest that fear, a consequence-based emotion, can lead to emotion-focused coping, such as running away (Roseman, Wiest & Swartz, 1994; Frijda, 1986, Frijda, Kuipers, & ter Schure, 1989). This offers a new direction for future research, namely to examine under which conditions consequence-based emotions lead to either problem- or emotion-focused coping, and the role of cognitive appraisals in this process.

As expected, we found that stronger consequence-based emotions were associated with stronger intentions to engage in self-focused coping (Hypothesis 4). This extends previous research by showing that consequence-based emotions can increase the likelihood that people engage in self-focused coping not only when facing internally controlled risks and naturally-occurring risks, but also externally controlled risks, such as the risks from energy projects.

As expected, we found that stronger morality-based emotions, and to a lesser extent stronger consequence-based emotions, were associated with stronger intentions to engage in others-focused coping (supporting Hypothesis 5). This supports our reasoning that people experiencing negative morality-based emotions are more likely to believe that the actions of responsible parties contribute to the risks and that urging those parties to change their actions could prevent or reduce the risks. Interestingly, the three types of emotions explained a larger proportion of the variance in others-focused coping compared to the other two types of coping. This suggests that others-focused coping is relatively more strongly emotionally driven.

Importantly, we found that the relationships between negative emotions towards risks and coping with risks were similar across the two research phases, suggesting that the relationships are robust over time. An interesting finding is that, also when controlling for other emotions, stronger consequence-based emotions remained significantly associated with stronger intentions to engage in all three types of coping strategies. This suggests that conse-

quence-based emotions are motivating people to cope with risks in different ways, unlike morality-based emotions that mostly lead to others-focused coping and feeling powerless that in this case were no longer significantly associated with any type of coping when controlling for the other emotions. The question is what type of coping consequence-based emotions are most likely to promote, and whether this varies across risky activities. This could depend on cognitive appraisals that underpin consequence-based emotions, for example perceived uncertainty over risks (Lerner & Keltner, 2000, 2001). Future research could test whether and how the different appraisals eliciting consequence-based emotions influence the extent to which consequence-based emotions lead to different types of coping.

3.5.3. Limitations & future research

Our results provide initial evidence about the relevance of others-focused coping in dealing with risks posed by externally controlled energy projects, and that different types of negative emotions towards risks are related to different types of coping with risks. The results come from a real-life case study among people who are actually exposed to some serious risks from gas extraction in their region. Due to the correlational design of our study, we cannot draw firm conclusions about the causal direction of relationships between the different types of negative emotions and the different types of coping with externally controlled risks from energy projects. We argued that strong negative emotions could motivate people to cope with the risks. Yet, the way people cope with risks might in turn affect the extent to which people experience negative emotions. Specifically, successful coping can decrease negative emotions, either by means of emotion-focused coping, or when risks are actually reduced due to problem-focused coping. Future experimental studies could test the causal direction of the relationships between negative emotions and people's intentions to engage in different types of coping strategies and how this develops over time. For example, levels of negative emotions could be systematically varied to test how emotions influence people's intentions to engage in different types of coping. For instance, morality-based emotions could be induced by presenting moral violations of responsible parties causing the risks. Next, it can be studied whether the coping strategies in turn affect the extent to which people experience negative emotions.

We studied coping intentions, so the question remains whether the results would be similar if we had examined actual coping behaviour. Future research could look at the extent to which experiencing negative emotions is related to self-reported as well as actual coping behaviours, for example by asking people whether they want to sign up as a member of a protest group to urge responsible parties to take action to reduce the risks (i.e., others-focused coping). Furthermore, we studied others-focused coping that is directed at urging responsible parties to reduce the risks by addressing the causes of the risks. Future research could also look at others-focused coping directed at urging responsible parties to reduce the negative consequences of the risks, for example

urging them to offer compensations, or to implement protective measures to alleviate negative consequences of energy projects (e.g., reinforcing houses to prevent physical injury in case of induced earthquakes from energy projects).

We studied others-focused coping with risks of gasquakes induced by gas extraction. The question remains whether others-focused coping also is a relevant strategy to cope with other risks, and whether similar factors affect coping strategies in such cases. This is particularly relevant as many risks are at least partly externally controlled. For example, people could cope with health risks caused by smoking by urging governments and the tobacco industry to make smoking less attractive by drastically increasing prices or by making tobacco products less addictive. In a similar vein, people may engage in others-focused coping to deal with naturally-occurring risks, because even when governments cannot control the causes of such risks, they could be seen as responsible for protecting the public from their negative impacts. For example, people could urge governments to provide shelter and financial help in case of natural hazards.

A particularly interesting case are climate change risks, such as coping with extreme weather events caused by climate change, where others-focused coping may play an important role as well. Specifically, not only people themselves, but also external parties, such as government and industry, can be seen as responsible for removing or reducing the causes of climate change risks (i.e., climate change mitigation) and preventing or reducing their negative consequences (i.e., climate change adaptation). For example, to mitigate climate change, people themselves could behave in a more sustainable manner (i.e., self-focused coping), but they could also urge governments to implement sustainability policies that facilitate sustainable actions and/or reduce climate impacts, and urge industry to operate in a sustainable manner and to produce sustainable products (i.e., others-focused coping). All in all, future research could study the extent to which others-focused coping is also relevant for internally controlled risks, naturally-occurring risks and climate risks, and test whether similar factors and processes play a role as in the case of externally controlled risks.

3.5.4. Practical implications

Our results show that when people are exposed to externally controlled risks, they may not only take action themselves to reduce the negative consequences of risks, but they may also urge responsible others to act to reduce the risks, the more so the more they experience negative emotions. This suggests that responsible parties can expect action to urge them to do something about the risks when the public experiences strong negative emotions. To prevent and/or reduce negative emotions and reduce the likelihood of others-focused coping actions such as protests, responsible parties could act as early as possible to prevent the risks and their negative consequences, thereby preventing or reducing the negative emotions. In doing so, they could engage the public in the planning, implementation, and evaluation of energy projects, for example to plan how to

best reduce the risks and/or how to best compensate for the eventual risks.

In conclusion, we found that it is important to distinguish others-focused coping as a distinct type of coping with risks, and that it is a common type of coping people engage in when faced with externally controlled risks from energy projects. People are most likely to engage in others-focused coping when they experience strong morality-based emotions towards the risks from energy projects, whereas they are most likely to engage in self-focused coping and emotion-focused coping when they experience stronger negative consequence-based emotions towards the risks from energy projects.

3.6. Appendix

Table 1. Socio-demographic characteristics of the participants in phase 5 and 6

		Phase 5	Phase 6
Gender	Female	44%	67%
	Male	55%	31%
	Missing values	1%	2%
Age (in years)	<i>M (SD)</i>	57.65 (13.79)	52.91 (15.50)
	Minimum	21	22
	Maximum	92	85
	Missing values	2%	2%
Highest completed education	Primary school	1%	2%
	Lower vocational	8%	7%
	Secondary (vocational)	37%	46%
	Higher (vocational)	41%	35%
	Scientific education	10%	7%
	Other	1%	2%
	Missing values	1%	2%
Income per month	< € 1000	2%	2%
	€ 1000-€ 2000	17%	24%
	€ 2000-€ 3000	33%	20%
	€ 3000-€ 4000	25%	26%
	€ 4000-€ 5000	10%	7%
	>€ 5000	4%	7%
	Missing values	8%	18%
Length of residence in the area (in years)	<i>M (SD)</i>	35.02 (19.31)	27.14 (15.42)
	Minimum	0.5	1
	Maximum	84	64
	Missing values	1%	0%



Chapter 4. Positive versus negative emotions towards renewable energy projects: The role of perceived consequences and trust.

This chapter is based on: Vrieling, L., Perlaviciute, G., Steg, L. & Squintani, L. (manuscript submitted for publication). Positive versus negative emotions towards renewable energy projects: the role of perceived consequences and trust.

4.1. Abstract

Energy projects can evoke different emotions in people, which can affect public acceptability of such projects and influence people's well-being. The Trust and Emotional Appraisal of Risks model (TEAR; Vrieling et al., 2021) postulates that people may experience negative emotions towards energy projects when they perceive the projects as risky and when they have little trust in parties that are responsible for implementing and managing the projects. Yet, besides risks, energy projects typically also have beneficial effects, which could elicit positive emotions towards energy projects (Huijts et al., 2014; Huijts, 2018). Therefore, we extended the TEAR model and examined to what extent perceived consequences (ranging from negative to positive) of energy projects are related to both negative and positive emotions towards those projects. Furthermore, we examined whether trust in responsible parties is uniquely related to both negative and positive emotions towards energy projects, besides the perceived consequences of energy projects. We tested the extended TEAR model in two studies, focusing on projects that are likely to have both negative and positive consequences: a local heat network and a local wind park. As expected, we found that the more people believed the energy project has positive (rather than negative) consequences and the more they trust the responsible parties, the stronger positive emotions and the weaker negative emotions they experienced towards the projects. We discussed the theoretical and practical implications of our findings.

Keywords: perceived consequences, trust, emotions, renewable energy projects

4.2. Introduction

To mitigate climate change, a transition towards a low-carbon energy system that more strongly relies on renewable energy sources, such as solar and wind energy, is needed (IPCC, 2022). Renewable energy projects can evoke different emotions in people, which can affect the level of public support for those energy projects: positive emotions are associated with higher acceptability whereas negative emotions are associated with lower acceptability

(Huijts, Molin & van Wee, 2014; Midden & Huijts, 2009). Public acceptability in turn affects the likelihood that such projects will be implemented (Boyd, 2017; Papazu, 2017; Shaw et al., 2015). Furthermore, negative emotions towards energy projects can threaten people's well-being, while positive emotions towards energy projects could enhance their wellbeing (Lazarus, 1966). Hence, it is important to understand which factors influence emotions towards energy projects.

The TEAR model (Vrieling et al., 2021) postulates that people may experience negative emotions towards energy projects when they perceive the projects as risky and if they have little trust in parties that are responsible for implementing and managing the projects. The TEAR model is based on the transactional model of stress and coping, which suggests that the extent to which people experience negative emotions towards risky activities depends on risk perceptions and perceived control over the risks (Lazarus & Folkman, 1984). Risk perceptions entails the evaluation of how threatening the situation is for people, while perceived control is the evaluation of one's ability to control the situation. The higher the perceived risks and the less people think they have control over the risks, the more likely it is that an energy project elicits negative emotions.

An important novel contribution of the TEAR model (Vrieling et al., 2021) is the argument that trust in responsible parties may affect negative emotional responses towards energy projects, rather than perceived personal control. Specifically, people who are exposed to the risks of energy projects usually have no or very little control over the occurrence and severity of these risks. Rather, they have to rely on responsible parties (e.g., energy companies, governments) who are responsible for regulating and mitigating the risks. Hence, people's own ability to control the risks may be less relevant for the extent to which energy projects elicit negative emotions. Rather, people's trust in responsible parties may better reflect perceived control over the situation. In other words, in the case of externally controlled risks, perceived control might have less to do with one's own control over the risks, but more with the extent to which people believe that responsible others will control the risks. Therefore, the strength of negative emotions are likely to be related to the extent to which people think they can rely on responsible parties, in particular the extent to which they can trust those responsible parties. Indeed, it has been found that the less people trust responsible parties, the stronger negative emotions they experience towards energy projects, such as a hydrogen fuel station (Huijts et al., 2014; Midden & Huijts, 2009), and a local gas extraction project, even when controlling for the perceived risks of the gas extraction project (Vrieling et al., 2021). This implies that negative emotions towards energy projects is likely to depend on the level of trust in responsible parties, rather than individuals' perceived level of control.

The TEAR model focuses on the risks of energy projects, and therefore primarily aims to explain people's negative emotions towards the energy projects (Vrieling et al., 2021). Yet, energy projects typically also have beneficial effects. For example, energy projects can create employment, improve access to affordable energy, and help to limit climate change (Perlaviciute & Steg, 2015). If people associate energy projects with such positive outcomes, this could potentially result in positive emotions towards the projects. Indeed, it has been shown that people can experience positive emotions towards energy projects. For example, a study on public responses to a tidal energy converter project showed that people experience positive emotional responses to the project such as feeling excited and happy (Devine-Wright, 2011). Furthermore, studies on new hydrogen projects showed that people experience positive emotions such as joy, pride and satisfaction (Huijts et al., 2014; Huijts, 2018). Moreover, a study on a local carbon capture and storage (CCS) project associated with negative consequences, such as risks of CO2 leakage and earthquakes, as well as positive consequences, such as contributing to mitigating climate change, showed that people's perceptions of risks of CCS evoked negative emotions (i.e., worry), whereas the perceptions of benefits of CCS evoked positive emotions (i.e., hope; Kahlor et al., 2019). In the current paper, we therefore extend the TEAR model in order to better understand people's different emotional responses to energy projects. Specifically, we hypothesize that depending on the extent to which people expect energy projects to have either more negative or more positive consequences, they may experience stronger negative or more positive emotions towards the energy projects, respectively.

The TEAR model (Vrieling et al., 2021) further suggests that besides risks, the extent to which people trust responsible parties to properly implement and manage the project is related to negative emotions towards the project: higher trust is related to weaker negative emotions. The question is whether trust in responsible parties would also uniquely affect the likelihood that people experience (positive) emotions towards energy projects, also when controlling for the perceived positive consequences. On the one hand, energy projects may already elicit positive emotions because of its perceived positive consequences, and people may not consider the extent that they need to rely on responsible parties. This would mean that trust is not uniquely related to positive emotions when the perceived positive consequences are controlled for. On the other hand, people may still find it important that the project is implemented and managed properly, no matter the consequences the project has. In that case, trust would uniquely contribute to the explanation of positive emotions towards energy projects, next to the perceived consequences of energy projects. To the best of our knowledge, studies so far have examined the effects of perceived consequences and trust in responsible parties on positive emotions towards energy projects separately, rather than testing the unique effects of each factor on positive emotions towards energy projects. The latter is particularly relevant as some studies suggest that higher trust in

responsible parties is related to perceiving fewer risks and perceiving more benefits (e.g., Siegrist & Cvetkovich, 2000). This could mean that perceived positive consequences of energy projects and trust do not both uniquely predict positive emotions towards energy projects. To find out, we will study the role of trust in eliciting positive emotions towards energy projects, next to the perceived consequences of energy projects.

4.2.1. Current study

In this paper, we aim to test whether the extended TEAR model (Vrieling et al., 2021), namely by incorporating the perceived negative and positive consequences of energy projects, can explain the extent to which people experience both negative and positive emotions towards renewable energy projects. To test the robustness of our findings, we test our reasoning in two studies focusing on two renewable energy projects that are likely to have both negative and positive consequences: a heat network (Study 1) and a wind park (Study 2). In this way, we can test whether the relationship between perceived consequences, trust in responsible parties and emotions towards energy projects are robust irrespective of the type of renewable energy project. Both renewable energy projects would be implemented in local communities and hence have real consequences for local residents, and both projects are managed by external parties.

4.3. Study 1: Heat network project

The municipality of Groningen in the Netherlands aims to use only renewable energy sources in 2035. One way to achieve this goal is by connecting houses in neighborhoods to a heat network that relies on renewable energy sources instead of natural gas, such as geothermal energy, heat from surface water or the sewerage system, and residual heat from industry. Among others, the municipality of Groningen is considering to implement a heat network in the neighborhood of Vinkhuizen-Noord. The gas-grid operator Enexis would be responsible for installing the necessary infrastructure for the heat network.

4.3.1. Method

The data collection in the neighbourhood Vinkhuizen-Noord took place in June and July 2019. Trained research assistants approached randomly selected residents of Vinkhuizen-Noord at their homes, asking them to participate in this study by filling in a questionnaire including the questions relevant for the present paper, which would take them approximately 15 to 20 minutes. We aimed to particularly approach private home owners rather than people living in rental houses, because people living in rental houses cannot decide themselves whether or not to join the heat network. We did not approach residents of rental houses belonging to a local social housing corporation.

People who were willing to participate in the study could either make an appointment with the research assistants for the questionnaire to be picked up at a later time, or they could send the questionnaire back to the university

via a port free envelope. When people were not home, they were approached a second time. People living in a privately-owned apartment in one of the eight apartment buildings in the area received a questionnaire in their mailbox with the request to fill it in before the indicated date and with an indication of the time when the questionnaires would be picked up. This different procedure was followed to overcome the barrier created by the intercom system at the building entrance, which prevents the first contact with the potential respondents to take place at their door. People might be very reluctant to allow research assistants in the building when the initial contact takes place via the intercom. When people living in the apartment buildings were not at home at the pick-up time or indicated that they did not finish filling in the questionnaire before that time, a research assistant would come back another time to pick up the questionnaire, or respondents could send the questionnaire back to the university via a port free envelope.

The research area consisted of 1163 homes. A total of 582 were approached to participate in person at residents' door, of which 471 people agreed to participate. In total 254 of those 471 people got their questionnaire picked up in person. Furthermore, 158 people living in apartment buildings received an invitation in their mailbox, of which 31 were picked up directly at their door. A total of 29 questionnaires were sent to the university via the port free envelopes. Hence, in total 314 questionnaires were filled in (response ratio: 42%), of which nine were excluded from the analyses because the respondents did not give their informed consent. This implies that data from 305 participants were analysed. The sample was representative of the population of Vinkhuizen (see Appendix for demographic characteristics).

