4-1-2021

Awe, perspective taking and pro-environmental behavior

A study on the effects of awe and perspective taking on pro-environmental behavior in the transition towards sustainable energy

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Master Thesis

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Abstract

The construction of wind turbines comes along with the resistance of local residents. This resistance happens even after surveys showing a collective acceptance of wind turbines, but when the construction plans become more concrete, people refuse to cooperate. To increase people's acceptance of wind turbines, a more collective mindset has to be established. To this end, awe is induced with pictures of vast landscapes, and perspective taking is effectuated with textual manipulations. To study the separate and combined effects of awe and perspective taking on people's pro-environmental behavior, a 2 (awe: high versus low) X 2 (perspective taking: high versus low) between-subjects design was conducted. This is done with an online experiment, where participants were confronted with a scenario study with a fictional case about the construction of wind turbines near their living environment. However, the online experiment did not show significant effects on people's pro-environmental behavior. Further studies can investigate whether other types of stimuli (e.g., showing the fragility of nature) combined with other types of technology (e.g., Virtual Reality) are better for establishing a collective mindset, leading to increased pro-environmental behavior.

Keywords: Awe, perspective taking, NIMBY syndrome, energy transition, pro-environmental behavior

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1. Introduction

The Dutch municipality of Enschede agreed to three potential areas for building wind turbines. However, there are new plans regarding the construction of wind turbines in rural areas of Enschede. These new plans frustrated citizens and interest groups of Enschede and resulted in a majority of opinions being against these plans (Louwes, 2018). The current transition towards more sustainable energy sources is a challenging process and has incurred societal tensions and frustrations (Dignum, 2016). It is important to stimulate a collective mindset to establish increased acceptance of wind turbines among people. The NIMBY syndrome has played an important role in people's response to the transition. NIMBY is an acronym for "not in my backyard" (Wolsink, 2000), and it refers to people's resistance against the installation of wind turbines in their local areas. This resistance can occur even after surveys showing overall supportive attitudes for building wind turbines, however, this general support does not imply support for every concrete plan for building wind turbines (Wolsink, 2000). Hence, more must be done to make people more supportive of wind turbines and the transition to sustainable energy in general.

Environmental education steers on providing knowledge to citizens to establish behavior change, which is an effective tool combined with big and intimidating environmental issues (Boyes & Stanisstreet, 2012), such as the energy transition. However, little attention has been paid to the role of the environment in stimulating behavior change. Several studies have shown that the experience of awe makes people more prosocial (Piff, Dietze, Feinberg, Stancato, & Keltner, 2015; Prade, & Saroglou, 2016). The effects of awe on pro-environmental behavior are underexposed, but studies show that awe has positive effects on people's pro-environmental behavior (Zhao, Zhang, Xu, Lu, & He, 2018). Awe is defined as a feeling of being small as an individual, which results from an individual's feeling of being part of a bigger whole or something greater than the self. This feeling makes an individual's goals comparatively irrelevant in contrast to the bigger picture (Piff et al., 2015). This effect can be achieved by observing vast scenes, such as the view of the Grand Canyon.

The ability to take other perspectives to perceive the world through might be an important aspect involved in triggering a more collective mindset. Perspective taking is the ability to take the perspective of someone or something else to perceive the world (Galinsky, Maddux, Gilin, & White, 2008). In many cases, this ability has been proven to have positive effects on prosocial behavior. For example, Mashuri, Zaduqisti, and Supriyono (2012) found that perspective taking increased people's willingness to help people from an outgroup. The current study investigates to what extent perspective taking positively impacts another type of prosocial behavior; pro-environmental behavior. This behavior is in the context of this study the degree to which people are favorable towards wind turbines and the energy transition.

To the best of knowledge, there has not been a research conducted that aims at inducing awe and effectuating perspective taking to make people more favorable towards wind turbines and the energy transition. We will study the separate and combined effects of awe and perspective taking on people's

support towards the building of wind turbines and the transition to sustainable energy in general. To this end, a 2 (awe: high versus low) X 2 (perspective taking: high versus low) between-subjects design was conducted. Before giving a detailed explanation of the research, the central constructs will be elaborated in the next section.

2. Theoretical framework

Although research may show that people have an overall positive opinion towards the transition to sustainable energy, when "their own backyard is involved" they are unwilling to cooperate (e.g., "building wind turbines is good, but not in my environment"). This phenomenon can be explained by the NIMBY syndrome (Wolsink, 2000). It describes, in a general sense, the suboptimal result of the decision-making process of individuals. Individuals make decisions based on perceived personal costs and benefits that lead to optimal personal situations. However, these decisions consequently lead to suboptimal situations for society as a whole. In other words, the interests of the whole society are considered less important than personal benefits. Even though a higher collective benefit can be achieved, the personal benefits become more important and predominate the higher collective benefit (Wolsink, 2000). Thus, if something has personal consequences and lands in "one's own backyard," individuals tend to act in an antisocial way. What can be done to compensate for this negative effect of the NIMBY syndrome in response to the energy transition? One solution may lie in a frequently studied emotion that increases prosocial behavior, "awe."

Awe is an emotional feeling which can be triggered by observing something vast. Keltner and Haidt (2003) defined two components of awe: vastness and the need to accommodate. Vastness contains the confrontation with situations stressing the smallness of an individual (e.g., by vast landscapes). The need to accommodate entails an adjusted perception to comprehend the vastness. The confrontation with vastness can have a confusing effect due to a lack of knowledge to comprehend the vastness (Keltner & Haidt, 2003), for example, the challenge to comprehend the size of the universe compared to the life of an individual on earth. However, when people succeed to comprehend the vast experience, it can have an enlightening effect. The individual obtains new insights to comprehend the vast experience, which leads to an adjusted perception of the world around them (Keltner & Haidt, 2003), this can be established by showing the more comprehendible vast situations, such as the expansive landscape of the Grand Canyon. This experience makes people feel small as an individual, which induces a decreased importance of personal goals in individual's lives and enhances attention for the bigger whole they belong to (Piff et al., 2015).

2.1. Awe and pro-environmental behavior

Several studies show that the experience of awe makes people more social and kind in general. An extensive study regarding the effects of awe on prosocial behavior showed that people who were exposed to an awe-inducing nature video (versus an amusing and a neutral video) were more generous

to unknown people and experienced the feeling of being small in the bigger picture (Piff et al., 2015). Another study confirmed these prosocial effects of awe. After being exposed to an awe-inspiring video, compared to an amusing or neutral video, a significantly greater number of people reported more willingness to help others in response to hypothetical scenarios (Prade, & Saroglou, 2016). However, the effects of awe on other types of prosocial behavior, such as pro-environmental behavior, are less frequently studied. A study conducted by Zhao et al. (2018) found that the experience of awe encouraged pro-environmental behavior. They found that people sacrificed themselves for the environment, due to awe. The experience of awe decreased an individual's view of being entitled to dominate nature, making a pro-environmental attitude more likely. In the context of this study, pro-environmental behavior is a type of prosocial behavior and is defined as the degree to which people are favorable towards wind turbines and the energy transition in general. According to these studies, there is an observable positive relationship between experiencing awe and pro-environmental behavior; hence, it is proposed that:

H1: Communication high in awe (versus low in awe) foster pro-environmental behavior.

In identifying the elicitors of awe, studies have shown that there is a relation between beauty, nature, and awe. Keltner and Haidt (2003) distinguished several ways for inducing awe. One method is exposure to beauty, that is, something aesthetically pleasant (e.g., a natural landscape, a person, or a piece of art). In a study by Shiota, Keltner, and Mossman (2007) participants were found to experience high degrees of awe after recalling experiences with beautiful nature. In another study, by Cohen, Gruber, and Keltner (2010), the researchers found that 55% of their participants related nature to their task of recalling a "profound sense of beauty." Moreover, the participants indicated high levels of awe related to their recalled memories. Yaden et al. (2018) found that while beauty as a theme was most frequently related to awe experiences, on a more concrete level, natural landscapes are most frequently triggering awe in people. Thus, these studies endorse a relationship between beauty, nature, and awe. Additionally, vastness triggers the feeling of being small as an individual. Hence, in this study, high-awe will be induced by vast natural landscapes and low-awe by contrast, by close-ups of natural landscapes. To control for differences in perceived beauty by participants, a varied collection of natural scenes is composed.

2.2. Perspective taking

In addition to awe, perspective taking has also been shown to have positive effects on communication. On a general level, perspective taking can be defined as the ability to cognitively take the perspective of another entity to perceive situations (Galinsky et al., 2008). Perspective taking frequently has a positive influence on communication. For example, Galinsky et al. (2008) found that perspective taking has positive effects on negotiations, as it enables people to define underlying interests and stimulate the creation of alternative solutions with greater collective benefits. This shows that perspective taking makes opposing parties more able to meet each other's needs in a negotiating situation. A study

conducted by Shih, Wang, Trahan Bucher, and Stotzer (2009) found that perspective taking positively influences attitudes towards people outside of a group by reducing prejudice and discrimination against them. In another study conducted by Mashuri et al. (2012), researchers found similar effects of perspective taking. Higher degrees of willingness to help members of other groups were found, stressing the positive effects of perspective taking in intergroup settings. Based on these studies showing the positive effects of perspective taking in interhuman communication, it is reasoned that perspective taking will enhance people's willingness to contribute to the environment as well. Hence, the following hypothesis is proposed:

H2: Communication high in perspective taking (versus low) will have a positive effect on pro-environmental behavior.

Gehlbach and Brinkworth (2012) have distinguished 12 perspective taking strategies to identify how perspective taking occurs. One of those strategies involves "drawing on background information." People who wield this strategy to take another perspective make use of available information about the person or object in question, which makes the perspective easier to understand. The background information does not necessarily have to be part of the situation of interest, but it enables a broader view of the situation in which motives become clearer. For example, being a parent can be relevant background information for someone who tries to understand a supportive attitude towards wind turbines and the energy transition.

Besides testing the expected effects of awe and perspective taking on pro-environmental behavior separately, this study tests whether these factors interact with each other as well. That is, will there be an even stronger positive effect on pro-environmental behavior when combining high-awe and high perspective taking in a message, compared to a message that invokes awe or perspective taking solely. This expectation is based on the effects of awe and perspective taking that shifts an individual's focus from their concerns to collective concerns. Following this reasoning, these factors together will have a boosting effect on pro-environmental behavior.

3. Method

3.1. Research design

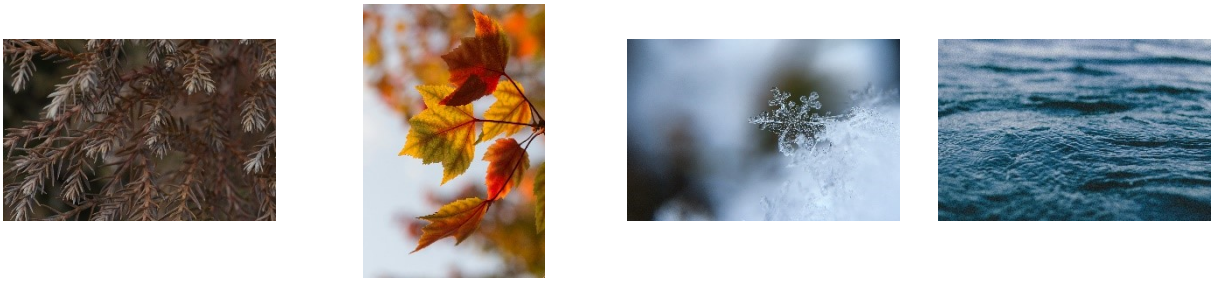
This study investigated the effects of awe and perspective taking on people´s pro-environmental behavior. It is expected that both independent variables have a positive effect on pro-environmental behavior. To test the hypotheses and the expected interaction effect, a 2 (awe: high versus low) X 2 (perspective taking: high versus low) between-subjects research design was conducted. This is done by an online experiment. This study defined four dependent variables; interests in environmental issues, willingness to pay more for renewable energy, perceived importance of wind turbines, and acceptance of wind turbines.

3.2. Manipulations

3.2.1. Awe

A pre-test was conducted to select pictures varying in quality of awe (high-awe versus low-awe). Since vastness and natural landscapes are good elicitors of awe, a slideshow consisting of twelve pictures of vast natural landscapes was composed. In the low-awe condition, a slideshow consisting of twelve close-ups of natural landscapes was composed. Each slideshow lasted about two minutes. Figure 1 provides examples of four high-awe and four low-awe pictures. The collection of all high/low awe pictures is included in Figure 4 in Appendix A.

Images 1-4: High-awe pictures



Images 5-8: Low-awe pictures

Figure 1: High- versus low-awe pictures

The two slideshows were pretested in a room with a table, a chair, a laptop, and an 85-inch screen. The participants completed the pre-test individually.