4.3.1.1. Measures

4.3.1.1.1. Perception of consequences

Respondents were asked to indicate to what extent they evaluated the following consequences of the heat network in Vinkhuizen-Noord negatively or positively: ease and comfort of heating their house, ease and comfort of heating water (e.g., showering), ease and comfort of cooking (using electricity), their energy costs in the short-term, their energy costs in the long-term, value of houses in Vinkhuizen-Noord, image of Vinkhuizen-Noord, the reliability of the energy supply (e.g., no power cuts), future generations, and reducing climate change. Responses were given on a 7-point scale ranging from 1 *very negative* to 7 *very positive*. We computed the mean score of these consequences ($\alpha = .86$); higher scores mean more positive or less negative evaluations of the consequences. On average people believed the heat network will have relatively more positive than negative consequences ($M = 4.88$, $SD = 1.05$).

4.3.1.1.2. Trust in responsible parties

Respondents indicated their level of trust in the two parties that are mainly responsible for developing and implementing the heat network. First, the mu-

nicipality of Groningen, which is the local government that explores the option of implementing a heat network and decides which utility company will be hired to develop and manage the heat network. Second, Enexis, which is the grid company that owns and installs the heat network pipes¹. Respondents indicated to what extent they agree with the statements: 'Considering the development of a heat network in Vinkhuizen-Noord, I can trust (1) the municipality of Groningen, and (2) Enexis, respectively, both on a 7-point scale ranging from 1 *I totally disagree* to 7 *I totally agree*. People's trust in the responsible parties was rather high (municipality: $M = 5.54$, $SD = 1.67$; Enexis: $M = 5.45$, $SD = 1.75$). As both parties have rather different roles and responsibilities in the heat network project, we decided to analyse trust in both parties separately.

4.3.1.1.3. Emotions towards the heat network

Respondents reported to what extent they experience different emotions when thinking about the development of a heat network in Vinkhuizen-Noord, on a 7-point scale, ranging from 1 *not at all* to 7 *very strongly*. Seven items reflected negative emotions: annoyed, afraid, uneasy, terrible, angry, disappointed, and feeling powerless. Another six items reflected positive emotions: satisfied, calm, enthusiastic, happy, hopeful, and proud. We computed mean scores for negative and positive emotions; higher scores represent stronger negative ($\alpha = .90$) and positive emotions, respectively ($\alpha = .90$). On average, people experienced stronger positive emotions ($M = 4.36$, $SD = 1.34$) than negative emotions ($M = 2.14$, $SD = 1.21$).

4.3.2. Results and Discussion

We first explored the relationships between the variables included in the extended TEAR model. Specifically, Table 1 shows the bivariate correlations between perceived consequences of the heat network project, trust in both responsible parties, and negative and positive emotions towards the heat network project, respectively. As expected, the more respondents believed the heat network would have positive consequences and the more they trusted the municipality and Enexis, the less negative emotions and the more positive emotions they experienced towards the heat network project. Perceived consequences of the heat network project were more strongly related to both positive and negative emotions towards the heat network than trust in both responsible parties.

¹ We additionally measured trust in two other parties involved in developing the heat network: *Warmtestad* and *Buurtwarmte050*. *Warmtestad* is a utility company of the Municipality of Groningen and the *Water Company Groningen* that supplies sustainable heat to companies and residents in Groningen. *Buurtwarmte050* is a local bottom-up initiative founded to promote sustainable heating for houses. Many respondents were not familiar with these parties, as illustrated by 69% of the respondents skipping the question on trust in *Warmtestad* and 89% skipping the question on trust in *Buurtwarmte050*. Therefore, we did not include trust in these parties in our analyses.

In line with previous research (e.g., Siegrist & Cvetkovich, 2000), the more respondents believed the heat network would have positive consequences, the more they trusted the responsible parties. Further, negative emotions were negatively related to positive emotions. Lastly, higher trust in the municipality was related to higher trust in Enexis.

Table 1.

Bivariate correlations between perceived consequences of the heat network project, trust in responsible parties, negative emotions, and positive emotions towards the heat network project

	Trust in Municipality	Trust in Enexis	Negative emotions	Positive emotions
Perceived consequences	.31	.29	-.27	.64
Trust in municipality		.83	-.18	.27
Trust in Enexis			-.23	.20
Negative emotions				-.34

Note. All correlations are significant at $p < .001$

Next, we conducted multiple regression analyses to test the unique relationship between perceived consequences of the heat network project and trust in the responsible parties, on the one hand, and negative and positive emotions towards the heat network project, on the other hand (see Table 2). As indicated earlier, we conducted the analyses for trust in the municipality of Groningen and Enexis separately².

Perceived consequences of the heat network project and trust in the municipality of Groningen explained 10% of the variance in negative emotions ($F(2,270) = 15.38, p < .001$) and 41% of the variance in positive emotions towards the heat network project ($F(2,269) = 95.27, p < .001$). As expected, the more people believed the heat network would have positive rather than negative consequences, the less they experienced negative emotions and the more they experienced positive emotions towards the heat network project. Interestingly, trust in the municipality of Groningen was only uniquely significantly associated with positive emotions but not with negative emotions: the more people trusted the municipality of Groningen, the more they experienced positive emotions towards the heat network project.

² As trust in these parties correlated strongly ($r = .83$), we also conducted a regression analysis with an aggregated measure, reflecting mean trust in both responsible parties, and found similar results.

Similarly, perceived consequences of the heat network project and trust in Enexis explained 11% of the variance in negative emotions ($F(2,272) = 17.44, p < .001$) and 41% of the variance in positive emotions towards the heat network project ($F(2,271) = 94.60, p < .001$). Again, the more people perceived positive rather than negative consequences of the heat network project, the less they experienced negative emotions and the more they experienced positive emotions towards the heat network project. Trust in Enexis was only uniquely significantly associated with negative emotions and not with positive emotions: the more people trusted Enexis, the less they experienced negative emotions towards the heat network project.

In sum, the extended TEAR model could explain both negative and, even more, positive emotions towards the heat network project. Perceived consequences of the heat network project seemed to be the most important factor explaining negative and especially positive emotions towards the heat network project. Trust in responsible parties was also related to emotions, although less strongly. Higher trust in the municipality was related to more positive emotions, whereas higher trust in the grid company was related to less negative emotions towards the project.

Table 2.

Regression of negative emotions and positive emotions towards the heat network project on perceived consequences of the heat network project and trust in the municipality of Groningen and Enexis

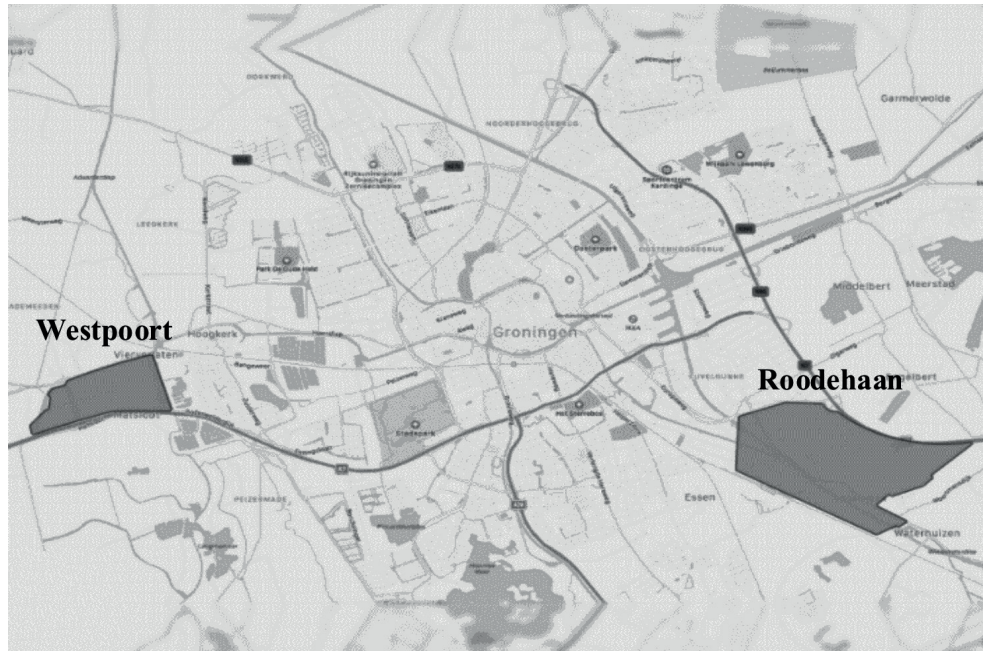
		Negative emotions			Positive emotions		
		β	t	p	β	t	p
Municipality of Groningen	Perceived consequences	-.28	-4.59	<.001	.61	12.43	<.001
	Trust	-.10	-1.66	.10	.10	2.05	.04
Enexis	Perceived consequences	-.26	-4.42	<.001	.63	13.04	<.001
	Trust	-.15	-2.60	.01	.03	.62	.54

4.4. Study 2: Wind park

Next to a heat network, the municipality of Groningen aims to establish wind parks to transition to a low carbon energy system. The current study examined two wind parks that were being planned by the municipality of Groningen at the time of this study: one that would be located in the region Westpoort, and one in the region Roodehaan (see Figure 1). Both Westpoort and Roodehaan are located in the municipality of Groningen, just outside the outer city borders, respectively at the West and the East of the city of Groningen. Both areas have a mixed industrial and countryside landscape and are adjacent to the highway connecting the province of Groningen to the province of Friesland on the West and Germany on the East.

Figure 1.

Map of the location of the envisaged windparks in Westpoort and Roodehaan in the municipality of Groningen



4.4.1. Method

This study is part of a longitudinal research project on public acceptability of wind parks that may be established in Westpoort and Roodehaan. For the current study, we report results from the first phase of this study conducted in October and November 2019, when the planned wind park projects were introduced to the public. The recruited sample consisted of people living within 500 metres, between 500 and 1500 metres and more than 1500 metres away from the planned wind turbines³.

Inhabitants living within 500 metres and between 500 and 1500 metres away

³ In Westpoort, the people approached within 500 meters from the windturbines live in the neighborhood Viervelaten and De Poffert, and a few houses between these neighborhoods, while the people approached 1500 meters away from the windturbines live in the towns Hoogkerk and Oostwold. In Roodehaan, the people approached within 500 meters from the wind turbines live in a part of the town Engelbert and an area South of the highway A7, while the people 1500 metres away from the wind turbines live in another part of the town Engelbert and a part of the town Haren. Lastly, people living more than 1500 metres from the windturbines in Westpoort or Roodehaan live in the other part of the town Haren and a few neighborhoods in the city of Groningen, specifically De Held, Vinkhuizen Zuid, Coendersborg and Euroborg.

from the wind parks (around 6000 people) first received a letter from the municipality informing them about the development of the wind parks, and inviting them to fill in the questionnaire online. Furthermore, flyers were distributed in the area within 1500 metres around the wind park including a QR-code that would guide people to the online questionnaire. Next, trained research assistants approached randomly selected inhabitants living within 500 metres, between 500 and 1500 metres away from the turbines, asking them to participate in this study by filling in a paper-and-pencil questionnaire. People who were willing to participate could either make an appointment with the research assistants for the questionnaire to be picked up later or they could send the questionnaire back to the university via a port free envelope. The questionnaires for the people living within 500 metres or between 500 metres and 1500 metres from the wind turbines were identical, yet tailored for the area people live in (either Westpoort or Roodehaan). The questionnaire for people living more than 1500 metres away were not tailored to either Westpoort or Roodehaan, but questions were asked for Westpoort and Roodehaan together. Filling in the questionnaire took approximately 15 to 20 minutes.

A total of 220 participants filled in the online questionnaire, of which 42 did not give their informed consent and thus could not be included in the analyses. Furthermore, 997 people were approached at their home to participate, of which 728 agreed to participate. Of these, 509 people filled in the paper-and-pencil questionnaire and either got it picked up in person or sent it back to the university (response rate: 51%). The sample is representative of the population living in the areas (see Appendix for demographic characteristics).

4.4.1.1. Measures

4.4.1.1.1. Perception of consequences

Respondents were asked to imagine that wind turbines would be developed in their region, either in Roodehaan or in Westpoort, depending on where they live, and to indicate to what extent they evaluated the following consequences of the wind turbines negatively or positively: value of houses in the area, image of the area, quality of life of people living in the area, health of people living in the area, nature in the area, the attractiveness of the area, the local economy in the municipality of Groningen, the employment level in the municipality of Groningen, the reliability of energy supply (e.g., no power cuts), impact on future generations, impact on the environment, and reducing climate change. Responses were given on a 7-point scale, ranging from 1 *very negative* to 7 *very positive*. We computed a mean score of perceived consequences ($\alpha = .95$); higher scores indicate that people perceived more positive and less negative consequences. On average, people perceived the consequences slightly more negatively than positively ($M = 3.70$, $SD = 1.42$).

4.4.1.1.2. Trust

The municipality of Groningen is the main responsible party for developing the wind parks at the time of the study⁴. Specifically, the municipality decides on the size, location, and operation of the wind parks. Respondents indicated to what extent they agreed with the statement: 'Considering the development of wind energy in Roodehaan/Westpoort, I can trust the municipality of Groningen' on a 7-point scale ranging from 1 *I totally disagree* to 7 *I totally agree*. On average, people's trust in the municipality of Groningen was not very low nor very high, around the scale mid-point ($M = 4.01$, $SD = 1.99$).

4.4.1.1.3. Emotions

Respondents reported to what extent they experience different negative and positive emotions when thinking about the development of wind turbines in either Roodehaan or Westpoort, on a 7-point scale ranging from 1 *not at all* to 7 *very strongly*. Six items reflected negative emotions: annoyed, afraid, terrible, angry, disappointed, and feeling powerless. Another five items reflected positive emotions: satisfied, calm, enthusiastic, happy, and proud. We computed mean scores for negative emotions ($\alpha = .92$) and positive emotions ($\alpha = .92$); higher scores represent stronger negative and positive emotions, respectively. On average, people did not experience very strong negative ($M = 3.05$, $SD = 2.00$) or positive emotions ($M = 2.89$, $SD = 1.67$), and both types of emotions were experienced to a similar extent.

4.4.2. Results and Discussion

Again, we first explored the bivariate correlations between perceived consequences of the wind projects, trust in the municipality of Groningen, and negative and positive emotions towards the wind projects (see Table 3). As expected, the more people believed the wind park would have positive consequences and the more they trusted the municipality of Groningen, the less negative emotions and the more positive emotions they experienced towards the wind parks. Again, the perception of the consequences of the wind park was more strongly related to both positive and negative emotions towards the wind park than trust in the municipality of Groningen. Stronger positive emotions were related to weaker negative emotions, and the more people believed the wind parks has positive consequences, the more they trusted the municipality of Groningen.

⁴ Two other parties were involved in exploring the possibilities for the windparks: the local environmental organisation de Natuur- en Milieufederatie Groningen and a local organisation for energy cooperatives Grunneger Power. Together with the municipality of Groningen these parties founded the Windplatform that aimed to explore, together with inhabitants, whether the wind parks are feasible. The questionnaire included items on trust in these parties as well, yet these parties were often not known by the public as illustrated by 64% of the respondents skipping the trust question about Natuur- en Milieufederatie Groningen and 69% skipping the question about Grunneger Power. Therefore, we did not include trust in these parties in the analyses.

Table 3.

Bivariate correlations between perceived consequences of the wind park, trust in the municipality of Groningen, negative emotions, and positive emotions towards the wind park

	Trust in the municipality	Negative emotions	Positive emotions
Perceived consequences	.52	-.71	.70
Trust in the municipality		-.52	.48
Negative emotions			-.64

Note. All correlations are significant at $p < .001$

Next, we conducted multiple regression analyses to test the unique relationship between perceived consequences of the wind parks and trust in the municipality of Groningen, on the one hand, and negative and positive emotions towards the wind parks on the other hand (see Table 4). Perceived consequences of the wind parks and trust in the municipality of Groningen explained 55% of the variance in negative emotions ($F(2,1229) = 761.85$, $p < .001$) and 51% of the variance in positive emotions towards the wind parks ($F(2,1224) = 644.09$, $p < .001$). The more people believed the wind park would have positive consequences, and the more they trusted the municipality, the less they experienced negative emotions and the more they experienced positive emotions towards the wind park. Again, perceived consequences of the wind park were more strongly related to negative and positive emotions towards the wind park than trust in responsible parties.

Overall, the extended TEAR model could explain both negative and particularly positive emotions towards the wind parks. Perceived consequences of the wind parks seem to be the most important factor explaining positive and negative emotions towards the wind parks, while trust in the municipality of Groningen is less strongly related to negative and positive emotions.

Table 4.

Regression of negative emotions and positive emotion towards the wind parks on perceived consequences of the wind parks and trust in the municipality of Groningen

	Negative emotions			Positive emotions		
	β	t	p	β	t	p
Perceived consequences	-.63	-28.13	<.001	.63	26.82	<.001
Trust in the municipality	-.19	-8.44	<.001	.15	6.50	<.001

4.5. General Discussion

It is generally agreed that renewable energy projects need to be implemented to mitigate climate change (IPCC, 2022). Such renewable energy projects can evoke both positive and negative emotions in people, which can affect the level of public support for those projects and people's well-being. Hence, it is important to understand which factors affect the extent to which energy projects elicit different emotions. Extending the TEAR model (Vrieling et al., 2021), we examined whether perceived consequences of renewable energy projects and trust in responsible parties are both uniquely related to negative and positive emotions towards renewable energy projects. We tested this in two studies focusing on two different renewable energy projects that were considered to be implemented in the municipality of Groningen at the time of the study: a heat network project (Study 1) and two wind park projects (Study 2). These renewable energy projects are being managed by external parties and might be implemented in people's vicinity, with likely both negative consequences and positive consequences for local residents.

In support of the extended TEAR model, we found that perceived consequences explained both negative and positive emotions elicited by renewable energy projects. Specifically, the more people believed the energy project has positive (rather than negative) consequences, the stronger positive emotions and weaker negative emotions they experienced towards the energy project. This is an important finding, because it means that people not only perceive negative consequences which elicit negative emotions, but they also experience positive emotions because they believe the renewable energy project will have positive consequences. Maximizing the benefits of energy projects could therefore strengthen people's positive emotions and weaken negative emotions towards the projects.