In total fifteen people participated in the pre-test, and each participant watched two slideshows (high-awe and low-awe). The order in which the two slideshows were presented to the participants was randomized. Awe was measured with three items, this is done by a questionnaire similar to the one Piff et al. (2015) used in their pre-test. Participants indicated their agreement of experiencing the following emotions from the Dispositional Positive Emotion Scales: joy, contentment, pride, love, compassion, amusement, and awe. All emotions other than awe were filler items. As the awe slideshow sought to induce a feeling of awe by showing vast and imposing natural landscapes, participants had to indicate their agreement with the following two statements on a seven-point Likert scale: “The slideshow gave me the feeling of being in the presence of something greater than myself.” and “The slideshow gave me an overwhelming feeling.” The questionnaire is included in Table 4 in Appendix A. After this question, the participants watched the other slideshow and answered the same items.

To test whether significant differences existed between the high-awe and low-awe conditions, an independent samples t-test was conducted on the three awe items.

Experienced awe

There was a significant difference between the high-awe condition (M = 4.80, SD = 1.37) and the low-awe condition (M = 3.87, SD = 1.46); $t(28) = 1.805$, $p = .041$. The data indicated that the high-awe condition inspired a greater sense of awe compared to the low-awe condition.

Feeling the presence of something greater than myself

There was a significant difference between the high awe-condition (M = 5.20, SD = 1.52) and the low-awe condition (M = 3.60, SD = 1.88); $t(28) = 2.560$, $p = .008$. This data indicated that the high-awe condition inspired a stronger sense of being in the presence of something greater than oneself compared to the low-awe condition.

Overwhelming feeling

There was a significant difference between the high-awe condition (M = 4.67, SD = 1.35) and the low-awe condition (M = 3.13, SD = 1.46); $t(28) = 2.994$, $p = .003$. The data indicated that the high-awe condition induced a stronger overwhelming feeling compared to the low-awe condition.

These results confirmed the effectiveness of the slideshow's manipulation of awe, and supported its use in the experiment.

3.2.2. Perspective taking

Since this study is interested in the NIMBY syndrome in the context of the energy transition, participants read a fictional case, related to this topic, describing Pieter Geerdink from Embrace the Wind. In the scenario, Pieter Geerdink is an employer responsible for giving advice related to the energy transition.

Table 1 shows the case participants read, which was either a high perspective-taking or a low perspective-taking case. The first paragraph of both cases was identical and provided the participants with background information. The second paragraph introduced Pieter Geerdink and Embrace the Wind. As shown in bold in Table 1, the high perspective-taking case makes use of Gehlbach and Brinkworth's (2012) strategy of "drawing on background information." This was done by elaborating on Pieter Geerdink as a person (e.g., his family and job), issues he has to deal with in his position (e.g., contrasting interests), and the role of Embrace the Wind in the fight against climate change (e.g., advising the municipality of Enschede with weighing the interests of different parties). The low perspective-taking case, by contrast, provides brief information about Pieter Geerdink and Embrace the Wind. To further effectuate perspective taking, a linguistic prompt was used which directly asked participants to take the perspective of Pieter Geerdink (bold and curved in Table 1).

The final part of the scenario raised a dilemma for the participant. They were presented with plans for the construction of five wind turbines located on a nature reserve near their house. For a better

illustration of the decision's implications, a visual before-after representation was included in both cases and is shown in Figure 2.

Table 1. Perspective taking case high versus low

High perspective taking	**Low perspective taking**
Background information	*Background information*
Net als alle andere gemeenten zet de gemeente Enschede zich in voor duurzame energie. De gemeente is daarvoor op zoek naar geschikte locaties voor windmolens. Daarbij wordt de gemeente bijgestaan door de stichting Embrace the Wind. Deze stichting geeft advies aan de gemeente en heeft daarvoor regelmatig gesprekken met inwoners.	Net als alle andere gemeenten zet de gemeente Enschede zich in voor duurzame energie. De gemeente is daarvoor op zoek naar geschikte locaties voor windmolens. Daarbij wordt de gemeente bijgestaan door de stichting Embrace the Wind. Deze stichting geeft advies aan de gemeente en heeft daarvoor regelmatig gesprekken met inwoners.
Introduction Embrace the wind	*Introduction Embrace the wind*
Eindverantwoordelijke voor het advies van Embrace the Wind is Pieter Geerdink. **Pieter is 32 en woont met zijn vrouw en twee kinderen in Enschede. Naast zijn baan als docent Nederlands werkt hij als vrijwilliger voor Embrace the Wind in de regio Enschede.** **Als vrijwilliger voor Embrace the Wind komt Pieter steeds in aanraking met uiteenlopende belangen rondom de bouw van windmolens.** In de strijd tegen klimaatverandering is het belangrijk dat er meer windmolens komen. Alle gemeenten moeten hieraan hun steentje bijdragen. Echter hebben omwonenden vaak moeite met plannen voor nieuwe windmolens, omdat ze bang zijn voor de effecten op hun woongenot. **Pieter kan zich alle standpunten goed voorstellen. Perfecte oplossingen bestaan niet. De stichting Embrace the Wind probeert altijd alle belangen eerlijk mee te wegen en kiest voor het alternatief met de meeste voordelen en de minste nadelen.** Daarbij probeert de stichting in goed overleg te blijven met omwonenden en hen te laten meedenken over de precieze inrichting. ***Probeert u zich voor te stellen wat u zou doen als u in de schoenen van Pieter Geerdink stond.***	Embrace the Wind is een stichting die gemeenten adviseert over windmolenprojecten. De stichting heeft een afdeling voor de regio Enschede. Bij de stichting zijn vrijwilligers werkzaam die zich inzetten voor windenergie. Eindverantwoordelijke voor het advies van Embrace the Wind is Pieter Geerdink (32 jaar, woonachtig in Enschede).
Dilemma	*Dilemma*
De gemeente Enschede heeft, op advies van de stichting Embrace the Wind, eind vorig jaar een plek aangewezen die uitstekend is voor de bouw van vijf windmolens. De bouw hiervan moet eind 2020 gerealiseerd zijn. Er is één probleem: Het gaat om een natuurgebied dat grenst aan uw huis. Hierdoor zal het uitzicht vanuit uw tuin veranderen van situatie 1 naar situatie 2.	De gemeente Enschede heeft, op advies van de stichting Embrace the Wind, eind vorig jaar een plek aangewezen die uitstekend is voor de bouw van vijf windmolens. De bouw hiervan moet eind 2020 gerealiseerd zijn. Er is één probleem: Het gaat om een natuurgebied dat grenst aan uw huis. Hierdoor zal het uitzicht vanuit uw tuin veranderen van situatie 1 naar situatie 2.

Figure 2: Illustrative picture

3.3. Measures

Interests in environmental issues

This construct was measured by the interests in environmental issues scale of De Jong, Harkink, and Barth (2018). The scale consists of six items (e.g., "I see myself as an environmentally friendly person," and " I prefer companies that produce in an environmentally friendly manner"). All items are included in Appendix B. Participants' degree of agreeableness was indicated on a seven-point Likert scale (alpha = 0.841)[1].

[1] To improve the reliability of this construct, the reverse coded item, "I think there is too much fuss about the environment," was excluded from further analysis.

Willingness to pay more for renewable energy

For measuring participants' willingness to pay more for renewable energy, a scale of Bang, Ellinger, Hadjimarcou, and Traichal (2000) was used, containing six items (e.g., "How willing would you be to use more expensive forms of energy to reduce pollution?" and " How willing would you be to pay more for wind-powered energy?"). The participants indicated their degree of willingness on a seven-point Likert scale (alpha = 0.852).

Perceived importance of wind turbines

This construct was measured with three statements: "As a local resident, I would like to have a say about the construction of wind turbines in my direct environment"; "As a local resident, I would like to stay informed about the developments regarding the construction of wind turbines in my direct environment", and "As a local resident, I would not be interested in future construction plans of wind turbines in my direct environment" [reverse coded]. Participants indicated their degree of agreeableness regarding these statements on a seven-point Likert scale. (alpha = 0.714).

Acceptance of wind turbines

This construct consisted of six items (e.g., "As a local resident, I would oppose the construction of wind turbines on this spot" [reverse coded] and "As a local resident, I would support the building plans for wind turbines in this location"). The degree to which participants agreed with the statements was indicated on a seven-point Likert scale (alpha = 0.921).[2]

3.4. Procedure

After participants gave consent, the experiment started with either the high or low perspective-taking case, as shown in Table 1. This was followed by the first awe manipulation, which consists of six pictures (high or low awe). Participants were told that these pictures are used in several sustainability projects. The pre-tested picture series of high/low awe, as shown in Figure 4 in Appendix A, was split into two series of each six pictures. During the experiment were two moments where participants were asked to watch a series of pictures, after the high/low perspective-taking case and after the first questionnaire.

The experiment also had two moments where participants had to answer questions regarding the transition to sustainable energy. These two sections add up to 23 questions in total. The experiment ended with seven demographic questions (e.g., What is your age, gender, and living situation). Figure 3 provides an overview of the experimental route.

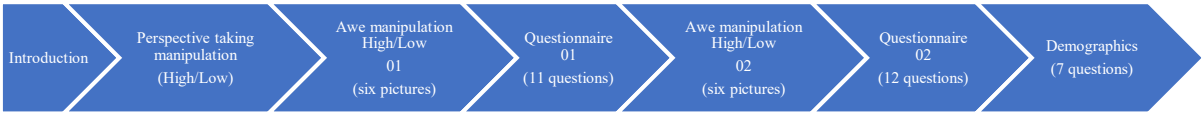


Figure 3: Experimental route

[2] The constructs "perceived importance of wind turbines", and "acceptance of wind turbines" were formed based on a factor analysis, included in Appendix C.

3.5. Participants

To gather participants for the experiment, online communication channels were used, such as Facebook, WhatsApp, and Instagram. To reach as many participants as possible, a snowball sampling method was used. This method uses participants to reach other participants (Babbie, 2016). This was done by asking participants to reach out to other people for participating in the experiment. The target group of the study consisted of adults, eighteen years old or older, who had lived the majority of their lives in the Netherlands. The experiment was conducted in Dutch.

In total, 305 people participated in the online experiment. However, among these registered participations were cases that could not be used for further analysis and were therefore excluded. For example, people who took too much time or too little time to complete the experiment were excluded. To do justice to the efforts of the participants, a rather broad timeframe was used to decide whether a case should be included or not. Participants who took four minutes or longer, but not more than 40 minutes to complete the experiment were included in the analysis. In addition, participants who indicated that they were not willing to participate and participants who did not fully complete the experiment were excluded from the analysis. These criteria led to an exclusion of 74 participants, resulting in a sample of 231 cases.

The sample ($N = 231$) consisted of 105 (45.5%) male participants, 125 (54.1%) female participants, and one participant who selected “other” for gender. A slight majority of the participants (118 or 51.3%) were in the age category of 21–30 years, and the mean age was 35.4 years. The status of parent among the participants was rather equally distributed: 43.7% of the participants had children and 56.3% did not. Finally, a majority, approximately two-thirds of the participants, lived in a city. Table 2 provides a more detailed overview of the demographics and characteristics of the sample.

In order to check whether participants’ background factors across the four experimental conditions were similar, a Pearson’s Chi-Square test was conducted. These tests showed no significant differences between the four conditions regarding gender ($\chi^2 = 8.748$, $p = .188$), having children ($\chi^2 = 5.494$, $p = .139$), living situation ($\chi^2 = 6.499$, $p = .370$), unobstructed view from garden ($\chi^2 = 1.782$, $p = .619$), wind turbines in area ($\chi^2 = 5.236$, $p = .155$), and level of education ($\chi^2 = 31.353$, $p = .144$). An analysis of variance showed no significant differences between the four conditions in relation to the age of the participants, $F(3, 226) = 0.111$, $p = .954$.

Table 2. Demographics and descriptive characteristics of the sample

Demographics and descriptive characteristics		Frequency	%
Gender			
	Male	105	45.5%
	Female	125	54.1%
	Other	1	0.4%
Age*			
	≤ 20	8	3.5%
	21–30	118	51.3%
	31–40	39	17.0%
	41–50	20	8.7%
	51–60	30	13.0%
	61–70	12	5.2%
	71–80	3	1.3%
	≥ 81	-	-
Children			
	Yes	101	43.7%
	No	130	56.3%
Living situation			
	City	155	67.1%
	Village	64	27.7%
	Outside built-up area	12	5.2%
Unobstructed view from garden			
	Yes	72	31.2%
	No	159	68.8%
Wind turbines in area			
	Yes	18	7.8%
	No	213	92.2%
Level of education			
	Primary school	-	-
	Pre-vocational secondary education	4	1.7%
	Senior general secondary education / Pre-university education	11	4.8%
	Secondary vocational education	58	25.1%
	Higher professional education; Bachelor's or Master's	116	50.2%
	University education; Bachelor's, Master's or PhD	39	16.9%
	Other	3	1.2%

**One missing value*

4. Results

Correlation analyses will be conducted for studying the relationship between the dependent variables. ANOVA analyses will be used for testing the hypotheses.