Furthermore, in support of the extended TEAR model, we found that the strength of both negative and positive emotions not only depended on the expected (negative and positive) consequences of an energy project, but also on the extent to which people trusted responsible parties will implement an energy project in an adequate way. More specifically, we found that even though trust in responsible parties is related to the perceived consequences of the energy projects, trust is also uniquely related to negative and positive emotions towards both energy projects. This means that high levels of trust in responsible parties increases the likelihood that people experience positive emotions, and decreases the strength of negative emotions, not only when people believe an energy project will have negative consequences, but also when they believe the project will have positive consequences. This is an important finding because it means increasing trust in responsible parties might not only reduce negative emotions, but could also strengthen positive emotions towards energy projects, which may subsequently increase the level of public support for energy projects and enhance people's well-being.

Interestingly, in Study 1, we found that trust in responsible parties was not always significantly related to emotions the heat network project when the perceived consequences of the heat network project were controlled for. Namely, trust in the municipality of Groningen was only significantly uniquely related to positive emotions towards the heat network, while trust in the grid operator Enexis was only uniquely related to negative emotions towards the heat network. It could be that people expect the grid operator Enexis to primarily ensure that the heat network works correctly and to prevent any risks due to a malfunctioning system. Therefore, lack of trust in the grid operator can increase negative emotions. Yet, people may not expect Enexis to be responsible for achieving positive outcomes, such as limiting climate change, as such outcomes merely depend on whether the heat network will be implemented or not, which is decided by the municipality of Groningen. People may expect from their municipality that the decision-making process is fair and that the project is well developed, which can in turn increase positive emotions. The inconsistent finding in the extent to which trust in the municipality of Groningen uniquely explains positive and negative emotions may also just be due to the relatively smaller sample (compared to Study 2), meaning that relatively weak relationships do not always reach significance due to lack of power. Indeed, the strength of the unique relationship between trust in the municipality of Groningen and positive and negative emotions towards the heat network, respectively, was rather similar and in both cases relatively weak (i.e., .10 and -.10, respectively), and only reached significant when explaining positive emotions. Future studies could further test the robustness of the relationship between trust in responsible parties and negative and positive emotions, when controlling for perceived consequences, in a larger sample.

Overall, we found similar results in both studies, which means that the extended TEAR model can explain negative and positive emotions towards different renewable energy projects. Interestingly, we found that perceived consequences were less predictive of negative emotions compared to positive emotions in Study 1, in which we examined emotions towards a heat network, while in Study 2 on the wind park perceived consequences and trust in responsible parties explained positive and negative emotions equally well. An explanation could be that the heat network project was overall rated rather positively, and people hardly experienced negative emotions towards the heat network. This may be because a heat network is less controversial as it just entails laying pipes in the underground, whereas wind turbines in one's vicinity can be more controversial, because they are very visible. Future research could study whether the relationship between perceived consequences and emotions is indeed different for more visible compared to less visible energy projects.

Our results have important implications for developing energy projects that are likely to elicit more positive and less negative emotions. As the percei-

ved consequences of energy projects were most strongly related to emotions towards energy projects, one obvious strategy is to make sure that projects have more prominent positive consequences, and that negative consequences are limited as much as possible. For example, by ensuring that the source of heat for heat networks is as sustainable as possible, the heat network is more likely to contribute to reducing CO² emissions and combating climate change. Next, trust in responsible parties could be enhanced to reduce negative emotions and to increase positive emotions towards energy projects. For example, responsible parties could enhance trust by demonstrating that they are honest and open, and/or that they have the necessary skills and knowledge to implement and manage the energy project (Liu et al., 2020a).

As we used a correlational design to study the relationships between perceived consequences of energy projects, trust in responsible parties, negative emotions and positive emotions towards energy projects, we cannot draw firm conclusions about the causal relationships between these factors. It cannot be ruled out that causality of these relationships might go in another direction as well. For example, based on the affect heuristic (Finucane et al., 2002) and the risks as feelings hypothesis (Loewenstein et al., 2001), it may be hypothesised that emotions towards energy projects affect the perceived consequences of such projects. Specifically, positive and negative initial feelings towards an activity (such as an energy project) may colour how people evaluate the consequences of the activity, for example based on their previous experiences with similar activities. When the feelings towards the activity are primarily positive, people may believe that this activity has higher benefits and lower risks. On the other hand, when people primarily experience negative emotions, they may be more inclined to perceive fewer benefits and higher risks. Future research is needed to test whether perceived consequences lead to emotions and/or vice versa, by using experimental or longitudinal study designs.

In conclusion, we found that the extended TEAR model can explain not only negative emotions, but also positive emotions elicited by energy projects that are likely to have positive consequences, such as renewable energy projects. The more people believe an energy project has positive (rather than negative) consequences, and the more they trust parties responsible for the energy project, the more they experience positive emotions, and the less they experience negative emotions towards the energy project.

4.6 Appendix

Table 1.
Socio-demographic characteristics of the participants of Study 1

Gender	Female	58%
	Male	42%
	Other	0%
	Missing values	7%
Age (in years)	Mean	47.9
	Minimum	19
	Maximum	87
	Missing values	9%
Highest completed education	Lower education	13%
	Secondary education	33%
	Higher education	41%
	Other	2%
	Missing values	11%
Income per year	< €20.000	22%
	€20.000 - €40.000	40%
	> €40.000	21%
	Missing values	17%

Table 2.
Socio-demographic characteristics of the participants of Study 2

Gender	Female	44%
	Male	53%
	Other	< 1%
	Missing values	3%
Age (in years)	Mean	51.8
	Minimum	16
	Maximum	88
	Missing values	6%
Highest completed education	Lower education	13%
	Secondary (vocational) education	41%
	Higher (vocational) education	40%
	Other	2%
	Missing values	4%
Income per month	< €1000	7%
	€1000 - €2000	23%
	€2000 - €3000	26%
	€3000 - €4000	18%
	€4000 - €5000	9%
	> €5000	5%
	Missing values	12%

Chapter 5. The role of trust in public acceptability of energy projects: Integrity versus competence.

Chapter 5 is based on: Liu, L.¹, Vrieling, L.¹, Perlaviciute, G., Bouman, T., & Steg, L. (2022). The role of trust in public acceptability of energy projects: Integrity versus competence. *Environmental Research Communications*, 4(3), 035003.

¹ Joint first authors.

5.1. Abstract

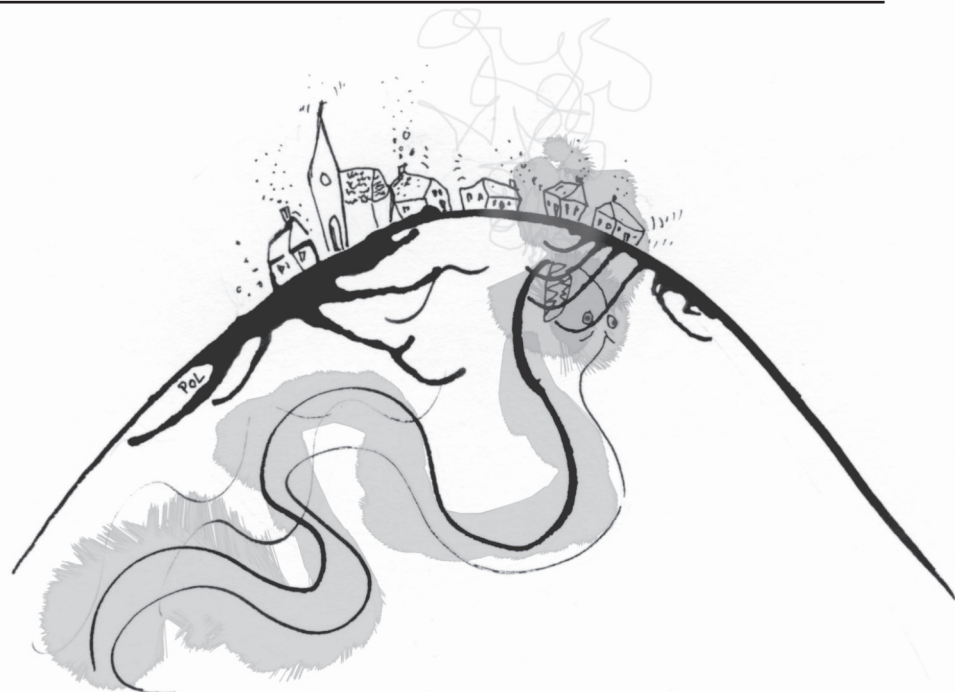
Public acceptability of energy projects depends on people's trust in agents responsible for those projects. We examined to what extent different dimensions of trust, notably integrity- and competence-based trust, are associated with public acceptability of real ongoing energy projects associated with acute risks and other consequences. A series of questionnaire studies in the Netherlands revealed that both integrity- and competence-based trust were positively associated with public acceptability of natural gas extraction which causes earthquakes in the region. Yet, integrity-based trust was more strongly and consistently associated with public acceptability of the natural gas extraction compared to competence-based trust. The findings were rather consistent across four different measurement phases. We discuss the theoretical and practical implications of our findings.

Keywords: integrity-based trust; competence-based trust; acceptability; energy projects

5.2. Introduction

A stable production and provision of energy is essential to social development and human welfare. The successful implementation and continuation of energy projects depends on the extent to which the public finds the projects acceptable (Devine-Wright, 2007; Liu et al., 2020a; Wüstenhagen et al., 2007). We define public acceptability as the extent to which people evaluate the energy projects (un)favourably. Indeed, low public acceptability can lead to delays and even cancellations of energy projects (Boyd, 2017; Papazu, 2017; Shaw et al., 2015).

Energy projects are highly complex (Rossi, 1997; Tritter & McCallum, 2006) and the general public typically does not have sufficient knowledge and skills to implement and manage those projects, and thus has to rely on other agents to do so. Consequentially, trust in agents that are responsible for implementing and managing energy projects, such as governments and energy companies, is an important factor for public acceptability (Braun et al., 2018; Earle & Siegrist, 2006; He et al., 2013; Rayner, 2010; Terwel et al., 2009; Yang et al., 2016). The literature on social license to operate also shows that trust



is important for enhancing public acceptability and social approval of energy projects, because people are more likely to evaluate decisions made by responsible agents as legitimate and credible when they have higher trust in the agent [17,18].

Trust in responsible agents is a complex, much encompassing concept, which has different dimensions (e.g., see Siegrist, 2021 for a review). We will focus on two dimensions of trust that have been found to be related to public acceptability, namely competence-based trust and integrity-based trust (Liu et al., 2020a; Braun et al., 2018; Terwel et al., 2009; Graham et al., 2009; Siegrist et al., 2012). Specifically, people need to trust that these agents have the knowledge and skills to implement and manage the project (i.e., competence-based trust). In addition, people need to trust that the agent is open and honest about managing the project and takes public interests, such as their safety, into account (i.e., integrity-based trust). Research shows that both stronger competence- and integrity-based trust are related to higher public acceptability of energy projects (Liu et al., 2020a; Braun et al., 2018; Terwel et al., 2009; Graham et al., 2009; Siegrist et al., 2012). For example, people found a carbon dioxide capture and storage project more acceptable when they thought that the responsible agent has relevant knowledge and skills to implement and manage the project (i.e., high competence-based trust; Terwel et al., 2009). Similarly, the more people perceived the responsible agent as caring about public interests (i.e., high integrity-based trust), the more acceptable they found energy projects proposed and managed by the agent, such as climate engineering (Braun et al., 2018; Graham et al., 2009; Siegrist et al., 2012).

An important question that remains, however, is to what extent each of the two dimensions of trust is important for public acceptability of energy projects. In other words, are both dimensions of trust equally important for acceptability of energy projects, or is one dimension of trust more important than the other for acceptability of energy projects? Such knowledge would reveal which dimension of trust to prioritise when designing energy projects and which one could be the main barrier for public acceptability. So far, the understanding of this question is limited, as studies typically considered how integrity- or competence-based trust relate to public acceptability of energy projects separately. To study both dimensions of trust at the same time is of particular importance, because integrity-based trust and competence-based trust might be correlated (Siegrist et al., 2003; Yzerbyt et al., 2005). This could mean that integrity-based and competence-based trust do not both uniquely predict acceptability of the energy project as one influences the other, rather than both being important factors for acceptability of an energy project. Hence, the question remains whether and to what extent integrity-based trust and competence-based trust are uniquely related to acceptability of an energy project when controlling for the other dimension of trust.

Correlational studies on real-life genetically modified field projects suggest that perceived morality of responsible agents tends to be more strongly related to project acceptability than perceived performance of responsible agents (Siegrist et al., 2012). Arguably, this is because perceived morality is related to an agent's good or bad intentions about public interests (i.e., integrity), which can particularly influence the extent to which the public finds the project acceptable. In contrast, perceived performance is less indicative of the good or bad intentions of responsible agents, but more of whether the agent has sufficient knowledge and skills to manage the project (i.e., competence). Thereby, competence-based trust is likely to be less useful for inferring whether public interests will be secured, and thus less relevant for evaluating how acceptable people find the project (cf. De Bruin & Van Lange, 1999, 2000). The stronger importance of an agent's morality compared to its competence is also rooted in evolutionary psychology. Namely, knowing whether an agent has good or bad intentions regarding harming or protecting you (i.e., integrity) is more important for survival than knowing whether the agent has the knowledge and skills (i.e., performance) to act in line with their good or bad intentions (Fiske et al., 2007). Drawing on these strings of literature, we expect that integrity-based trust, which primarily relates to the morality of the responsible agent, would have a stronger effect on acceptability of energy projects than competence-based trust, which primarily relates to the performance of the agent.

To our best knowledge, only one study on the acceptability of energy projects examined both dimensions of trust so far, providing initial evidence that integrity-based trust might be more important for public acceptability than competence-based trust (Liu et al., 2020a). Specifically, people found a wind energy project more acceptable when they trusted that the responsible agent is honest and open about its activities and considers public interests (i.e., integrity-based trust), irrespective of the extent to which they thought the agent has sufficient competence to implement and manage the project (competence-based trust). Whereas higher competence-based trust only led to higher project acceptability when integrity-based trust was low (Liu et al., 2020a). In this study, however, people evaluated a hypothetical energy project, with a hypothetical responsible agent, so the question remains whether similar results would be found for a real ongoing energy project, where people are exposed to actual risks and other consequences of the energy project. Research suggests that people may evaluate hypothetical and real energy projects differently (Brügger et al., 2017). For example, people tend to evaluate the responsible agents and the project more positively when they are hypothetical rather than real, as they do not experience real threats from the project (Brügger et al., 2017), which could potentially influence the relationship between trust and acceptability.

5.2.1. Current study

As a case in point, we study public acceptability of an ongoing natural gas extraction project in the province of Groningen, the Netherlands, and people's trust in the main responsible agent⁵ for this project, namely the Dutch Petroleum Company Nederlandse Aardolie Maatschappij (NAM). Natural gas is an important energy source in the Netherlands as it is the primary energy source for heating houses and water, and for cooking. However, natural gas extraction causes earthquakes in the province of Groningen. The strongest earthquake so far was 3.6 on the Richter scale, namely the Huizinge earthquake in August 2012. Inhabitants of the province of Groningen face various negative consequences caused by the earthquakes due to the natural gas extraction, such as damage to houses and drop in house values, physical injury, stress and worry, and reduced quality of living. NAM operates the natural gas extraction and is responsible for assessing, preventing, and mitigating the risks associated with the natural gas extraction. We aim to study to what extent integrity-based and competence-based trust in the NAM are associated with how acceptable the public finds the ongoing natural gas extraction that comes with acute risks of earthquakes and other consequences.

This study is part of a large-scale longitudinal questionnaire study on public opinion about the natural gas extraction and the induced earthquakes in the province of Groningen, consisting of six waves carried out between November 2013 - May 2019 (for more details, see Perlaviciute et al., 2017; Vrieling et al., 2021). The current paper is based on data from the first four phases of the longitudinal study, as the last two phases did not include measures of integrity- and competence-based trust in NAM. The longitudinal design enables us to test our hypothesis over time. Notably, many things happened during the course of the study which may have influenced people's trust in the integrity and the competence of the NAM and their acceptability of natural gas extraction. For example, more induced earthquakes took place in the meantime. Also, the NAM took various mitigation measures to limit the risks caused by natural gas extraction, such as reinforcing houses and compensating people for the damage to their houses (for more details see Perlaviciute et al., 2017; Vrieling et al., 2021). We test whether the relationships between the two dimensions of trust and public acceptability of natural gas extraction are robust and remain stable despite possible changes in the levels of trust in the integrity and competence of the NAM and public acceptability of the natural gas extraction.

⁵ The Dutch government is also an important responsible agent in this project as they decide on how much gas will be extracted (see Van der Voort & Vanclay, 2015).

5.3. Method

5.3.1. Procedure and participants

Across the four phases, 933 participants answered the questions relevant for the aims of this study. The total number of participants per phase is depicted in Table 1. In each phase, participants were asked whether they are willing to participate in subsequent phases, in which case they were approached again in the next phases. At the same time, in each phase, new participants were recruited to ensure similar sample sizes across the phases. The samples are representative of the general population in the province of Groningen (see Appendix for demographic characteristics of the participants in all four phases).

Table 1.
Number of participants per research phase

	Phase 1 November – December 2013	Phase 2 June – July 2014	Phase 3 December 2014	Phase 4 December 2016
Total N (new participants)	390	429 (255)	413 (159)	329 (129)

Note. Not all participants completed all items in the questionnaire, resulting in varying sample sizes in our analyses. New participants refer to those who did not take part in any of the previous phases.