4.1. Correlation analyses

Table 3 shows three significant correlations between the dependent constructs. There is a significant, weak positive correlation between participants' interests in environmental issues and their acceptance of wind turbines ($r = .13$, $p = .049$). Participants' interests in environmental issues and their willingness to pay more for renewable energy has a significant, moderately strong, positive correlation ($r = .39$, $p < .001$). A significant, moderately strong positive correlation between participants' willingness to pay more for renewable energy and their acceptance of wind turbines was found ($r = .46$, $p < .001$).

Remarkably, participants' perceived importance of wind turbines was the one construct that did not correlate significantly with any other construct.

Table 3. Correlations between the dependent constructs

	1	2	3	4
1. Perceived importance of wind turbines	1	-.11	.09	.08
2. Acceptance of wind turbines		1	.13*	.46**
3. Interests in environmental issues			1	.39**
4. Willingness to pay more for renewable energy				1

*Significant at $p < .05$
**Significant at $p < .01$
Note. $N = 231$

4.2. ANOVA analyses

Perceived importance of wind turbines

In order to test whether there are differences among the four conditions, a 2 (awe: high versus low) X 2 (perspective taking: high versus low) analysis of variance was conducted with the perceived importance of wind turbines as the dependent variable. The main effect of awe on the perceived importance of wind turbines was insignificant, (F (1, 227) = 1.775, p = .184). Although in the predicted direction, the means did not differ (M = 6.20, SD = 1.01 versus M = 6.02, SD = 1.17). The main effect of perspective taking on the perceived importance of wind turbines was also not significant (F (1, 227) = 2.563, p = .111). Although not significant, the difference occurred in the expected direction (M = 5.99, SD = 1.16 versus M = 6.22, SD = 1.02). Likewise, the interaction effect was insignificant (F< 1, ns).

For explorative purposes, the next analyses were conducted with separate items. There was a marginal significant main effect of perspective taking on the statement "As a local resident, I would like to stay informed about the developments regarding the construction of wind turbines in my direct environment," (F(1. 227) = 3.837, p = .051). This indicates that participants in the high perspective-taking condition (M = 6.23, SD = 1.23) expressed less desire to be informed compared to participants in the low perspective-taking condition (M = 6.50, SD = 0.87), the difference was against the expected direction.

Acceptance of wind turbines

Similar to the analysis of the perceived importance of wind turbines, a 2 (awe: high versus low) X 2 (perspective taking: high versus low) analysis of variance was conducted with the acceptance of wind turbines as the dependent variable. The main effect of awe on the acceptance of wind turbines was not significant (F (1, 227) = 2.537, p = .113). Showing that there was no difference between the high-awe (M = 3.62, SD = 1.43) and low-awe (M = 3.93; SD = 1.43) condition. The main effect of perspective taking as well as the interaction effect on the acceptance of wind turbines were insignificant (both F's < 1, ns).

For explorative purposes, the next analyses were conducted with separate items. There was a significant main effect of awe on item: "As a local resident, I would find the building of wind turbines in this location a good development," ($F(1, 227) = 4.575$, $p = .034$). This indicates that participants in the high-awe condition ($M = 3.25$, $SD = 1.58$) were less supportive towards the building of wind turbines compared to participants in the low-awe condition ($M = 3.70$, $SD = 1.62$). However, the direction of the difference contradicted with what was predicted.

Interests in environmental issues

A 2 (awe: high versus low) X 2 (perspective taking: high versus low) analysis of variance was conducted as well, with interests in environmental issues as the dependent variable. The main effect of awe on interests in environmental issues was insignificant (F (1, 227) = 2.357 $p = .126$). The means for high-awe ($M = 5.16$, $SD = 1.02$) and low-awe ($M = 5.35$, $SD = 0.86$) did not differ significantly. The main effect of perspective taking and the interaction effect on interests in environmental issues were insignificant as well (both $F's < 1$, ns).

Next analyses were conducted with separate items for explorative purposes. There is a significant main effect of awe on "I see myself as an environmentally friendly person" ($F(1. 227) = 8.110$, $p = .005$). This indicates that participants in the high-awe condition ($M = 4.63$, $SD = 1.28$) perceived themselves as less environmentally friendly persons compared to participants in the low-awe condition ($M = 5.05$, $SD = 0.98$). The direction of the difference was against the prediction.

Willingness to pay more for renewable energy

Similar to the previous analyses, a 2 (awe: high versus low) X 2 (perspective taking: high versus low) analysis of variance was conducted with willingness to pay more for renewable energy as the dependent variable. The main effect of awe and perspective taking as well as their interaction were not significant (all $F's < 1$, ns).

For explorative purposes, the next analyses were conducted with separate items. There is a marginal significant main effect of awe on "How willing would you be to pay more now in exchange for possible lower electric rates in the future?" ($F(1, 227) = 2.952$, $p = .087$). This indicates that participants in the high-awe condition ($M = 4.93$, $SD = 1.24$) are marginally more willing to pay now in exchange for possible lower future electric rates, compared to participants in the low-awe condition ($M = 4.65$, $SD = 1.36$). The direction of the difference is in line with the prediction.

5. Discussion

5.1. Main findings

This study was inspired by research proclaiming the positive effects of awe and research proclaiming the positive effects of perspective taking on people's attitude towards their environment. It was investigated whether the positive effects of awe and perspective taking together could result in a boosting effect on pro-environmental behavior. Since no major effects were found concerning awe, perspective taking, or an interaction effect, the findings in this research contradict the results of previous research.

The correlation matrix in Table 3 shows three significant correlations between the constructs. The significant correlations are positive and in line with the expectations. Since all the constructs convey a degree of favorability towards sustainable energy, it is likely that people who score high in one construct, score high in the other constructs as well. For example, participants who are willing to pay more for renewable energy are expected to be more likely to accept wind turbines, and vice versa. A correlation coefficient of .459 endorses this expectation.

However, the construct, perceived importance of wind turbines, does not correlate significantly with any other construct, which is remarkable. For example, higher degrees of the perceived importance of wind turbines should intuitively lead to higher scores on participants acceptance of wind turbines, and vice versa. Yet, the correlation coefficients do not endorse this reasoning.

Though no significant results were found, there are results that nearly reached a marginal significant level, which were further analyzed. Though awe and perspective taking showed a difference in mean scores on the perceived importance of wind turbines in the expected direction, the differences were too small to reach a significant level.

An analysis of separate items showed four interesting results. A marginal significant effect was observed for perspective taking on "As a local resident, I would like to stay informed about the developments regarding the construction of wind turbines in my direct environment." However, the effects were against the predicted direction. Furthermore, awe showed a marginal significant effect on "How willing would you be to pay more now in exchange for possible lower electric rates in the future?" This effect was in line with the prediction. Two other significant effects of awe were found on separate items. However, the effects were in an unpredicted direction. Awe showed significant effects on "I see myself as an environmentally friendly person," and "As a local resident, I would find the building of wind turbines in this location a good development." Participants in the low-awe condition scored significantly higher than in the high-awe condition on these two items, which contradicts the literature-based prediction.

5.2. Theoretical contribution

Although the pre-test confirmed the effectiveness of the awe manipulation, the results from the main study did not yield effects of awe on the dependent variables. The analysis of the effects of awe on separate items showed three relevant effects. Two significant effects were found where the means differed from the predicted direction and one marginal significant effect was found in the predicted direction.

These results make it highly questionable whether awe is useful in increasing the acceptance of wind turbines. Why showed the pre-test different results on awe than the main study? A reasonable explanation could be the context in which the awe manipulation took place. The pre-test did not give any context, while the main study did, namely the energy transition and the construction of five wind turbines. Arguably, the context of the main study created a different perspective towards the pictures, which might explain the reverse effect of the awe manipulation. For example, the low-awe conditions used close-ups of natural scenes that showed nature as fragile, leading to increased awareness of nature's fragility. This can make participants more favorable towards the energy transition through the influence of wanting to protect nature. On the other hand, given the context of the main study, the wide landscapes in the high-awe conditions can give participants a feeling of loss (e.g., "beautiful natural landscapes will be replaced by a sight full of wind turbines"). This can make people anxious about losing natural landscapes and create higher resistance against the energy transition.

5.3 Future research

In this study, awe was induced by pictures of various vast landscapes. Nonetheless, there are other elicitors of awe. For instance, Keltner and Haidt (2003) have defined five awe elicitors based on virtue (e.g., a person showing strength of character), threat (e.g., extreme weather), ability (e.g., witnessing an athlete's skillful performance), beauty (e.g., a beautiful person or artwork), or supernatural causality (e.g., the experience of witnessing the presence of a ghost or angel). These awe elicitors have to be considered as theoretical variations, as they have not been validated through an experiment (Chirico & Yaden, 2018) and can be used as alternative manipulations of awe. In addition, since this study did not find significant effects of awe in line with the predictions, perhaps a sense of awe is not able to make people more favorable towards wind turbines. Rather, the confrontation with the fragility of nature may be more effective, which is evidenced by low-awe showing significantly higher scores on separate items than high-awe. It would be interesting to confront participants with the fragility of nature along with the different awe eliciting stimuli proposed by Keltner and Haidt (2003) to investigate whether this can increase participant's favorability towards the energy transition.

Due to COVID-19, this study was not able to conduct the experiment as planned. The awe manipulation took place via relatively small screens, which diminishes the effects of the manipulation. For future research, Virtual Reality (VR) could be an interesting way to confront participants with awe stimuli. VR

appears to be an effective medium for inducing emotions by people. The effectiveness of VR does not only depends on the technical graphics of the virtual environment but it is rather the emotions induced in the virtual environment that influences the experience (Riva et al., 2007). Riva et al. (2007) developed three virtual environments of a park, all three consisting of the same basic elements (e.g., same trees and lamps). They manipulated the virtual environment by variables, such as music, lights, and shadows to establish different experiences (anxiety, relaxing, and neutral). This study showed that affective stimuli (anxiety and relaxing) contribute significantly more to the sense of presence in the virtual environment, compared to a neutral environment. Hence, VR is an effective tool for inducing specific emotions by people.

In addition, Chirico, Ferrise, Cordella, and Gaggioli (2018) studied the effects of awe combined with VR. Their study showed that the awe-inducing environments stimulated higher degrees of awe than the neutral environment. This study further stressed the advantages of VR over 360° videos (videos with an entire 360° environment). They argue that VR is better able to represent a real environment than 360° videos because it is more interactive. Furthermore, this study also stresses the ability of VR to create higher degrees of experienced presence in the awe-inducing environment, it may make the emotional experience more intense. Thus, inducing emotions with VR instead of conventional pictures or 360° videos would be an enrichment for this type of study. VR is in particular helpful in transferring affective stimuli.

For future research that focuses on increasing people's pro-environmental behavior, a study on the effects of different awe elicitors with an additional condition stressing the fragility of nature will be interesting. This can be combined with different ways of presenting the affective stimuli to participants: VR, conventional pictures, and 360° videos.

5.4 Limitations

The situation concerning COVID-19 asked for a reconsideration of the research method. Since physical contact had to be avoided as much as possible, conducting an experiment in a physical location was highly inadvisable, and it was decided to redesign the experiment for an online environment. Conducting this type of experiment online did have serious consequences. Hence, a big difference can be observed between the pre-test of awe and the main experiment regarding the procedure and results.

First, since awe is a feeling of being small compared to the frame that the stimuli provides, a widescreen through which the participants are confronted with the awe pictures was expected to contribute to the experience of awe. However, according to Qualtrics data, up to 53% of the surveys started via Qualtrics are on mobile devices. The relatively small screen sizes of mobile devices can heavily diminish the effect of the awe manipulation (for comparison, the awe pre-test used an 85-inch screen). Thus, this explains (at least partly) the absence of significant effects on the awe manipulation in the experiment.

Following this reasoning, it is questionable whether we can speak at all about an “awe experience” in the online experiment.

Second, the pre-test took place in a controlled environment. This was not the case for the main experiment, due to the online format in which it was conducted. An online experiment is unable to control for external distractions, which is significant since emotional manipulations, in general, are hard to establish. External noises or other distracting factors can quickly nullify the effects of the awe manipulation. In addition, the characteristics of the online experiment makes a rushed completion of the experiment tempting, for example, due to a distracting environment (e.g., a parent with small children at home). Thus, participants are perhaps less able or willing to put in enough effort to complete the task correctly with an online experiment compared to an experiment on a physical location.