5.3.2. Measures

5.3.2.1. Integrity-based trust

Respondents indicated to what extent they agreed with the following three statements regarding NAM: (1) takes the safety of the population into account, (2) is honest about the risks of gas extraction, and (3) is open about the risks of gas extraction (Braun et al, 2018; Graham et al, 2009). In phase 1, participants were asked to answer those items when considering gas extraction from the Groningen gas field⁶, and in phases 2-4 when considering earthqua-

⁶ We improved the questions of trust in the NAM after phase 1 to better reflect what we aimed to measure: evaluating people's level of trust in the NAM's integrity and competence to manage the risks of the energy project - in this case the earthquakes resulting from the gas extraction activities. Since the respondents in this study are local people exposed to the risks of earthquakes due to gas extraction, it is very likely that they already considered the risks of earthquakes when evaluating their trust in the NAM in phase 1 too. Indeed, despite the slightly different ways of phrasing the items, the pattern of results was very consistent across phases. This suggests that our results are rather robust, despite slightly different phrasing of the items. Still, caution is needed when comparing the results of phase 1 with the results of the other phases.

kes induced by the gas extraction from the Groningen gas field. Responses were given on a 7-points scale, ranging from 1 *totally disagree* to 7 *totally agree*. We computed the mean score of the three items to represent people's trust in the integrity of the NAM; higher scores represent higher levels of integrity-based trust ($\alpha_{T1} = .92$, $\alpha_{T2} = .90$, $\alpha_{T3} = .91$, $\alpha_{T4} = .91$)⁷.

Figure 1 shows that people's trust in the integrity of the NAM was generally low (i.e., below the scale mid-point) and gradually decreased across the four phases.

5.3.2.2. Competence-based trust

Respondents indicated to what extent they agreed with the following three statements regarding the NAM: (1) is competent, (2) has the necessary skills to limit risks of gas extraction, and (3) has the knowledge needed to limit risks of gas extraction (Terwel et al., 2009; Gordon et al; 2017). Again, in phase 1, participants were asked to answer those items when considering gas extraction from the Groningen gas field, and in phases 2-4 when considering earthquakes induced by the gas extraction from the Groningen gas field². Responses were given on a 7-points scale, ranging from 1 *totally disagree* to 7 *totally agree*. We computed the mean score of the three items to represent people's trust in the competence of the NAM; higher scores represent higher levels of competence-based trust

($\alpha_{T1} = .88$, $\alpha_{T2} = .90$, $\alpha_{T3} = .89$, $\alpha_{T4} = .83$). Figure 1 shows that people's trust in the competence of the NAM was not very high (i.e., just above the scale mid-point) and varied only slightly across the phases, from just above to just below the mid-point of the scale.

5.3.2.3. Acceptability of natural gas extraction

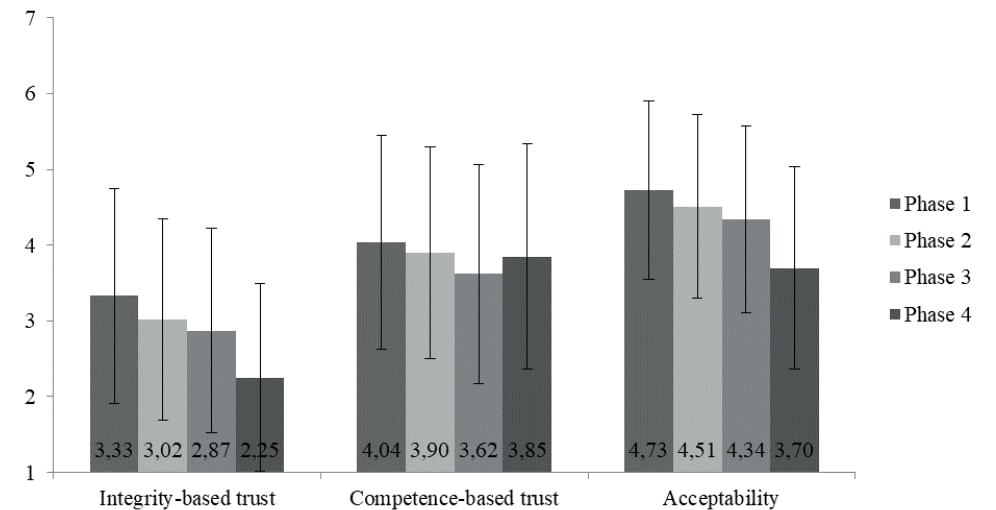
We included four separate items to measure acceptability, namely respondents indicated to what extent they find the natural gas extraction at the Groningen gas field (1) acceptable, (2) useful, (3) good and (4) necessary, respectively, on a 7-point scale ranging from 1 *totally not* to 7 *totally* (Liu et al., 2020a; Palomo-Vélez, 2021). We computed the mean score of the four items that reflect the extent to which people find the natural gas extraction acceptable; higher scores represent higher levels of acceptability

($\alpha T^1 = .83$, $\alpha T^2 = .88$, $\alpha T^3 = .89$, $\alpha T^4 = .90$). Figure 1 shows that people initially found the natural gas extraction somewhat acceptable, yet acceptability decreased across the four phases to just below the scale mid-point.

⁷ We inspected whether integrity- and competence-based trust can be empirically distinguished, by employing the Multiple Group Method (MGM) – a simple and effective type of confirmatory factor analysis (Stuive et al., 2009). Results from the MGM showed that integrity-based trust and competence-based trust could be empirically distinguished in all phases (see Appendix). Notably, the items measuring each dimension of trust correlated strongest with the scale they were assigned to (while correcting for correlations between items and subscales in which the items take part).

Figure 1.

Mean scores and standard deviations of integrity- and competence-based trust in the NAM, and public acceptability of natural gas extraction.



5.4. Results

To test the relationship between integrity-based trust, competence-based trust and acceptability of natural gas extraction, we first conducted correlational analysis. Next, we conducted multilevel modelling for repeated measures to study the unique relationship between the two dimensions of trust and acceptability.

5.4.1. Relationship between integrity-based trust, competence-based trust and acceptability of natural gas extraction

First, we inspected Pearson correlations between integrity- and competence-based trust and public acceptability of natural gas extraction in each phase (see Table 2). Both integrity- and competence-based trust were positively and significantly associated with public acceptability: the more people trust that the NAM was integer and competent, respectively, the more they find the natural gas extraction acceptable. As expected, in most phases, integrity-based trust was more strongly correlated with public acceptability, compared to competence-based trust, except in phase 2 where both dimensions of trust were similarly strongly correlated with public acceptability. The relationships were robust across the four phases.

Table 2.

Correlations between integrity- and competence-based trust, and acceptability

		Competence-based trust	Acceptability
Integrity-based trust	Phase 1	.57*	.32*
	Phase 2	.58*	.31*
	Phase 3	.55*	.40*
	Phase 4	.41*	.39*
Competence-based trust	Phase 1		.23*
	Phase 2		.29*
	Phase 3		.33*
	Phase 4		.27*

Note. * $p < .001$

Next, we used multilevel modelling for repeated measures (e.g., Charlton et al., 2020) to assess the unique relationships between the two dimensions of trust and public acceptability. This enables us to test the robustness of the relationships while accounting for possible differences across measurement phases (Charlton et al., 2020). Multilevel analysis allows us to also use responses of respondents that did not participate in all phases, as multilevel analysis is able to account for missing data. As such, the multilevel analysis for repeated measures allows for variations in the number of available measurements per respondent. Specifically, multilevel analysis treats each measurement as a different observation of the same variable and omits missing measurements from the analysis assuming they are missing at random (see Maas & Snijders, 2003). We used MLwiN (Version 3.05) to build two-level models where the measurement phases (level 1) were nested within individuals (level 2). Measurement phase was added as an uncentered predictor, whereas the dimensions of trust were added using grand mean centering. Effects were tested with approximate t-tests, applying a significance level of $\alpha = .05$.

Results of the multilevel model are shown in Table 3. Measurement phase had a significant negative effect on public acceptability, indicating that public acceptability significantly decreased over time. In line with the correlation analysis, both integrity- and competence-based trust were positively associated with public acceptability. As expected, higher integrity-based trust was more strongly associated with higher public acceptability, compared to competence-based trust. Interestingly, the interaction effect of measurement phase and integrity-based trust was positive and significant, meaning that the effect of integrity-based trust on public acceptability increased over time. The interaction effect of measurement phase and competence-based trust was not significant.

Table 3.

Results of multilevel regression models testing the relationships between integrity-, competence-based trust and acceptability across time

	Estimate	SE	p	95% CI
<i>Fixed effects</i>				
Intercept	4.680	.050	<.001	[4.580;4.780]
Measurement phase	-.228	.025	<.001	[-.278;-.178]
Integrity-based trust	.145	.039	<.001	[.067;.223]
Competence-based trust	.082	.039	.036	[.004;.160]
Phase x integrity-based trust	.073	.020	<.001	[.033;.113]
Phase x competence-based trust	.002	.019	.916	[-.036;.040]
<i>Random effects</i>				
Level-2 variance τ_0^2	.676	.059		
Level-1 variance σ^2	.674	.038		
R^2	19.016			
Deviance	4528.849			

Note. Measurement phase was coded 0 = 1st phase, ascending.

5.5. Conclusion and Discussion

We studied the extent to which integrity- and competence-based trust are associated with public acceptability of a real ongoing energy project with acute risks and other consequences, namely local natural gas extraction. Particularly, we hypothesized that integrity-based trust, compared to competence-based trust, would be more strongly associated with public acceptability. We tested the relationships at different points in time to examine the robustness of the relationships, irrespective of possible changes in the means of the two dimensions of trust and acceptability judgements.

As expected, the results showed that the more people trust that the responsible agent has integrity, and the more they trust that the responsible agent is competent in managing the project, the more the energy project was found acceptable by people. Moreover, as expected, trust in the integrity of the responsible agent was more strongly associated with public acceptability of the natural gas extraction, compared to competence-based trust.

The pattern of results was rather consistent across the different measurement phases, even though public acceptability of the natural gas extraction and the level of integrity-based trust in the NAM decreased over time. This suggests that the relationships we found between the dimensions of trust and public acceptability of the natural gas extraction are rather robust (caution is needed when comparing phase 1; see Footnote 2). Interestingly,

the relationship between integrity-based trust and acceptability of the natural gas extraction got even stronger over time. The NAM changed some practices in limiting risks caused by the gas extraction over the years which may have influenced the effect of integrity-based trust on the acceptability of natural gas extraction. We did not measure how people perceived such changes and thus we could not control for these perceived changes empirically. Importantly, the main aim of this paper is to examine the relationship between the two dimensions of trust and acceptability, and we found integrity-based trust was more strongly associated with acceptability than competence-based trust across different measurement phases.

Our results have important theoretical implications. The findings are in line with the literature which shows that in situations where people have to rely on others, two factors are important for people's responses to such situations: people's perception of the other's good intentions (i.e., their integrity), and their knowledge and skills (i.e., their competence; cf. De Bruin & Van Lange, 1999, 2000; Fiske et al., 2007; Earle, 2010; Wojciszke et al., 1998; Wojciszke & Abele, 2008). More importantly, the finding that integrity-based trust is more important for acceptability of energy projects compared to competence-based trust not only applies for hypothetical projects where people may not yet experience and/or foreseen actual acute risks and other consequences (Liu et al., 2020a), but also applies for real ongoing energy projects with actual acute risks and other consequences. These findings support our reasoning that trusting whether an agent will be open and honest and protect public interests, which is reflected in integrity-based trust, is more important for public acceptability of an energy project than trusting whether an agent has the knowledge and skills to manage the project. Future research could test whether integrity-based trust also plays a more important role in acceptability in different contexts, such as with different types of operators involved (e.g., government vs. industry), and for different types of energy projects (e.g., projects that may involve different costs and benefits), and culture.

Our findings also have important practical implications. Many energy companies are trying to improve people's trust in them by emphasising that they are open and honest and care about public interests through promotions in the media (i.e., high in integrity-based trust), and that they are competent in managing their energy projects through recruiting staff with sufficient knowledge and skills (i.e., high in competence-based trust). Our results suggest that considering both dimensions of trust is important for securing public acceptability. Yet, strategies focused on integrity-based trust seem particularly important to enhance and secure public acceptability of energy projects, as our results suggest that (perceived) integrity of energy companies might be more important for public acceptability of their energy projects than (perceived) competence of energy companies. Hence, in order to enhance public acceptability of the energy projects, energy companies primarily need to be open and honest about the energy projects and the associated risks and other conse-

quences, and protect public interests, which could be one way to enhance people's integrity-based trust. Importantly, it may not be sufficient for energy companies to only communicate that they care about public interests. Rather, their actions need to demonstrate that they have integrity. If they say they are honest but cannot prove so or even worse that their actions show the opposite, this may even lower people's trust in their integrity. Future research could study what are other effective ways to enhance trust besides being open and honest about risks and protecting public interests, such as organizing more transparent public participation and decision-making procedures to increase integrity-based trust.

Due to the correlational design of our study, it cannot be ruled out that causality can also go in the other direction, namely that acceptability influences the extent to which people trust the responsible agent. While the literature shows that indeed having higher integrity-based and competence-based trust enhances acceptability of energy projects, it could also be that people trust that the agent has integrity and is competent, because they already think the project is of good quality and find the project acceptable. Future research could apply (field) experimental designs or longitudinal designs to study if this can be the case.

Future research could test if and how integrity-based trust and competence-based trust are related to each other and whether one influences the other. We found that the two dimensions of trust are positively related to each other (see Table 2). This is in line with other studies showing that the two dimensions of trust are positively correlated (Siegrist et al., 2003). Following the social cognition literature, we assumed that integrity and competence are two conceptually different components, which people rely on to form an evaluation of an agent (Fiske et al., 2002; Fiske et al., 2007; Wojciszke et al., 1998), and our findings support this assumption as we were able to empirically distinguish the two dimensions of trust and found that both dimensions were uniquely associated with public acceptability. Other studies also found that integrity- and competence-based trust can be empirically distinguished (e.g., Siegrist et al., 2012). Future studies could consider other dimensions of trust as well, such as trust in past behaviour of responsible agents (Earle & Siegrist, 2008), and test how it is related to public acceptability, next to integrity-based and competence-based trust.

To conclude, our research empirically examined how integrity- and competence-based trust are related to public acceptability of a real ongoing energy project. Our study indicates that both higher integrity- and competence-based trust are associated with higher public acceptability of real energy projects. Yet, integrity-based trust was most strongly associated with public acceptability of the energy project compared to competence-based trust. The pattern of the results was rather consistent over four different measurement phases. Policies aimed at promoting public acceptability of energy projects

should particularly consider increasing perceived integrity of the responsible agent(s), as to secure public acceptability and thereby a stable energy production and provision.

5.6. Appendix

Table 1.
Socio-demographic characteristics of the participants per research phase

		Phase 1	Phase 2	Phase 3	Phase 4
Gender	Female	43%	45%	43%	46%
	Male	54%	52%	56%	53%
	Missing values	2%	2%	1%	1%
Age (in years)	<i>M (SD)</i>	52.15	52.66	54.81	51.37
	Minimum	19	18	20	18
	Maximum	90	84	84	91
	Missing values	3%	2%	1%	1%
Highest completed education	Primary school	2%	1%	1%	5%
	Lower vocational	9%	9%	7%	8%
	Secondary	36%	33%	35%	33%
	Higher vocational	36%	31%	27%	41%
	Scientific education	12%	9%	6%	10%
	Other	2%	1%	1%	0%
Missing values	3%	16%	22%	3%	
Income per month	< €1000	4%	3%	3%	7%
	€1000-€2000	25%	26%	23%	23%
	€2000-€3000	28%	25%	23%	25%
	€3000-€4000	20%	17%	18%	30%
	€4000-€5000	8%	6%	8%	5%
	>€5000	4%	2%	1%	5%
	Missing values	11%	21%	25%	7%
Length of residence in the area (in years)	<i>M (SD)</i>	30.59	31.95	34.40	32.25
	Minimum	.50	1	1	1
	Maximum	83	83	80	83
	Missing values	2%	15%	20%	1%

Table 2.
Multiple Group Method (MGM) for integrity- and competence-based trust

		Phase 1		Phase 2		Phase 3		Phase 4	
		Integrity-based trust	Competence-based trust	Integrity-based trust	Competence-based trust	Integrity-based trust	Competence-based trust	Integrity-based trust	Competence-based trust
Integrity-based trust	The NAM takes the safety of the population into account.	.74	.46	.71	.53	.71	.46	.75	.35
	The NAM is honest about the risks of gas extraction.	.81	.48	.79	.47	.80	.48	.82	.31
	The NAM is open about the risks of gas extraction.	.79	.48	.78	.45	.79	.42	.77	.29
Competence-based trust	The NAM is competent.	.49	.62	.48	.71	.46	.69	.37	.54
	The NAM has the necessary skills to limit risks of gas extraction.	.46	.75	.52	.79	.49	.75	.32	.65
	The NAM has the knowledge needed to limit risks of gas extraction.	.46	.76	.46	.79	.41	.73	.27	.68

Note. The correlations in the table are corrected for correlations between items and subscales in which the items take part. Strongest correlations are printed in bold.



Chapter 6. General discussion

Energy is essential to people's daily lives. Various energy projects have been planned and implemented to secure access to energy. Such projects are typically associated with both negative and positive consequences, such as environmental risks caused by fossil fuel production, or environmental benefits from renewable energy production. People may respond to energy projects and their various consequences in different ways, including experiencing negative and positive emotions towards the energy project (Perlaviciute et al., 2018) and evaluating a project as either less or more acceptable (Perlaviciute & Steg, 2015). Furthermore, people can engage in different ways of coping with the risks of energy projects. The way people respond to energy projects can in turn influence people's well-being, as well as the implementation and continuation of the respective energy projects. Accordingly, it is important to understand how people respond to energy projects and what influences their responses.