Finally, the low and high perspective-taking cases made use of a photoshopped picture that showed the before-after effect (Figure 2) to clarify the described situation. Perhaps, the landscape incorporated in the scenario also induced a sense of awe, considering its vast character. The image was used in all conditions and induced potentially unwanted effects (e.g., awe in the low-awe condition). The image potentially stimulated perspective taking as well, since the described situation became more concrete and tangible for the participants.

5.5 Conclusion

The awe manipulation in the pre-test demonstrated the effects that were expected. However, in the main experiment, none of the significant effects that were expected were found. Perhaps is awe not the method to make people more supportive towards wind turbines and the energy transition in general. As proposed, future research can study other ways to increase people’s favorability towards the energy transition. Two significant effects of awe on separate items showed that the low-awe (fragile nature) scored higher than the high-awe (vast landscapes). Therefore, stressing the fragility of nature may be an interesting angle for increasing the support for the construction of wind turbines and the transition to renewable energy in general.

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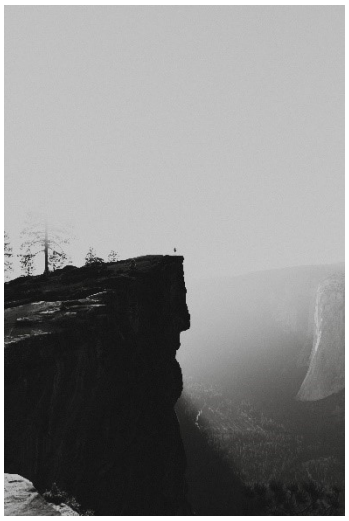
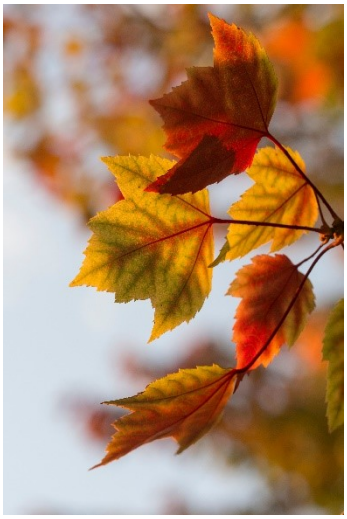
Appendix A: Pre-test Visual Stimuli

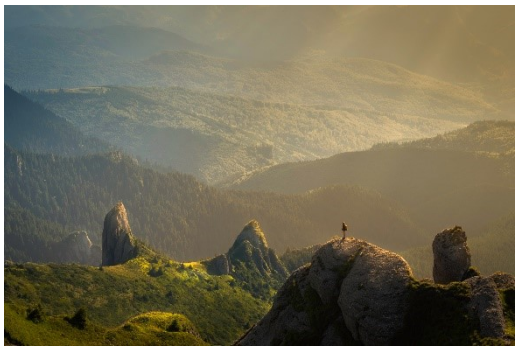


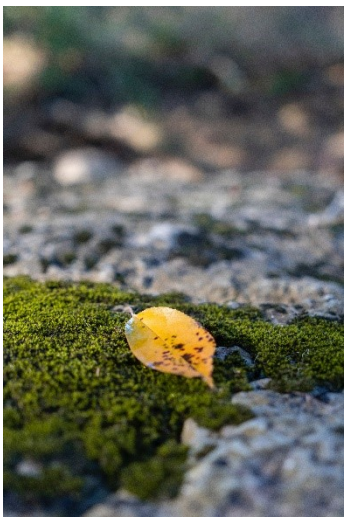










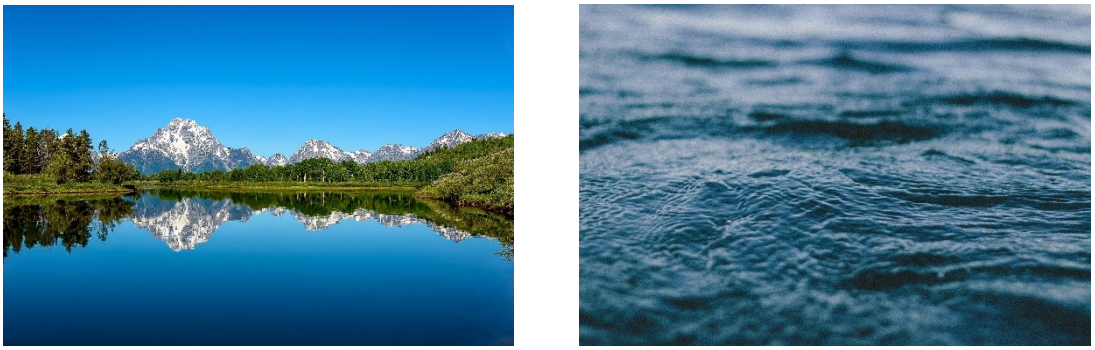


Figure 4: Pre-tested awe picture series as used in the experiment. Left column: high-awe pictures, right column: low-awe pictures

Table 4. Pre-test Questionnaire

Statements ***(with Dutch translation)***
Geef aan in hoeverre u de volgende emoties ervoer tijdens de slideshow (1 = "Helemaal niet" en 7 = "Extreem")
1. Joy *(Blijdschap)*
2. Contentment *(Tevredenheid)*
3. Pride *(Trots)*
4. Love *(Liefde)*
5. Compassion *(Medelijden)*
6. Amusement *(Vermaak)*
7. Awe *(Ontzag)*
Geef aan in hoeverre de volgende statements op u van toepassing zijn (1 = "Helemaal niet waar" en 7 = "Helemaal waar").
8. The slideshow gave me the feeling of being in the presence of something greater than myself. *(De slideshow gaf mij het gevoel van de aanwezigheid van iets groter dan mezelf.)*
9. The slideshow gave me an overwhelming feeling. *(De slideshow gaf mij een overweldigend gevoel.)*

Appendix B: Questionnaires of the online experiment

Table 5. Interest in environmental issues.