In this PhD dissertation, we proposed that for understanding public responses to energy projects, it is critical to consider that such projects and the associated consequences are often mostly controlled by external parties, such as governments and industry. Specifically, we argued that people's responses to externally controlled energy projects may depend on how much trust they have in responsible parties, because they need to rely on those parties for implementing and managing the projects responsibly. First, we proposed and tested the hypothesis that the extent to which people experience different types of negative emotions towards energy projects depends on the extent to which people perceived the projects as risky, and the level of trust in responsible parties. Second, we examined how negative emotions are related to the way people cope with the risks of energy projects, and proposed a novel type of problem-focused coping that has not been considered before and may be important for coping with externally controlled activities: others-focused coping, namely urging responsible parties to manage and reduce the risks. Third, we examined whether trust in responsible parties is also related to the likelihood that people experience positive emotions towards energy projects, next to the perceived consequences of those projects. Fourth, we studied to what extent different types of trust in responsible parties are related to how acceptable people find energy projects.

6.1. Perceived risks and trust elicit different types of negative emotions towards externally controlled risks of energy projects

We first examined to what extent externally controlled energy projects evoke different types of negative emotions in people, and which factors are related to the strength of these negative emotions. Appraisal theories suggest that the extent to which people experience different types of negative emotions depends on the extent to which activities are perceived to be associated with risks, and the extent to which people feel able to control these risks (e.g., La-

zarus, 1991; Roseman & Smith, 2001; Frijda, 2007; Ortony et al., 1988; Scherer, 1999; Smith & Ellsworth, 1985). Yet, we reasoned that in the case of energy projects, people have little control themselves over the project and the associated risks, as these projects are typically implemented and managed by external parties. This suggests that people's perception of their own ability to control the risks may be less relevant for understanding responses towards risky energy projects. We therefore reasoned that the extent to which externally controlled energy projects elicit negative emotions depends on the extent to which people think that responsible parties can and will control those risks. Hence, we proposed that, besides the perceived risks of energy projects, the extent to which people trust the responsible parties is related to the extent to which people experience negative emotions towards the risks of energy projects.

We studied which specific negative emotions and to what extent negative emotions are associated with perceived risks of energy projects and trust in responsible parties. First, energy projects may elicit consequence-based emotions, which are focused on the potential negative consequences or risks of energy projects (Böhm & Pfister, 2000, 2005, 2017; Hendrickx & Nicolaij, 2004). People are likely to experience stronger negative consequence-based emotions the more they believe an energy project poses risks. Second, people may experience negative morality-based emotions towards energy projects; such emotions are focused on whether the risks result from violations of moral values and norms, and the perceived morality of responsible parties (Böhm & Pfister, 2000, 2005, 2017; Hendrickx & Nicolaij, 2004). This suggests that people are more likely to experience negative morality-based emotions if they have less trust in the responsible parties. Third, people may feel powerless towards energy projects, especially when they think they cannot rely on responsible parties to manage and control the risks (Böhm & Pfister, 2005, 2017; Perlaviciute et al., 2017). Therefore, we expected lower levels of trust in responsible parties to be associated with stronger feelings of powerlessness towards energy projects.

In Chapter 2, we tested the relationships between perceived risks of externally controlled energy projects and trust in responsible parties, on the one hand, and consequence-based emotions, morality-based emotions and feelings of powerlessness, on the other hand. As a case in point, we focused on an energy project that is associated with prominent risks, namely natural gas extraction and the induced earthquakes in the Netherlands. The gas extraction and the risks of earthquakes are controlled by two external parties, namely the Dutch Petroleum Company NAM and the Dutch government (see Perlaviciute et al., 2007). As expected, and in line with previous research, we found that higher perceived risks of the earthquakes caused by gas extraction were related to stronger negative consequence-based emotions towards the risks, such as fear. Interestingly, and extending previous work, we found that higher perceived risks of earthquakes were also related to stronger morali-

ty-based emotions, such as anger, and feelings of powerlessness towards the risks.

Furthermore, as expected, lower trust in responsible parties was related to stronger morality-based emotions and stronger feelings of powerlessness, while trust was not significantly uniquely related to consequence-based emotions. This supports our reasoning that in situations where people themselves have little control over risks and therefore have to rely on responsible parties for mitigating the risks, trust in responsible parties affects the extent to which people experience morality-based emotions and feelings of powerlessness. These findings suggest that it is indeed important to consider trust in responsible parties to understand the extent to which people experience negative emotions towards externally controlled energy projects. At the same time, perceived (high) risks were associated with all three types of negative, namely consequence-based emotions, morality-based emotions and feelings of powerlessness, and were more strongly related to each type of negative emotions than trust in responsible parties. These findings suggest that perceived risks are a key predictor of different negative emotions towards externally controlled energy projects. To conclude, people are particularly likely to experience negative emotions the more they believe an energy project poses serious risks, as in the case the earthquakes due to gas extraction for example. People will experience even stronger negative morality-based emotions and feelings of powerlessness if they have little trust in parties that are responsible for managing and reducing the risks.

6.2. Emotions affect how people cope with risks of externally controlled energy projects

Next, we examined how people cope with the risks of externally controlled energy projects. Coping refers to cognitive and behavioural responses aimed at managing or reducing risks (Lazarus & Folkman, 1984). Two types of coping with risks have been distinguished: emotion-focused coping and problem-focused coping (Folkman & Lazarus, 1980, 1985; Folkman et al., 1986; Lazarus & Folkman, 1984). Emotion-focused coping entails preventing or reducing the negative emotions elicited by the risks, such as by avoiding thinking or talking about the risks or denying being exposed to the risks. Problem-focused coping entails taking action to prevent or reduce the risks and/or negative consequences. Examples are reducing the behaviour that causes the risks (e.g., stop smoking to prevent health risks) or taking protective action to reduce the negative consequences of the risks (e.g., buy flood insurance).

The way people cope with risks can influence their emotional and physical well-being and support for energy projects, which makes it an important response to energy projects to study. Most studies examined how people cope with risks that are within an individual's control (i.e., internally controlled risks), or naturally occurring risks (e.g., Babcock & Seebauer, 2019; Barbour et al., 2012; Grothmann & Reusswig, 2006; Miceli et al., 2008; Schmidt

et al., 2010; Takao et al., 2011; Tannenbaum et al., 2015). The question remains whether people engage in similar coping strategies when exposed to risks from activities that are controlled by external parties, which is often the case with energy projects.

We proposed that an additional type of coping may be relevant when people have to deal with externally controlled risks. Specifically, extending previous theorising, we distinguished two types of problem-focused coping: self-focused coping and others-focused coping. Self-focused coping means - similar as in the case of internally controlled and naturally occurring risks - that people take action themselves to reduce the negative consequences of risks of energy projects. However, in case of externally controlled energy projects, people may also urge responsible parties to take action to reduce the risks; we call it others-focused coping. Examples are protesting or signing a petition to urge responsible parties to stop risky activities. Others-focused coping, as a type of problem-focused coping, has not yet been considered in research, but it seems highly relevant for understanding how people cope with the risks that are controlled by others.

In Chapter 3, we studied how people cope with the risks of an externally controlled energy project: the risks of earthquakes from natural gas extraction in the Netherlands. We first examined whether others-focused coping is indeed a relevant and distinct type of way to cope with the risks caused by externally controlled energy projects, next to self-focused coping and emotion-focused coping. Second, we examined to what extent people indeed engage in others-focused coping when faced with the risks of externally controlled energy projects. As expected, we found that others-focused coping, self-focused coping and emotion-focused coping could be empirically distinguished. Furthermore, we found that people were rather likely to engage in others-focused coping when faced with the risks of gas extraction, to a similar extent as they would engage in self-focused coping. People were in general less likely to engage in emotion-focused coping. These findings support our reasoning that it is important to consider others-focused coping in order to better understand how people deal with situations where they have little control over risky activities and have to rely on external parties for mitigating the risks.

Next, we examined to what extent different coping strategies depend on the three types of negative emotions that can be elicited by externally controlled energy projects, namely consequence-based emotions, morality-based emotions, and feeling powerless. We hypothesised that people are most likely to engage in emotion-focused coping when they feel powerless towards the risks of energy projects. Specifically, when people feel powerless towards reducing the risks of energy projects, they may think that their situation cannot be changed, and may therefore rather try to reduce their negative emotions, for example by trying not to think about the risks. Furthermore, in line with

research on internally controlled risks and naturally occurring risks, we hypothesized that people are more likely to engage in self-focused coping when they experience negative consequence-based emotions. Consequence-based emotions are mostly elicited when people perceive that energy projects cause negative consequences, and self-focused coping strategies are orientated towards reducing those negative consequences. Next, we hypothesized that people are more likely to engage in others-focused coping when they experience strong morality-based emotions. This is because people may want to urge responsible parties to take action to reduce the risks and thereby correct moral violations that had evoked the negative morality-based emotions. Yet, we argue that others-focused coping might also stem from negative consequence-based emotions, as engaging in others-focused coping could prevent or reduce the negative consequences of the risks.

Different from what we expected, when including all types of emotions, emotion-focused coping was not significantly related to feelings of powerlessness, but was rather most strongly and positively related to negative consequence-based emotions. There is some earlier research showing that stronger consequence-based emotions might increase the likelihood of emotion-focused coping, particularly when these emotions stem from feeling uncertain about the risks (Lerner & Keltner, 2000, 2001). People may feel uncertain about the risks especially when they think that the risks are not within human control (Smith & Ellsworth, 1985). Therefore, people may tend to engage in emotion-focused coping as a way to cope with risks when they think that nobody can do anything about the risks anyway. Future research could test whether consequence-based emotions are indeed most strongly related to emotion-focused coping when people feel highly uncertain about the risks.

As expected, stronger consequence-based emotions were related to more self-focused coping. This finding replicates and extends previous research by showing that consequence-based emotions increase the likelihood that people engage in self-focused coping not only when facing internally controlled risks and naturally occurring risks, but also when coping with externally controlled risks, such as the risks from energy projects.

Importantly, in line with our reasoning, we found that stronger morality-based emotions, and to a lesser extent stronger consequence-based emotions, were associated with stronger intentions to engage in others-focused coping. This supports our reasoning that when people have little control over risks and have to rely on responsible parties for mitigating the risks, people are likely to experience stronger negative morality-based emotions, which motivates them to engage in others-focused coping. Interestingly, the three types of emotions explained a larger proportion of the variance in others-focused coping compared to the other two types of coping. This suggests that others-focused coping is relatively more strongly driven by emotions compared to the other types of coping that have been considered in research so far.

Interestingly, when including all emotions, only consequence-based emotions were significantly associated with stronger intentions to engage in all three types of coping strategies. This suggests that in case of externally controlled risks from energy projects, consequence-based emotions can motivate people to cope in different ways. In contrast, morality-based emotions were mostly related to others-focused coping, while feeling powerless was not significantly associated with any type of coping when controlling for the other types of emotions. All in all, our findings show that people can engage in different strategies to cope with externally controlled risks, and that they are especially likely to do so when they experience negative consequence-based emotions. We further demonstrated that people engage in others-focused coping when dealing with the risks of energy projects, more so when they experience negative emotions, especially morality-based emotions.

6.3. Perceived consequences and trust not only elicit negative emotions, but also positive emotions towards energy projects

Externally controlled energy projects typically not only cause risks, which may evoke negative emotions in people, but also have positive outcomes, which, we reasoned, could elicit positive emotions in people. Therefore, we examined to what extent perceived consequences, ranging from negative to positive, are related to both negative and positive emotions towards energy projects. Our next question was whether trust in responsible parties would also be related to the likelihood that people experience positive emotions towards energy projects, in addition to the perceived positive consequences of those projects. While people may experience negative emotions if they lack trust in responsible parties, they may as well experience positive emotions if they trust responsible parties.

In Chapter 4, we tested the extent to which perceived consequences of externally controlled energy projects, ranging from negative to positive consequences, and trust in responsible parties are associated with both negative and positive emotions towards the energy projects. This time, we focused on two renewable energy projects that people may associate with both negative and positive outcomes, namely a local heat network and a local wind park. We studied trust in two parties that are mainly responsible for developing and implementing the heat network: the municipality of Groningen, which explores the option of implementing a heat network and decides which utility company will be hired to develop and manage the heat network, and the grid company Enexis, which builds the infrastructure for the heat network. In the case of the wind park, we examined trust in the municipality of Groningen, which was the main party responsible for this project at the time of the study.

In general, we found that perceived consequences and trust in responsible parties could explain both negative and positive emotions elicited by both renewable energy projects. Specifically, people experienced more positive emotions and less negative emotions when they believed the energy

projects had more positive (and less negative) consequences, and when they had more trust in the responsible parties. Similar to what we had observed for perceived risks, perceived consequences in general were more strongly related to people's emotions towards energy projects than trust in responsible parties. In fact, trust in responsible parties was not always significantly related to emotions when perceived consequences of energy projects were controlled for. In fact, in case of emotions towards the heat network project, only trust in the local municipality was associated with positive emotions, whereas only trust in the grid company was associated with negative emotions. People may hold different parties responsible for different things (e.g., governments for a good process in general, and the infrastructure companies for making sure the technology works smoothly and safely), which could affect whether trust affects emotions.

6.4. Integrity-based trust is more strongly related to public acceptability of externally controlled energy projects than competence-based trust

Next, we studied the relationship between trust in responsible parties and public acceptability of energy projects. Two dimensions of trust have been found to be related to public acceptability of energy projects: competence-based trust and integrity-based trust (Braun et al., 2018; Graham et al., 2009; Liu et al., 2020a; Siegrist et al., 2012; Terwel et al., 2009). Competence-based trust reflects the extent to which people trust that responsible parties have the knowledge and skills to implement and manage the energy project. Integrity-based trust reflects the extent to which people trust that the responsible parties are open and honest about how they implement and manage the energy project and take public interests into account. The question is which dimension of trust is most strongly related to acceptability of energy projects. Such knowledge would reveal what is most important to people when they have to rely on responsible parties and thus what responsible parties need to focus on mostly when designing energy projects. We aimed to test to what extent each of the two dimensions of trust is important for public acceptability of energy projects.

We reasoned that integrity-based trust could be more important for acceptability of energy projects compared to competence-based trust, because people care more about whether responsible parties implement and manage the project in a way that protects public interests rather than whether they have the knowledge and skills to implement and manage the project. Initial evidence from experimental studies indeed found that integrity-based trust is more strongly related to acceptability of projects than competence-based trust (Liu et al., 2020a). However, this study looked at a hypothetical energy project. Therefore, the question remains whether the same is true for real projects, especially when projects have severe risks as trust in responsible parties might be particularly important for acceptability. In Chapter 5, we tested the extent to which integrity-based trust and competence-based trust are related to public acceptability of a real-life energy project that comes with

prominent externally controlled risks, where people need to rely on responsible parties to manage those risks: a gas extraction project that causes recurring earthquakes.

We found that higher integrity-based trust and higher competence-based trust were both uniquely related to higher public acceptability of the natural gas extraction project that induces earthquakes. This replicates our previous findings that trust is an important factor explaining people's responses to situations where people have little control over the risks themselves. Importantly, as expected, we found that integrity-based trust was more strongly associated with public acceptability of the energy project compared to competence-based trust. We therefore showed that also in real-life projects with real risks, particularly the perceived integrity of responsible parties can play an important role in public acceptability of such projects.

6.5. Theoretical implications and future research directions

In this dissertation we focused on externally controlled energy projects and found that perceived consequences and trust in responsible parties play a role in understanding how people respond emotionally to energy projects. Studies on people's emotional responses to risky activities have mostly focused on risks that are within an individual's control or are naturally occurring risks. Perceived risks and perceived one's ability to control the risks have been found to be important factors that influence people's emotional responses towards such risks (Lazarus & Folkman, 1984). We reasoned and found that in case of energy projects, where people have little control over risks and have to rely on responsible parties to manage the risks, trust in responsible parties is an important predictor, besides the perceived risks, of people's negative and positive emotions towards these projects. This is an important finding because it means that increasing trust might not only reduce negative emotions, but could also strengthen positive emotions towards energy projects. Trust was particularly related to the types of emotions that are likely to be most directed at the actions of responsible parties, notably morality-based emotions and feeling powerless. Trust in responsible parties was not significantly related to consequence-based emotions, which can be explained by the fact that consequence-based emotions mostly stem from the appraisal of the risks and not from the appraisal of the agent causing the risks.

Furthermore, we reasoned and found that people may engage in a specific type of problem-focused coping when facing externally-controlled energy projects: others-focused coping. Others-focused coping is likely particularly important for externally controlled activities where people have to mainly rely on responsible parties for risk mitigation, because they themselves can do little to reduce the risks. In such cases, it could be more effective to urge responsible parties to take actions to reduce the risks. We found that others-focused coping can indeed be empirically distinguished from self-focused coping and emotion-focused coping, and that people were rather likely to

engage in others-focused coping when faced with the risks from energy projects. We further found that stronger consequence-based emotions increase the likelihood that people engage in all three types of coping, while stronger morality-based emotions mainly increased the likelihood that people engage in others-focused coping.

Future research could study whether our findings also apply to other types of risks, such as internally controlled risks, naturally occurring risks and climate risks, by examining whether similar responses occur and similar factors play a role in eliciting these responses. Notably, internally controlled risks and naturally occurring risks are also not fully within people's control, and are also at least partly caused by actions of external parties. For example, in case of health risks caused by smoking, the tobacco industry can be held partially responsible for the risks by making cigarettes more addictive, and promoting smoking. Hence, people can experience negative emotions focused on the actions of those responsible parties, such as morality-based emotions, which can be elicited by a lack of trust in those parties. Furthermore, the risks of smoking can be reduced by engaging in other-focused coping strategies and urging the tobacco industry to take action and make smoking less addictive and attractive. Similarly, governments could drastically increase prices for cigarettes and prohibit cigarette advertisements. In a similar vein, governments can be seen as responsible for taking action to reduce risks caused by natural disasters, such as earthquakes and volcano eruptions. Even though governments cannot control the causes of naturally occurring risks, they could protect the public from the negative impacts of such risks and can thus be urged to do so. For example, governments could plan evacuation routes, provide shelter, and provide financial help in case of natural hazards.

A particularly interesting case where our findings can have important implications are risks caused by climate change, such as extreme weather events, droughts and heat waves. Not only individuals, but also external parties, such as government and industry, can be seen as responsible for removing or reducing the causes of such risks (i.e., climate change mitigation) and preventing or reducing the negative consequences climate risks (i.e., climate change adaptation). Future research could study the extent to which perceived consequences of climate change and trust in various parties involved influences people's emotional responses to climate change, and to what extent different types of emotions are associated with coping with climate risks, including others-focused coping.

6.6. Limitations

Throughout this dissertation, we tested the relationship between the variables of interest, namely perceived consequences of energy projects, trust in responsible parties, emotions, coping strategies, and acceptability of energy projects, following correlational designs. Therefore, we are not able to draw causal conclusions about the relationship between these variables. It cannot

be ruled out that causality might also go in another direction. For example, negative emotions may influence the perception of consequences (Finucane et al., 2000; Merk & Pönitzsch, 2017; Midden & Huijts, 2009; Montijn Dorgelo & Midden, 2008; Loewenstein, 2001; Slovic et al., 2007). Based on the affect heuristic (Finucane et al., 2002) and the risks as feelings hypothesis (Loewenstein et al., 2001), it may be expected that emotions towards energy projects affect perceived consequences of those projects. Specifically, people may experience positive and negative initial feelings towards an activity, which then colours their evaluations of consequences, for example based on their previous experiences with similar activities. When the feelings towards the activity are primarily positive, people are more likely to perceive an activity as having high benefits and low risks. On the other hand, when people primarily experience negative emotions, they may be more inclined to perceive few benefits and high risks. Further, emotions may affect perceived risks indirectly through coping with risks: the stronger negative emotions people experience, the more they may engage in coping, which could either reduce the risks (through problem-focused coping) or make people deny the risks (emotion-focused coping), which in both cases would result in lower perceived risks.

Similarly, we cannot rule out the possibility that acceptability influences trust rather than trust leads to acceptability, or that these relationships are bidirectional too. While the literature shows that having higher integrity-based and competence-based trust indeed enhances acceptability of energy projects, it could also be that people trust that the agent has integrity and is competent, because they think the project is of good quality and find the project acceptable. Future research could employ experimental designs and/or longitudinal designs to study if these potential bidirectional relationships and feedback loops take place.

In Chapter 3, we tested how negative emotions explained coping intentions. Studies have suggested that intentions are relatively good indicators of actual behaviour (Webb & Sheeran, 2006). However, future research is needed to test whether our findings on coping intentions can be replicated when studying actual coping behaviour, for example by asking people to sign up as a member of a protest group to urge responsible parties to take action to reduce the risks (i.e., others-focused coping). Furthermore, in this dissertation we looked at others-focused coping behaviour directly focused on stopping or reducing risky activities, thereby preventing or reducing the risks. Future research could look at others-focused coping behaviour focused on preventing or reducing the negative consequences of the risks, such as offering compensation for risks and damage encountered, or to implement protective measures to alleviate negative consequences of energy projects (e.g., reinforcing houses to prevent physical injury in case of induced earthquakes from energy projects).

Lastly, while we looked at actual real-life energy projects, these projects are all located in the same region, namely the province of Groningen in the Netherlands. As all participants were from the same region, there might have been factors unique to this region that might have affected people's responses to energy projects and the relationship between factors explaining the responses to energy projects. Therefore, future research could test whether our results can be replicated in different regions or countries.

6.7. Practical implications

Our findings have important practical implications for responsible parties who aim to implement and manage energy projects that are aimed to be both socially responsible and acceptable. Given that perceived consequences of energy projects were consistently and most strongly related to people's emotions, one obvious strategy is to reduce the (perceived) negative consequences and increase the (perceived) positive consequences of energy projects as much as possible in order to increase people's positive emotions and reduce negative emotions towards energy projects. Next, an important strategy is to increase and/or ensure high trust in responsible parties, which can reduce people's negative emotions, strengthen positive emotions, and increase public acceptability of energy projects. This requires responsible parties to not only communicate but also to show with real actions that they can be trusted. If successful, they can enhance people's well-being by reducing negative emotions and increasing positive emotions, and, even though some risks would remain, by demonstrating to people that they can rely on external parties for dealing with the risks in a socially responsible way. Furthermore, especially increasing integrity-based trust is critical for responsible parties to have a license to operate, as we found that particularly integrity-based trust is important for enhancing and ensuring public acceptability of energy projects. Responsible parties could increase integrity-based trust by being transparent in their communication and showing that they can manage the project in a way that public interests are ensured, for example by taking concrete measures to guarantee people's safety and making sure that benefits flow to communities that host the energy projects.

Our results show that when people are exposed to externally controlled risks, they may not only take action themselves to reduce the negative consequences of energy projects, but they may also urge responsible others to act to reduce the risks, the more so the more they experience negative consequence-based emotions and particularly morality-based emotions. This suggests that responsible parties can expect people will urge them to do something about the risks when the public experiences these strong negative emotions. To reduce such negative emotions and thereby reduce the likelihood of others-focused coping actions such as protests, responsible parties could take action themselves as early as possible to reduce the risks and to incorporate public interests. One way to better engage with people's concerns could be by involving the public in the planning, implementation, and evalu-

ation of energy projects, for example to discuss how to best reduce the risks and how to best compensate for the eventual risks (i.e., public participation in decision-making; Perlaviciute, 2022). Such a constructive dialogue may prevent legal action and protests later on.

6.8. Conclusions

In conclusion, we proposed that in situations where people lack control and have to rely on external parties for managing (the consequences of) energy projects, trust in responsible parties is an important factor to explain emotional responses towards (the consequences of) projects, in addition to the perceived consequences of the project. Specifically, higher levels of trust are associated with weaker negative emotions and stronger positive emotions towards energy projects, and higher public acceptability of energy projects. Particularly integrity-based trust is related to public acceptability of energy projects. Furthermore, we found that people are likely to cope with the risks of externally controlled energy projects by engaging in others-focused coping: urging responsible parties to take actions to reduce the risks. This novel type of problem-focused coping has not been identified before, but can play an important role in how people cope with risks of externally controlled energy projects. All in all, this dissertation suggests that reducing negative and increasing positive consequences of energy projects, and having trustworthy parties could help facilitate positive rather than negative public responses to energy projects. This is important for both ensuring the well-being of people as well as the socially responsible implementation of energy projects in order to ensure a reliable energy supply.

Nederlandse samenvatting

Energie is essentieel voor ons dagelijkse leven. Er worden verschillende energieprojecten ontwikkeld om huishoudens te voorzien van energie, zoals aardgaswinning, windmolenparken en warmtenetten. Deze energieprojecten hebben vaak zowel negatieve als positieve gevolgen voor mensen, zoals negatieve gevolgen van gaswinning voor de kwaliteit van leven van omwonenden en het milieu, en positieve gevolgen van duurzame energieprojecten voor lokale werkgelegenheid en het klimaat. Mensen kunnen op verschillende manieren reageren op energieprojecten en de daarbij horende gevolgen, waaronder het ervaren van negatieve en positieve emoties (Perlaviciute et al., 2018) en een project evalueren als meer of minder acceptabel (Perlaviciute & Steg, 2014). Daarnaast kunnen mensen op verschillende manieren omgaan met de negatieve gevolgen en risico's van energieprojecten door het vertonen van verschillende zogenaamde *copingstrategieën*, namelijk bepaalde manieren om met de risico's van energieprojecten om te gaan. De manier waarop mensen reageren op en omgaan met energieprojecten kan een effect hebben op hun welzijn, en op de succesvolle voortgang van energieprojecten. Daarom is het belangrijk om te onderzoeken op welke manier mensen reageren op energieprojecten en welke factoren daar invloed op hebben.

In dit proefschrift stelden wij dat, om te begrijpen hoe mensen reageren op energieprojecten, het belangrijk is om te erkennen dat vooral externe partijen, zoals overheden en industrie, in de regel controle hebben op energieprojecten en de bijbehorende gevolgen; wij hebben het daarom over extern gecontroleerde energieprojecten. Dit betekent dat mensen afhankelijk zijn van externe partijen die verantwoordelijk zijn voor het ontwikkelen en het beheren van energieprojecten, alsmede voor het beperken en managen van risico's van energieprojecten. Extern gecontroleerde energieprojecten verschillen daarom van andere risicovolle activiteiten waar mensen zelf controle over hebben, zoals persoonlijke risico's van een ongezonde leefstijl, wat wij intern-gecontroleerde risico's noemen. Extern gecontroleerde energieprojecten en de daarbij horende risico's zijn ook anders dan risico's die een natuurlijke oorzaak hebben waar niemand volledige controle over heeft, zoals natuurrampen. Mensen kunnen daarom mogelijk anders reageren op extern gecontroleerde activiteiten en de risico's die daardoor worden veroorzaakt, en andere factoren kunnen effect hebben op reacties van mensen op deze activiteiten, vergeleken met intern-gecontroleerde risico's en natuurlijke risico's.

In dit proefschrift werd eerst onderzocht welke factoren samenhangen met de mate waarin mensen verschillende negatieve emoties ervaren over de risico's van extern gecontroleerde energieprojecten. Volgens *appraisal theorieën* hangt de mate waarin men verschillende emoties ervaart af van de mate waarin mensen risico's ervaren en de mate waarin mensen het gevoel hebben zelf controle te hebben over deze risico's (Lazarus, 1991; Roseman &



Smith, 2001; Frijda, 2007; Ortony et al., 1988; Scherer, 1999; Smith & Ellsworth, 1985). In het geval van energieprojecten hebben mensen echter vaak weinig controle over het project en de bijbehorende risico's, omdat deze projecten vaak ontwikkeld en beheerd worden door externe partijen. Dit impliceert dat de mate waarin mensen zelf een gevoel van controle hebben over de risico's minder relevant is om te begrijpen welke emoties worden opgeroepen door risicovolle energieprojecten. Daarom beredeneerden wij dat de mate waarin risico's van extern gecontroleerde energieprojecten leiden tot negatieve emoties afhangt van de mate waarin mensen denken dat verantwoordelijke partijen controle hebben over de risico's. Dit betekent vervolgens dat de mate waarin energieprojecten emoties oproepen afhangt van de mate waarin mensen vertrouwen hebben in de verantwoordelijke partijen, naast de mate waarin mensen risico's ervaren.

Afhankelijk van in hoeverre mensen projecten als risicovol zien en hoeveel vertrouwen ze in verantwoordelijk partijen hebben, kunnen mensen verschillende types negatieve emoties ervaren. Wij stelden voor dat waargenomen risico's vooral sterk gerelateerd zijn aan 'consequence-based' emoties, omdat zulke emoties gericht zijn op de potentiële negatieve gevolgen van energieprojecten (Böhm & Pfister, 2000, 2005, 2017; Hendrickx & Nicolaij, 2004). Daarnaast stelden wij dat vertrouwen in verantwoordelijke partijen vooral sterk gerelateerd is aan 'morality-based' emoties, omdat zulke emoties gericht zijn op de mate waarin risico's het gevolg zijn van overtredingen van morele waarden en normen, en dus hoe moreel de verantwoordelijke partijen zijn (Böhm & Pfister, 2000, 2005, 2017; Hendrickx & Nicolaij, 2004). Verder stelden wij dat vertrouwen ook vooral sterk gerelateerd is aan gevoelens van machteloosheid, omdat mensen weinig controle hebben en afhankelijk zijn van verantwoordelijke partijen voor het beperken van risico's (cf. Hendrickx & Nicolaij, 2004; Huijts, 2018; Perlaviciute et al., 2017).

Zoals verwacht, hebben we gevonden dat energieprojecten sterkere negatieve 'consequence-based' emoties (zoals angst) oproepen wanneer men vindt dat het energieproject meer risico's met zich meebrengt. Naarmate men vindt dat een energieproject meer risico's heeft, ervaart men ook sterkere 'morality-based' emoties (zoals boosheid) en voelt men zich meer machteloos. Verder hebben we gevonden dat, zoals verwacht, een lager vertrouwen in verantwoordelijke partijen gerelateerd is aan sterkere 'morality-based' emoties en gevoelens van machteloosheid. Vertrouwen in verantwoordelijke partijen hing niet significant samen met negatieve 'consequence-based' emoties. Deze bevindingen suggereren dat vertrouwen in verantwoordelijke partijen inderdaad belangrijk is om te begrijpen welke negatieve emoties mensen ervaren over risico's van extern gecontroleerde energieprojecten, omdat mensen zelf weinig controle hebben over deze risico's en afhankelijk zijn van verantwoordelijke partijen die de controle hebben over energieprojecten.

Vervolgens hebben we onderzocht in welke mate negatieve emoties invloed hebben op de verschillende manieren waarop mensen om kunnen gaan met de risico's van extern gecontroleerde energieprojecten. De literatuur over intern gecontroleerde risico's en natuurlijke risico's onderscheidt twee types *copingstrategieën*: probleemgerichte coping en emotiegerichte coping (Folkman & Lazarus, 1980, 1985; Folkman et al., 1986; Lazarus & Folkman, 1984). Probleemgerichte coping omvat gedragingen die gericht zijn op het voorkomen en/of verminderen van de risico's door de oorzaak van risico's aan te pakken (bijvoorbeeld stoppen met roken om de gezondheidsrisico's weg te nemen) of door beschermende maatregelen te nemen om de negatieve gevolgen van risico's te verminderen (bijvoorbeeld een verzekering afsluiten tegen schade door extreem weer). Emotiegerichte coping houdt in dat men vooral de negatieve emoties probeert te voorkomen of te verminderen, bijvoorbeeld door niet aan de risico's te denken, niet erover te praten of te doen alsof de risico's er niet zijn. Bij risico's van extern gecontroleerde energieprojecten is het relevant om onderscheid te maken tussen twee types probleemgerichte coping: 'self-focused' coping en 'others-focused' coping. Aan de ene kant kunnen mensen zelf actie ondernemen om de negatieve gevolgen van risico's te voorkomen of te verminderen, wat wij 'self-focused' coping noemen. Mensen kunnen bijvoorbeeld beschermende maatregelen nemen zoals het vastzetten van meubilair om de negatieve gevolgen van geïnduceerde aardbevingen door aardgaswinning of geothermiewinning te beperken, of evacuatieroutes plannen om zich te beschermen tegen de negatieve gevolgen van het doorbreken van dammen bij waterkrachtcentrales. Daarnaast introduceerden wij een nieuw type probleemgerichte coping die belangrijk kan zijn voor het omgaan met risico's van extern gecontroleerde energieprojecten: 'others-focused' coping, gericht op het onder druk zetten van verantwoordelijke partijen om actie te ondernemen om de risico's te verminderen, bijvoorbeeld door te protesteren of een petitie te ondertekenen.

We bleken inderdaad de drie typen coping empirisch te kunnen onderscheiden. Ook vonden we dat mensen redelijk sterke intenties hebben om 'others-focused' copingstrategieën toe te passen. Deze bevindingen suggereren dat het inderdaad belangrijk is om een onderscheid te maken tussen twee typen probleemgerichte coping, namelijk 'self-focused' coping en 'others-focused' coping, om te begrijpen hoe mensen omgaan met risico's van extern gecontroleerde activiteiten zoals energieprojecten. Verder bleek dat mensen meer geneigd zijn tot 'others-focused' coping wanneer zij sterke 'morality-based' emoties ervaren, terwijl men meer geneigd is tot 'self-focused' coping en emotiegerichte coping wanneer men in sterkere mate negatieve 'consequence-based' emoties ervaart. Gevoelens van machteloosheid verklaarden geen unieke variantie in de drie typen coping.

Ten derde hebben we onderzocht of vertrouwen in verantwoordelijke partijen ook samenhangt met de mate waarin mensen positieve emoties ervaren over energieprojecten, naast de mate waarin men denkt dat een ener-

gieproject positieve gevolgen heeft. Veel energieprojecten hebben immers ook positieve gevolgen, zo dragen windmolenparken bij aan het verminderen van klimaatverandering (Perlaviciute & Steg, 2015). Aan de ene kant kunnen dit soort energieprojecten al positieve emoties oproepen omdat ze positieve gevolgen hebben, waarvoor mensen niet afhankelijk zijn van verantwoordelijke partijen, wat zou suggereren dat vertrouwen geen unieke relatie heeft met de mate waarin energieprojecten positieve emoties oproepen. Aan de andere kant kunnen mensen het altijd belangrijk vinden dat verantwoordelijke partijen projecten naar behoren ontwikkelen en beheren, ongeacht de gevolgen die het project heeft. In dat geval zou vertrouwen in verantwoordelijke partijen wel unieke variantie verklaren in de mate waarin energieprojecten positieve emoties oproepen, naast de verwachte positieve gevolgen: hoe meer vertrouwen mensen hebben in verantwoordelijke partijen, hoe meer zij positieve emoties zouden ervaren. We hebben daarom onderzocht in welke mate waargenomen gevolgen van energieprojecten (variërend van negatief naar positief) en vertrouwen in verantwoordelijke partijen samenhangen met negatieve en positieve emoties over extern gecontroleerde energieprojecten.