Items ***(with Dutch translation)***
1. I prefer environmentally friendly products. *(Ik geef de voorkeur aan milieuvriendelijke producten.)*
2. I prefer companies that produce in an environmentally friendly manner. *(Ik geef de voorkeur aan bedrijven die op een milieuvriendelijke manier produceren.)*
3. I see myself as an environmentally friendly person. *(Ik zie mezelf als een milieuvriendelijk persoon.)*
4. I try to be as environmentally friendly as possible. *(Ik probeer zo milieuvriendelijk mogelijk te zijn.)*
5. I consider the environment an important topic to think about. *(Ik zie het milieu als een belangrijk onderwerp om over na te denken.)*
6. I think there is too much fuss about the environment. [reverse coded] *(Ik denk dat er teveel ophef wordt gemaakt over het milieu.)*

(De Jong et al., 2018, p. 92)

Table 6. Willingness to pay more for renewable energy

Items ***(with Dutch translation)***
1. How willing would you be to use more expensive forms of energy to reduce pollution? *(Hoe bereid zou u zijn om duurdere energie te gebruiken om vervuiling te verminderen?)*
2. How willing would you be to support a local project to generate energy with wind-powered devices. *(Hoe bereid zou u zijn om een lokaal project te steunen om energie op te wekken met apparaten die op wind werken?)*
3. How willing would you be to pay more for your electric bill if you knew the cost paid for environmentally safe electricity? *(Hoe bereid zou u zijn om meer voor uw elektriciteit te betalen als u wist dat deze hogere kosten voor milieuvriendelijke energie zijn?)*
4. How willing would you be to support a fuel adjustment clause in your electric bill to subsidize the cost of developing wind-powered energy? *(Hoe bereid zou u zijn om een clausule in uw elektriciteitsrekening op te nemen, waarmee de ontwikkeling van windenergie wordt gesubsidieerd?)*
5. How willing would you be to pay more now in exchange for possible lower electric rates in the future? *(Hoe bereid zou u zijn om nu meer te betalen voor elektriciteit in ruil voor mogelijk lagere elektriciteitstarieven in de toekomst?)*
6. How willing would you be to pay more for wind-powered energy? *(Hoe bereid zou u zijn om meer te betalen voor windenergie?)*

(Bang et al., 2000, p. 459)

Table 7. Self-constructed scales

Items per construct *(with Dutch translation)*
Geef aan in hoeverre u het eens bent met de volgende stellingen (1 = “Helemaal mee oneens” en 7 = “Helemaal mee eens”):
Perspective taking
1. I can imagine well that this is a difficult situation for the municipality of Enschede. *(Ik kan mij goed voorstellen dat dit voor de gemeente Enschede een moeilijke situatie is.)*
2. As a local resident, I would understand the decision to build the five wind turbines in this location. *(Als omwonende zou ik begrip hebben voor de beslissing om de vijf windmolens op deze plek te bouwen.)*
Perceived importance of wind turbines
3. As a local resident, I would like to have a say about the construction of wind turbines in my direct environment. *(Als omwonende zou ik graag meepraten over de bouw van windmolens in mijn directe omgeving.)*
4. As a local resident, I would like to stay informed about the developments regarding the construction of wind turbines in my direct environment. *(Als omwonende zou ik op de hoogte willen blijven over de ontwikkelingen rondom de bouw van windmolens in mijn directe omgeving.)*
5. As a local resident, I would not be interested in future construction plans of wind turbines in my direct environment [reverse coded] *(Als omwonende zou ik geen interesse hebben in toekomstige bouwplannen van windmolens in mijn directe omgeving.)*
Acceptance of wind turbines
6. As a local resident, I would support the building plans for wind turbines in this location *(Als omwonende zou ik de bouwplannen voor windmolens op deze plek steunen.)*
7. As a local resident, I would not accept wind turbines ruining my view. [reverse coded] *(Als omwonende zou ik het niet accepteren dat windmolens mijn uitzicht verpesten.)*
8. As a local resident, I would like to move if wind turbines are built on this spot. [reverse coded] *(Als omwonende zou ik willen verhuizen als op deze plek windmolens gebouwd worden.)*
9. As a local resident, I would eventually accept the construction plans for wind turbines. *(Als omwonende zou ik de bouwplannen voor de windmolens uiteindelijk accepteren.)*
10. As a local resident, I would oppose the construction of wind turbines on this spot. [reverse coded] *(Als omwonende zou ik in verzet komen tegen de bouw van windmolens op deze plek.)*
11. As a local resident, I would consider the construction of wind turbines on this spot a good development. *(Als omwonende zou ik de bouw van windmolens op deze plek een goede ontwikkeling vinden.)*

Appendix C: Factor analysis

Table 8. Factor analysis with all new items

	Factors	
	1	**2**
*Ik kan mij goed voorstellen dat dit voor de gemeente Enschede een moeilijke situatie is.**		*.553*
*Als omwonende zou ik begrip hebben voor de beslissing om de vijf windmolens op deze plek te bouwen.**	*.903*	
Als omwonende zou ik graag meepraten over de bouw van windmolens in mijn directe omgeving.		.820
Als omwonende zou ik op de hoogte willen blijven over de ontwikkelingen rondom de bouw van windmolens in mijn directe omgeving.		.813
Als omwonende zou ik geen interesse hebben in toekomstige bouwplannen van windmolens in mijn directe omgeving.		.513
Als omwonende zou ik de bouwplannen voor windmolens op deze plek steunen.	.884	
Als omwonende zou ik het niet accepteren dat windmolens mijn uitzicht verpesten.	.790	
Als omwonende zou ik willen verhuizen als op deze plek windmolens gebouwd worden.	.791	
Als omwonende zou ik de bouwplannen voor de windmolens uiteindelijk accepteren.	.870	
Als omwonende zou ik in verzet komen tegen de bouw van windmolens op deze plek.	.908	
Als omwonende zou ik de bouw van windmolens op deze plek een goede ontwikkeling vinden.	.819	

Table 9. Factor analysis with valid new items

	Factors	
	1	2
Als omwonende zou ik graag meepraten over de bouw van windmolens in mijn directe omgeving.		.837
Als omwonende zou ik op de hoogte willen blijven over de ontwikkelingen rondom de bouw van windmolens in mijn directe omgeving.		.828
Als omwonende zou ik geen interesse hebben in toekomstige bouwplannen van windmolens in mijn directe omgeving.		.584
Als omwonende zou ik de bouwplannen voor windmolens op deze plek steunen.	.881	
Als omwonende zou ik het niet accepteren dat windmolens mijn uitzicht verpesten.	.797	
Als omwonende zou ik willen verhuizen als op deze plek windmolens gebouwd worden.	.800	
Als omwonende zou ik de bouwplannen voor de windmolens uiteindelijk accepteren.	.874	
Als omwonende zou ik in verzet komen tegen de bouw van windmolens op deze plek.	.909	
Als omwonende zou ik de bouw van windmolens op deze plek een goede ontwikkeling vinden.	.823	

Note. 1 = Perceived importance of wind turbines, 2 = Acceptance of wind turbines