Zoals verwacht vonden we over het algemeen dat zowel waargenomen gevolgen als vertrouwen in verantwoordelijke partijen negatieve en positieve emoties verklaren: mensen ervaren sterkere positieve en minder sterke negatieve emoties wanneer ze vinden dat een energieproject vooral positieve (ten opzichte van negatieve) gevolgen heeft, en wanneer zij meer vertrouwen hebben in de verantwoordelijke partijen. Deze bevindingen suggereren dat vertrouwen in verantwoordelijke partijen ook een belangrijke rol speelt om te begrijpen in welke mate extern gecontroleerde energieprojecten positieve emoties oproepen.

Als laatste gingen we na in welke mate vertrouwen in verantwoordelijke partijen samenhangt met de publieke acceptatie van energieprojecten. We maakten daarbij onderscheid tussen twee types van vertrouwen in verantwoordelijke partijen: vertrouwen in de competentie en vertrouwen in de integriteit van de verantwoordelijke partijen (Braun et al., 2018; Graham et al., 2009; Liu et al., 2020; Siegrist et al., 2012; Terwel et al., 2009). Aangezien mensen zelf weinig controle hebben over energieprojecten, moeten zij vertrouwen op de competentie van de verantwoordelijke partijen, wat betekent dat mensen er van uit kunnen gaan dat deze partijen voldoende kennis en vaardigheden hebben om het energieproject te ontwikkelen en te beheren. Vervolgens, moeten mensen vertrouwen hebben in de integriteit van die partijen, omdat dit de garantie geeft dat deze partijen hun kennis en vaardigheden zullen gebruiken om de belangen van mensen te beschermen en goed om te gaan met de zorgen van mensen. We veronderstelden dat vertrouwen in de integriteit van de verantwoordelijke partijen sterker samenhangt met de acceptatie van energieprojecten dan vertrouwen in hun competentie, omdat vooral vertrouwen in de integriteit van partijen mensen een indicatie geeft van of er rekening wordt gehouden met de belangen en zorgen van mensen.

We vonden inderdaad dat acceptatie van energieprojecten sterker samenhangt met vertrouwen in de integriteit dan vertrouwen in de competentie van verantwoordelijke partijen. Het is dus belangrijk om naar vertrouwen in verantwoordelijke partijen te kijken om te begrijpen waarom en welke reacties mensen kunnen hebben op extern gecontroleerde energieprojecten, waarbij vooral vertrouwen in de integriteit van verantwoordelijke partijen belangrijk is voor acceptatie van energieprojecten.

Het onderzoek in deze dissertatie levert een belangrijke bijdrage aan de kennis over de effecten van energieprojecten op mensen: hoe reageren mensen op energieprojecten waarover ze zelf weinig controle hebben, omdat mensen afhankelijk zijn van verantwoordelijke partijen die de (risico's van de) projecten beheren, en welke factoren spelen een rol hierin? Zoals verwacht vonden we dat vertrouwen in verantwoordelijke partijen een belangrijke factor is om te begrijpen in welke mate dit soort projecten negatieve en positieve emoties oproepen (naast waargenomen negatieve dan wel positieve gevolgen). Vertrouwen in verantwoordelijke partijen was vooral gerelateerd aan emoties die opgeroepen worden door het handelen van verantwoordelijke partijen, namelijk 'morality-based' emoties en gevoelens van machteloosheid. Vertrouwen was niet significant gerelateerd aan 'consequence-based' emoties, waarschijnlijk omdat deze emoties vooral voortkomen uit de beoordeling van risico's en niet uit de beoordeling van het handelen van verantwoordelijke partijen.

Verder blijkt dat mensen inderdaad ook op een andere manier omgaan met risico's van extern gecontroleerde energieprojecten, namelijk ze vertonen 'others-focused' copingstrategieën. Dit type coping is waarschijnlijk vooral belangrijk in het geval van extern gecontroleerde energieprojecten waarbij mensen zelf weinig controle hebben maar afhankelijk zijn van externe partijen die verantwoordelijk zijn voor het beperken van risico's. In zulke gevallen kan men proberen de risico's te verminderen door erop aan te dringen dat de verantwoordelijke partijen actie ondernemen om de risico's te voorkomen en/of te verminderen. Mensen blijken meer geneigd om over te gaan tot dit soort 'others-focused' coping als ze sterkere 'morality-based' emoties ervaren, terwijl 'self-focused' coping en emotiegerichte coping meer waarschijnlijk zijn als men sterkere 'consequence-based' emoties ervaart.

Toekomstige studies zouden kunnen nagaan of vertrouwen en 'others-focused' coping ook relevante factoren zijn om te begrijpen hoe mensen omgaan met andere types risico's, zoals intern gecontroleerde risico's, natuurlijke risico's en risico's door klimaatverandering. Mensen hebben ook in andere gevallen namelijk niet zelf volledig de controle over risicovolle activiteiten en gedragingen, en zijn deels afhankelijk van partijen die mede verantwoordelijk zijn voor het beperken van risico's. Bijvoorbeeld als het gaat om gezondheidsrisico's door roken, kan de tabaksindustrie ook deels verantwoordelijk gezien worden, omdat zij sigaretten verslavend maken en roken

promoten. Verder kan de overheid roken onaantrekkelijk maken door de prijs van tabak te verhogen, of tabaksverkoop en roken op straat te verbieden. Vertrouwen en 'others-focused' coping kunnen ook een rol spelen bij hoe men omgaat met natuurlijke risico's zoals aardbevingen en vulkaanuitbarstingen. Ook al kunnen overheden weinig doen om de oorzaak van zulke risico's weg te nemen, kunnen mensen wel denken dat de overheid verantwoordelijk is voor het beschermen van mensen tegen de negatieve gevolgen van dit soort natuurlijke risico's, door bijvoorbeeld steun te bieden bij evacuaties, en onderdak en financiële hulp te bieden in geval van natuurrampen.

Verder is het interessant om na te gaan of vertrouwen en 'others-focused' coping ook een rol spelen bij het omgaan met risico's veroorzaakt door klimaatverandering, zoals extreem weer, droogte en hittegolven. In het geval van risico's veroorzaakt door klimaatverandering, hebben mensen zelf deels controle over de risico's, want ze kunnen de risico's beperken door meer klimaatvriendelijk gedrag te vertonen. Externe partijen zoals overheden en industrie kunnen echter ook verantwoordelijk worden gehouden voor het beperken van de oorzaak van de risico's (klimaatmitigatie) en van de negatieve gevolgen van de risico's (klimaatadaptatie).

In dit proefschrift, hebben we de relaties onderzocht tussen de waargenomen gevolgen van energieprojecten, vertrouwen in verantwoordelijke partijen, emoties, copingstrategieën en acceptatie van energieprojecten door middel van correlatieve onderzoeksdesigns. We kunnen daarom geen conclusies trekken over causale relaties tussen deze variabelen. Op basis van de 'affect heuristic' (Finucane et al., 2002) en de 'risks as feelings' hypothesis (Loewenstein et al., 2001) kan verwacht worden dat emoties over energieprojecten ook invloed kunnen hebben op de waargenomen gevolgen van energieprojecten. Evenzo kan er niet uitgesloten worden dat de acceptatie van energieprojecten invloed kan hebben op het vertrouwen in verantwoordelijke partijen in plaats van dat vertrouwen leidt tot acceptatie. Het zou bijvoorbeeld kunnen zijn dat mensen vertrouwen hebben in partijen omdat ze een project acceptabel vinden. Het is ook mogelijk dat beide elkaar beïnvloeden, dus dat vertrouwen acceptatie bepaalt, en dat veranderingen in acceptatie vervolgens weer invloed heeft op vertrouwen. Toekomstig onderzoek zou een experimenteel of longitudinaal design kunnen volgen om de causale relaties tussen deze variabelen te onderzoeken.

De bevindingen in dit proefschrift hebben belangrijke praktische implicaties voor verantwoordelijke partijen die energieprojecten willen ontwikkelen en beheren op zowel een sociaal verantwoorde als acceptabele manier. Gegeven dat emoties afhangen van de waargenomen gevolgen van energieprojecten, is een voor de hand liggende strategie om te proberen de negatieve gevolgen te beperken en de positieve gevolgen te versterken. Daarnaast kan worden geprobeerd het vertrouwen in verantwoordelijke partijen te verhogen, omdat dit negatieve emoties kan doen afnemen en positieve emo-

ties en acceptatie kan doen toenemen. Verantwoordelijke partijen kunnen publiekelijk laten zien dat mensen op hun kunnen vertrouwen. Als ze daarin succesvol zijn, kunnen ze het welzijn van mensen garanderen door negatieve emoties te beperken en positieve emoties te doen toenemen, ook al blijven er deels risico's voor mensen – verantwoordelijke partijen kunnen dan laten zien dat mensen erop kunnen vertrouwen dat zij de risico's zullen beperken op een sociaal verantwoordelijke manier. Verder is het voor verantwoordelijke partijen belangrijk om het vertrouwen in hun integriteit te verhogen om een 'social license to operate' te waarborgen, aangezien vertrouwen in de integriteit van partijen een belangrijke rol speelt in mensen hun acceptatie van energieprojecten. Verantwoordelijke partijen kunnen vertrouwen in hun integriteit versterken door transparant te zijn in hun communicatie en door te laten zien dat ze projecten beheren op een manier waarbij de belangen van mensen beschermd worden en goed om wordt gegaan met hun zorgen.

Onze onderzoeksresultaten laten zien dat mensen die blootgesteld worden aan extern gecontroleerde risico's zelf actie ondernemen om de gevolgen van de risico's te beperken ('self-focused' coping), maar vooral ook verantwoordelijke partijen aanzetten om actie te ondernemen om de risico's te beperken ('others-focused' coping) – vooral als zij sterke 'morality-based' emoties ervaren. Dit suggereert dat verantwoordelijke partijen kunnen verwachten dat mensen hen onder druk gaan zetten om risico beperkende maatregelen te nemen wanneer zij sterke negatieve emoties ervaren. Om zulke sterke negatieve emoties te verminderen, en daarbij de kans te verminderen dat mensen 'others-focused' copingstrategieën volgen, zoals verantwoordelijke partijen aanklagen en protesteren, kunnen de verantwoordelijke partijen acties ondernemen om de risico's te beperken. Dat kan door bijvoorbeeld mensen te betrekken in het ontwikkelen van energieprojecten en door risico beperkende maatregelen te nemen. Hierdoor kunnen rechtszaken en protesten voorkomen worden.

References

- Babcicky, P., & Seebauer, S. (2019).** Unpacking Protection Motivation Theory: evidence for a separate protective and non-protective route in private flood mitigation behavior. *Journal of Risk Research*, 22(12), 1503-1521.
- Barbour, J. B., Rintamaki, L. S., Ramsey, J. A., & Brashers, D. E. (2012).** Avoiding health information. *Journal of health communication*, 17(2), 212-229.
- Bidwell, D. (2016).** Thinking through participation in renewable energy decisions. *Nature Energy*, 1(5), 16051.
- Böhm, G. (2003).** Emotional reaction to environmental risks: consequentialist versus ethical evaluation. *Journal of Environmental Psychology*, 23(2), 199-212.
- Böhm, G., & Pfister, H. R. (2000).** Action tendencies and characteristics of environmental risks. *Acta Psychologica*, 104(3), 317-337.
- Böhm, G., & Pfister, H. R. (2005).** Consequences, morality, and time in environmental risk evaluation. *Journal of Risk Research*, 8(6), 461-479.
- Böhm, G., & Pfister, H. R. (2017).** The perceiver's social role and a risk's causal structure as determinants of environmental risk evaluation. *Journal of Risk Research*, 20(6), 732-759.
- Boutilier, R. G. (2017).** A measure of the social license to operate for infrastructure and extractive projects. Available at SSRN 3204005.
- Boutilier, R. G., & Thomson, I. (2011).** Modelling and measuring the social license to operate: fruits of a dialogue between theory and practice. *Social Licence*, 1, 1-10.
- Boyd, A. D. (2017).** Examining community perceptions of energy systems development: The role of communication and sense of place. *Environmental Communication*, 11(2), 184-204.
- Braun, C., Merk, C., Pönitzsch, G., Rehdanz, K., & Schmidt, U. (2018).** Public perception of climate engineering and carbon capture and storage in Germany: survey evidence. *Climate Policy*, 18(4), 471-484.
- Brügger, A., Dessai, S., Devine-Wright, P., Morton, T. A., & Pidgeon, N. F. (2015).** Psychological responses to the proximity of climate change. *Nature Climate Change*, 5(12), 1031-1037.
- Bubeck, P., Botzen, W. J. W., & Aerts, J. C. (2012).** A review of risk perceptions and other factors that influence flood mitigation behavior. *Risk Analysis: An International Journal*, 32(9), 1481-1495.
- Charlton, C., Rasbash, J., Browne, W. J., Healy, M., & Cameron, B. (2020).** MLwiN (Version 3.05)[Computer software]. University of Bristol: Centre for Multilevel Modelling.
- De Bruin, E. N., & Van Lange, P. A. (1999).** Impression formation and cooperative behavior. *European Journal of Social Psychology*, 29(2-3), 305-328.
- De Bruin, E. N., & Van Lange, P. A. (2000).** What people look for in others: Influences of the perceiver and the perceived on information selection. *Personality and Social Psychology Bulletin*, 26(2), 206-219.
- De Groot, J. I., & Steg, L. (2007).** Value orientations and environmental beliefs in five countries: Validity of an instrument to measure egoistic, altruistic and biospheric value orientations. *Journal of Cross-cultural Psychology*, 38(3), 318-332.
- De Groot, J. I., & Steg, L. (2008).** Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and behavior*, 40(3), 330-354.
- De Staat van Groningen. (2021, December 6).** Demografie. <https://destaatvan groningen.nl/kerngegevens-gemeente-groningen-demografie.html>
- Devine-Wright, P. (2008).** Reconsidering public acceptance of renewable energy technologies: a critical review. Delivering a low carbon electricity system: technologies, economics and policy, 1-15.
- Devine-Wright, P. (2011).** Place attachment and public acceptance of renewable energy: A tidal energy case study. *Journal of Environmental Psychology*, 31(4), 336-343.
- Earle, T. C. (2010).** Trust in risk management: A model based review of empirical research. *Risk Analysis: An International Journal*, 30(4), 541-574.
- Earle, T. C., & Siegrist, M. (2006).** Morality information, performance information, and the distinction between trust and confidence 1. *Journal of Applied Social Psychology*, 36(2), 383-416.
- Earle, T., & Siegrist, M. (2008).** Trust, confidence and cooperation model: a framework for understanding the relation between trust and risk perception. *International Journal of Global Environmental Issues*, 8(1-2), 17-29.
- Finucane, M. L., Alhakami, A., Slovic, P., & Johnson, S. M. (2000).** The affect heuristic in judgments of risks and benefits. *Journal of behavioral decision making*, 13(1), 1-17.
- Fiske, S. T., Cuddy, A. J., & Glick, P. (2007).** Universal dimensions of social cognition: Warmth and competence. *Trends in cognitive sciences*, 11(2), 77-83.
- Fiske, S. T., Cuddy, A. J., Glick, P., & Xu, J. (2018).** A model of (often mixed) stereotype content: Competence and warmth respectively follow from perceived status and competition. In *Social cognition* (pp. 162-214). Routledge.
- Folkman, S., & Lazarus, R. S. (1980).** An analysis of coping in a middle-aged community sample. *Journal of health and social behavior*, 21(3), 219-239.
- Folkman, S., & Lazarus, R. S. (1985).** If it changes it must be a process: study of emotion and coping during three stages of a college examination. *Journal of personality and social psychology*, 48(1), 150.
- Folkman, S., & Lazarus, R. S. (1988).** The relationship between coping and emotion: Implications for theory and research. *Social science & medicine*, 26(3), 309-317.
- Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986).** Dynamics of a stressful encounter: cognitive appraisal, coping, and encounter outcomes. *Journal of personality and social psychology*, 50(5), 992.
- Frijda, N. H. (1986).** The emotions. Cambridge University Press.
- Frijda, N. H. (2017).** The laws of emotion. Lawrence Erlbaum Associates Publishers.
- Frijda, N. H., Kuipers, P., & ter Schure, E. (1989).** Relations among emotion, appraisal, and emotional action readiness. *Journal of Personality and Social Psychology*, 57, 212-228.
- Gordon, R., Brunson, M. W., & Shindler, B. (2014).** Acceptance, acceptability, and trust for sagebrush restoration options in the Great Basin: A longitudinal perspective. *Rangeland Ecology & Management*, 67(5), 573-583.

- Graham, J. B., Stephenson, J. R., & Smith, I. J. (2009).** Public perceptions of wind energy developments: Case studies from New Zealand. *Energy Policy*, 37(9), 3348-3357.
- Graven, L. J., Grant, J. S., Vance, D. E., Pryor, E. R., Grubbs, L., & Karioth, S. (2014).** Coping styles associated with heart failure outcomes: A systematic review. *Journal of Nursing Education and Practice*, 4(2), 227-242.
- Grothmann, T., & Reusswig, F. (2006).** People at risk of flooding: Why some residents take precautionary action while others do not. *Natural hazards*, 38(1), 101-120.
- He, G., Mol, A. P., Zhang, L., & Lu, Y. (2013).** Public participation and trust in nuclear power development in China. *Renewable and Sustainable Energy Reviews*, 23, 1-11.
- Hendrickx, L., & Nicolaij, S. (2004).** Temporal discounting and environmental risks: The role of ethical and loss-related concerns. *Journal of Environmental Psychology*, 24(4), 409-422.
- Huijts, N. M. (2018).** The emotional dimensions of energy projects: Anger, fear, joy and pride about the first hydrogen fuel station in the Netherlands. *Energy Research & Social Science*, 44, 138-145.
- Huijts, N. M., Molin, E. J., & van Wee, B. (2014).** Hydrogen fuel station acceptance: A structural equation model based on the technology acceptance framework. *Journal of Environmental Psychology*, 38, 153-166.
- IPCC, 2022:** Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926
- Kahlor, L. A., Yang, J., Li, X., Wang, W., Olson, H. C., & Atkinson, L. (2020).** Environmental risk (and benefit) information seeking intentions: The case of carbon capture and storage in Southeast Texas. *Environmental Communication*, 14(4), 555-572.
- Keller, C., Bostrom, A., Kuttschreuter, M., Savadori, L., Spence, A., & White, M. (2012).** Bringing appraisal theory to environmental risk perception: a review of conceptual approaches of the past 40 years and suggestions for future research. *Journal of Risk Research*, 15(3), 237-256.
- Lazarus, R. S. (1966).** Psychological stress and the coping process. Springer Publishing.
- Lazarus, R. S. (1991).** Cognition and motivation in emotion. *American Psychologist*, 46(4), 352.
- Lazarus, R. S., & Folkman, S. (1984).** Stress, appraisal, and coping. Springer.
- Lerner, J. S., & Keltner, D. (2000).** Beyond valence: Toward a model of emotion-specific influences on judgement and choice. *Cognition & Emotion*, 14(4), 473-493.
- Lerner, J. S., & Keltner, D. (2001).** Fear, anger, and risk. *Journal of Personality and Social Psychology*, 81(1), 146.
- Liu, L., Bouman, T., Perlaviciute, G., & Steg, L. (2020a).** Effects of competence-and integrity-based trust on public acceptability of renewable energy projects in China and the Netherlands. *Journal of Environmental Psychology*, 67, 101390.
- Liu, L., Bouman, T., Perlaviciute, G., & Steg, L. (2020b).** Public participation in decision making, perceived procedural fairness and public acceptability of renewable energy projects. *Energy and Climate Change*, 1, 100013.
- Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001).** Risk as feelings. *Psychological bulletin*, 127(2), 267.
- Maas, C. J., & Snijders, T. A. (2003).** The multilevel approach to repeated measures for complete and incomplete data. *Quality and Quantity*, 37(1), 71-89.
- Merk, C., & Pönitzsch, G. (2017).** The role of affect in attitude formation toward new technologies: The case of stratospheric aerosol injection. *Risk Analysis*, 37(12), 2289-2304.
- Miceli, R., Sotgiu, I., & Settanni, M. (2008).** Disaster preparedness and perception of flood risk: A study in an alpine valley in Italy. *Journal of Environmental Psychology*, 28(2), 164-173.
- Midden, C. J., & Huijts, N. M. (2009).** The role of trust in the affective evaluation of novel risks: The case of CO2 storage. *Risk Analysis: An International Journal*, 29(5), 743-751.
- Montijn-Dorgelo, F. N., & Midden, C. J. (2008).** The role of negative associations and trust in risk perception of new hydrogen systems. *Journal of risk research*, 11(5), 659-671.
- Myers, R. (1990).** Classical and modern regression with applications (2nd ed.). Boston, MA: Duxbury.
- Nunally, J. C. (1978).** Psychometric theory. McGraw-Hill.
- Ortony, A., Clore, G. L., & Collins, A. (2022).** The cognitive structure of emotions. Cambridge University Press.
- Papazu, I. (2017).** Nearshore wind resistance on Denmark's renewable energy island: not another NIMBY story. *Science & Technology Studies*, 30(1), 4-24.
- Peters, E., & Slovic, P. (1996).** The role of affect and worldviews as orienting dispositions in the perception and acceptance of nuclear power. *Journal of applied social psychology*, 26(16), 1427-1453.
- Perlaviciute, G. (2022).** Contested climate policies and the four Ds of public participation: From normative standards to what people want. *Wiley Interdisciplinary Reviews: Climate Change*, 13(1), e749.
- Perlaviciute, G., & Steg, L. (2014).** Contextual and psychological factors shaping evaluations and acceptability of energy alternatives: integrated review and research agenda. *Renewable and Sustainable Energy Reviews*, 35, 361-381.
- Perlaviciute, G., & Steg, L. (2015).** The influence of values on evaluations of energy alternatives. *Renewable energy*, 77, 259-267.
- Perlaviciute, G., Steg, L., Contzen, N., Roeser, S., & Huijts, N. (2018).** Emotional responses to energy projects: Insights for responsible decision making in a sustainable energy transition. *Sustainability*, 10(7), 2526.
- Perlaviciute, G., Steg, L., Hoekstra, E. J., & Vrieling, L. (2017).** Perceived risks, emotions, and policy preferences: A longitudinal survey among the local population on gas quakes in the Netherlands. *Energy Research & Social Science*, 29, 1-11.
- Palomo-Vélez, G., Perlaviciute, G., Contzen, N., & Steg, L. (2021).** Promoting energy sources as environmentally friendly: does it increase public acceptability?. *Environmental Research Communications*, 3(11), 115004.
- Rayner, S. (2010).** Trust and the transformation of energy systems. *Energy Policy*, 38(6), 2617-2623.

- Roeser, S. (2006).** The role of emotions in judging the moral acceptability of risks. *Safety science*, 44(8), 689-700.
- Roeser, S. (2011).** Nuclear energy, risk, and emotions. *Philosophy & Technology*, 24(2), 197-201.
- Roseman, C.A. Smith, Appraisal theory:** Overview, assumptions, varieties, controversies. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion: Theory, methods, research* (pp. 3-19). Oxford University Press.
- Roseman, I. J., Wiest, C., & Swartz, T. S. (1994).** Phenomenology, behaviors, and goals differentiate discrete emotions. *Journal of personality and social psychology*, 67(2), 206.
- Rossi, J. (1997).** Participation run amok: The costs of mass participation for deliberative agency decision making. *Northwestern University Law Review*, 92, 173.
- Scherer, K. R. (1999).** Appraisal theory. In T. Dalgleish & M. Power (Eds.), *Handbook of Cognition and Emotion* (pp. 637-663). John Wiley & Sons.
- Schmidt, S., Tinti, C., Levine, L. J., & Testa, S. (2010).** Appraisals, emotions and emotion regulation: An integrative approach. *Motivation and Emotion*, 34(1), 63-72.
- Shaw, K., Hill, S. D., Boyd, A. D., Monk, L., Reid, J., & Einsiedel, E. F. (2015).** Conflicted or constructive? Exploring community responses to new energy developments in Canada. *Energy Research & Social Science*, 8, 41-51.
- Siegrist, M. (2021).** Trust and risk perception: A critical review of the literature. *Risk analysis*, 41(3), 480-490.
- Siegrist, M., Connor, M., & Keller, C. (2012).** Trust, confidence, procedural fairness, outcome fairness, moral conviction, and the acceptance of GM field experiments. *Risk Analysis: An International Journal*, 32(8), 1394-1403.
- Siegrist, M., & Cvetkovich, G. (2000).** Perception of hazards: The role of social trust and knowledge. *Risk analysis*, 20(5), 713-720.
- Siegrist, M., Earle, T. C., & Gutscher, H. (2003).** Test of a trust and confidence model in the applied context of electromagnetic field (EMF) risks. *Risk Analysis: An International Journal*, 23(4), 705-716.
- Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2007).** The affect heuristic. *European journal of operational research*, 177(3), 1333-1352.
- Smith, C. A., & Lazarus, R. S. (1990).** Emotion and adaptation. *Handbook of personality: Theory and research*, 609-637.
- Snijders, T. A., & Bosker, R. J. (2011).** Multilevel analysis: An introduction to basic and advanced multilevel modeling. Sage.
- Smith, C. A., & Ellsworth, P. C. (1985).** Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology*, 48(4), 813.
- Stuive, I. (2007).** A comparison of confirmatory factor analysis methods. Groningen, The Netherlands: University of Groningen.
- Stuive, I., Kiers, H. A., & Timmerman, M. E. (2009).** Comparison of methods for adjusting incorrect assignments of items to subtests: oblique multiple group method versus confirmatory common factor method. *Educational and Psychological Measurement*, 69(6), 948-965.
- Suls, J., & Fletcher, B. (1985).** The relative efficacy of avoidant and nonavoidant coping strategies: a meta-analysis. *Health psychology*, 4(3), 249.
- Takao, K., Motoyoshi, T., Sato, T., Fukuzondo, T., Seo, K., & Ikeda, S. (2004).** Factors determining residents' preparedness for floods in modern megalopolises: the case of the Tokai flood disaster in Japan. *Journal of Risk Research*, 7(7-8), 775-787.
- Tannenbaum, M. B., Hepler, J., Zimmerman, R. S., Saul, L., Jacobs, S., Wilson, K., & Albarracín, D. (2015).** Appealing to fear: A meta-analysis of fear appeal effectiveness and theories. *Psychological bulletin*, 141(6), 1178.
- Ten Berge, J. M. F., & Siero, F. W. (2001).** The basic ideas of factor analysis. *Metodologia de las Ciencias del Comportamiento*, 2, 217-232.
- Terwel, B. W., Harinck, F., Ellemers, N., & Daamen, D. D. (2009).** Competence based and integrity based trust as predictors of acceptance of carbon dioxide capture and storage (CCS). *Risk Analysis: An International Journal*, 29(8), 1129-1140.
- Tritter, J. Q., & McCallum, A. (2006).** The snakes and ladders of user involvement: moving beyond Arnstein. *Health policy*, 76(2), 156-168.
- Truelove, H. B. (2012).** Energy source perceptions and policy support: Image associations, emotional evaluations, and cognitive beliefs. *Energy Policy*, 45, 478-489.
- Van der Voort, N., & Vanclay, F. (2015).** Social impacts of earthquakes caused by gas extraction in the Province of Groningen, The Netherlands. *Environmental Impact Assessment Review*, 50, 1-15.
- Van der Werff, E., Steg, L., & Keizer, K. (2013).** The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. *Journal of Environmental Psychology*, 34, 55-63.
- Vrieling, L., Perlaviciute, G., & Steg, L. (2021).** Afraid, angry or powerless? Effects of perceived risks and trust in responsible parties on emotions towards gasquakes in the Netherlands. *Energy Research & Social Science*, 76, 102063.
- Webb, T. L., & Sheeran, P. (2006).** Does changing behavioral intentions engender behaviour change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, 132(2), 249.
- Willis, J. & Todorov, A. (2006).** First impressions: making up your mind after a 100-ms exposure to a face. *Psychological Science*, 17, 592-598.
- Wojciszke, B., & Abele, A. E. (2008).** The primacy of communion over agency and its reversals in evaluations. *European Journal of Social Psychology*, 38(7), 1139-1147.
- Wojciszke, B., Bazinska, R., & Jaworski, M. (1998).** On the dominance of moral categories in impression formation. *Personality and Social Psychology Bulletin*, 24(12), 1251-1263.
- Wojciszke, B. & Klusek, B. (1996)** Moral and competence-related traits in political perception. *Political Psychology Bulletin*, 27, 319-324.
- Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007).** Social acceptance of renewable energy innovation: An introduction to the concept. *Energy policy*, 35(5), 2683-2691.
- Yang, L., Zhang, X., & McAlinden, K. J. (2016).** The effect of trust on people's acceptance of CCS (carbon capture and storage) technologies: Evidence from a survey in the People's Republic of China. *Energy*, 96, 69-79.
- Yzerbyt, V., Provost, V., & Corneille, O. (2005).** Not competent but warm... really? Compensatory stereotypes in the French-speaking world. *Group Processes & Intergroup Relations*, 8(3), 291-308.

Acknowledgements

Dit proefschrift zou er nooit geweest zijn als ik niet zoveel toffe mensen om me heen had gehad de afgelopen jaren. Een paar van hen wil ik speciaal bedanken.

Als eerste wil ik mijn begeleiders bedanken, bij wie ik altijd mezelf kon zijn. Linda, we hebben veel kunnen lachen samen en ik kon altijd bij je terecht voor een goed gesprek. Ontzettend bedankt voor alles. Goda, jouw vrolijkheid, kalmte, en regelmaat heb ik altijd erg kunnen waarderen. Je deur stond altijd open, ook voor de kleine dingen. Heel erg bedankt voor al je hulp.

Ook wil ik mijn lieve vriendinnen en paranimfs Nieke en Nadja heel erg bedanken. Wat hebben we ontzettend veel gelachen samen. Zonder jullie op kantoor had ik het echt nooit volgehouden. Ik ben zo trots op ons. BCF!

And of course many thanks to all my lovely colleagues from the Environmental Psychology department! There have been so many of you over the past years and all of you have contributed to the fun and crazy work experience I have had at the RuG. Especially the Green Gang deserves a big thank you for all the LOL we've had, gossip we have shared, and adventures we embarked on together. Ook speciale dank voor mijn postdoc bazinnen Ellen en Janet! Jullie waren de lichtpuntjes van mijn werkweek tijdens de donkere corona tijden.

Some of the colleagues I have had over the past years, have become good friends and deserve a special thanks. Steph, Lu, and Irene, you were my voice and reason when I was lost. You saw things clearly when I couldn't. I would not be where I am today without your help.

Verder ben ik dankbaar voor de steun van mijn ouders en grote zus. Lieve papa en mama, een dochter met een doctorstitel is iets wat jullie nooit voor ogen hadden gezien. Bedankt dat jullie me altijd vrij hebben gelaten en me hebben geleerd om op mijn eigen krachten en keuzes te vertrouwen. Ook bedankt voor die keren dat ik een schop onder mijn kont nodig had. Lieve Li-
anne, je hebt me zoveel voorgedaan en geleerd in mijn leven. En nog steeds kan ik altijd op je bouwen, bedankt.

Ook zij die er niet meer zijn, verdienen een paar woorden van dank. Lieve opa en oma Vrieling en opa en oma van Dijk, bedankt dat jullie mij altijd hebben gestimuleerd om mijn creatieve, vindingrijke en ondernemende zelf te omarmen en te ontplooien. Het is de kant in mij waar ik veel gebruik van maak in mijn werk.

En natuurlijk woorden vol dank voor mijn allerbeste maatje, Sevrin. De afgelopen tijd is zeker ook niet makkelijk geweest voor jou, maar je gaf me alle

ruimte om de dingen te doen op mijn eigen manier en met mijn eigen tempo. Daar ben ik je eeuwig dankbaar voor. Je hebt me zien vallen en groeien en bleef me al die tijd onvoorwaardelijk steunen. Jouw liefde, vertrouwen en geduld hebben mij zoveel gebracht. Ik hou ontzettend veel van je.

Ook wil ik al mijn andere lieve (schoon)familie in het noorden en het westen van het land bedanken. Ieder van jullie heeft op hun eigen manier, bewust en onbewust, mij gesteund tijdens dit hectische avontuur. Jullie zijn allemaal topers!

En ook al mijn lieve vriendinnen, bedankt! Mijn EBV'tjes: Tesse en Elien; de wobbi's: Adisa, weer Elien, Floor, Jitske, Marloes, Robin, Rosa en Susan; LAL: Anoeke en Lotte; Ilse, Simone en Sara. Bedankt voor alle gezelligheid en geborgenheid tijdens dit hele proces. Had ieder mens maar zulke lieve vrienden om op terug te kunnen vallen.

Als laatste wil ik ook nog mezelf bedanken, want zonder mezelf was dit proefschrift er al helemaal niet geweest. Ik weet niet hoe ik het beter kan zeggen dan Snoop Dogg: "I want to thank me for believing in me, I want to thank me for doing all this hard work. I want to thank me for having no days off. I want to thank me for never quitting. I want to thank me for always being a giver and trying to give more than I receive. I want to thank me for trying to do more right than wrong. I want to thank me for being me at all times".

About the author

Leonie Vrieling (1992, Groningen) is born and raised in the city of Groningen, the Netherlands. In 2016 Leonie graduated from the University of Groningen with a master's degree in Social Psychology. As part of her master thesis project, she did an internship at the communication and policy department of the waste company ROVA in Zwolle, where she evaluated a program designed to stimulate households to reduce their waste and study what factors promote such behaviour. Leonie also worked as a research assistant during her master. After finishing her master, Leonie started her PhD project where she focused on studying public responses to externally controlled energy projects and what factors play a role in eliciting such responses. The results of this research are presented in the chapters of this book. Leonie published most of the chapters in this PhD thesis as papers in scientific journals. During her PhD project, Leonie also worked as a teacher for various courses in the bachelor psychology programme and master programs Social Psychology and Environmental Psychology. In addition, Leonie worked on various side projects during her PhD trajectory, including a large meta-analysis on household energy behaviour and a study on climate change adaptation behaviour in collaboration with the municipality of Groningen. Leonie was also active as a board member of the Energy Community for Young Researchers at the New Energy Coalition. Furthermore, at the end of her PhD trajectory, Leonie was hired to work on a research project on factors influencing the acceptance of energy policies and co-authored a paper on the results of this project. In addition, she was hired to work as a communication officer for the Environmental Psychology department. From 2020 to 2022, Leonie worked as a postdoc for a research project focusing on mobility behaviour during and after the corona lockdown with Ellen van der Werff and Janet Veldstra. Throughout her time as a researcher at the University of Groningen, Leonie presented the results of her academic work at international and national conferences, industry events and events for lay audiences.

Today, Leonie lives a quiet life with her partner and their dog in a small town in the province of Groningen. In her spare time she works on renovating her old house, reads books and does volunteer work with lonely elderly. Leonie currently enjoys a part time position at a small rural municipality in the province of Drenthe where she works as a policy advisor for sustainability and renewable energy. She is happy to be able to put her gained knowledge and expertise into practice.

The research presented in this book was funded by the Green Deal project "Public acceptability of energy concepts" under agreement number UI60071. Financial support for the printing of this dissertation was received from the University of Groningen and the Kurt Lewin Institute.

Illustration Pol Wijnberg - Stitswerd

Layout and design Fred Reiffers - Kantens

Printed by

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