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Abstract:
Economists have neglected place attachment as a potential explanation for people's preferences for environmental goods. We conducted the first discrete choice experiment to assess the place attachment concept in the valuation of and response to the place-specific environmental impact from a proposed wind farm in Norway. Place attachment increases required compensation for accepting the wind farm, strengthens resistance, and leads to a higher propensity to systematically choose the status quo option of no wind farm in the discrete choice experiment. This finding suggests that the so-called "not-in-my-backyard" (NIMBY) effect should be recognized as a rational response when people place a high value on local environmental amenities, including place identity and a sense of place.

Keywords: Place attachment, sense of place, NIMBY (not-in-my-backyard), discrete choice experiment, cultural ecosystem services, wind energy

JEL classification: Q40, Q51, Q57

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Sammendrag

Det latente miljøpsykologiske konseptet stedstilknytning har stort sett blitt oversett innen miljø-økonomi, til tross for å være sentralt i forhold til hvordan folk forholder seg til steder og miljøgoder. Vi utfører et valgeksperiment hvor vi evaluerer hvordan stedstilknytning påvirker folk sin respons overfor et foreslått vindkraftanlegg i Norge og hvordan de verdsetter miljøkonsekvensene. Vi finner at stedstilknytning forhøyer hvor mye folk krever i kompensasjon for å ha vindkraftanlegget. Stedstilknytning er altså verdiøkende. Vi finner også at stedstilknytning forklarer motstand mot prosjektet ved å øke sannsynligheten for å systematisk velge «ingen utbygging»-alternativet i valgeksperimentet. Dette kan forklares av NIMBY-effekten (not-in-my-back-yard). Basert på våre funn argumenterer vi for at stedstilknytning bør bli annerkjent som en viktig faktor for å forklare folks respons, motvillighet og generell preferanse-heterogenitet i uttrykte preferansemetoder. Videre argumenterer vi for at NIMBY-effekten delvis kan forklares av psykologiske konsepter som øker mennersker sin verdi av steder og naturområder.

1. Introduction

Place attachment, which shares a similar definition as *sense of place* (Shamai, 1991; Hausmann et al., 2016), describes the bond or the attachment an individual has to a place in different ways (Low and Altman, 1992; Moore and Graefe, 1994; Stedman, 2002; Scannell and Gifford, 2010; Ramkissoon and Mavondo, 2015).

While place attachment is a central concept in environmental psychology and, more recently, in multidisciplinary ecosystem services research in relation to place-specific environmental changes (Devine-Wright, 2009; Hausmann et al., 2016; Ryfield et al. 2019), it has not been directly addressed by more conventional environmental economics. Studying place attachment is relevant for the stated preference environmental valuation literature for several reasons. First, incorporating the concept of place attachment in place-specific stated preference research can contribute to explain people's preferences for environmental goods and their behavioral response to environmental changes; in other words, provide an improved understanding of the people-place-value relationship. Second, this study shows that incorporating a latent construct in a discrete choice model can be a fruitful part of construct validity evaluation. According to Bishop and Boyle (2019, p. 564): "*Construct validity begins with prior expectations about how the true value ought to be related to other variables. Such prior expectations are motivated by theory, intuition, and past empirical evidence. They are translated into hypotheses that can be tested using the study's data and statistical results.*" We review strands of literature outside standard economics to establish expectations about how place attachment may affect elicited stated preference welfare measures. In turn, these expectations, or hypotheses, are corroborated by our statistical analysis in support of construct validity. Third, linking place attachment to stated preference valuation estimates can have environmental policy implications. For example, we may better understand the distributional implications or equity aspects of specific management schemes (Bateman and Mace, 2020; Faccioli et al., 2020), which is important supplementary information in a social benefit-cost assessment (Boardman et al., 2017).

Our contributions from this study are two-fold:(1) We provide a literature review relating the concept of place attachment to place-specific environmental stated preference research. (2) We examine how place attachment affects individuals' response to and valuation of local place-specific environmental impacts in a discrete choice experiment setting. The study context is a proposed wind farm near a small village in the south-eastern part of Norway. We use a willingness-to-accept (WTA) format that offers reductions in annual municipal taxes to residents combined with variations in attributes that define the proposed wind farm. The literature review suggests that place attachment is important for how people value ecosystem goods and services and resistance against disruption of local environments.

Ecosystem services research distinguishes between spaces and places (Gee and Burkhard, 2010), whereby places provide additional cultural ecosystem services, such as sense of place, place attachment, and dimensions of place attachment (MEA, 2005; Gee and Burkhard, 2010; Hausmann et al., 2016; Ryfield et al., 2019). Attachment to a place can be seen as a benefit per se, e.g., through satisfying identify preference (Akerlof and Kranton, 2000), but it can also increase the value people place on local cultural ecosystem services such as recreation and nature views (Moore and Graefe, 1994; Hailu et al., 2005; Gee and Burkhard, 2010; Hausmann et al., 2016). In the first part of our analysis, we assess how place attachment affects the valuation of local place-specific environmental impacts using a discrete choice model (Ben-Akiva et al., 2002, 2012). The interest in psychological constructs, i.e., variables composed of several indicator dimensions, to explain preference heterogeneity has been increasing in environmental stated preference research (Hess and Beharry-Borg, 2012; Hoyos et al., 2015; Mariel and Meyerhoff, 2016; Czajkowski et al., 2017a, 2017b; Pakalniete et al., 2017; Boyce et al., 2019; Zawojska et al., 2019; Faccioli et al., 2020). However, this research is still in its infancy, and it should be explored further, according to Faccioli et al. (2021) and Mariel et al. (2021).

The environmental psychological literature suggests that place attachment may be important for observing the much-discussed NIMBY (not-in-my-backyard) attitude (Van der Horst, 2007; Devine-Wright, 2009; Devine-Wright and Howes 2010; Devine-Wright, 2013; Davison et al., 2012; Matilainen et al., 2017). The NIMBY attitude suggests that spatial proximity explains resistance to changes in local environments (Devine-Wright, 2009). It has been described as selfish behavior that prevents solving social problems (Lake, 1993), e.g., resistance against building local renewable energy infrastructures to mitigate global CO2 emissions. However, Devine-Wright (2009) argues that this type of opposition is a form of place-protective action when people have an emotional or recreational attachment to impacted places. The NIMBY phenomenon has been investigated in several prior stated preference valuation studies, see, e.g., Navrud and Bråten (2007), Klinglmair et al. (2015), Boyle et al. (2019), and Dugstad et al. (2020), but not yet in relation to the place attachment concept. This is the first stated preference study to examine whether place attachment explains opposition to local environmental impact. In the second part of our analysis, we use structural equation modeling (SEM) (Anderson and Gerbing, 1988; Rosseel, 2012) to assess whether place attachment affects the propensity to systematically choose the status quo alternative in our discrete choice experiment, which represents a scenario with no wind farm construction at zero compensation in terms of reduced municipal taxes.

We conclude that in stated preference research on place-specific environmental impacts, place attachment should be recognized as an essential factor for explaining people's responses and valuation estimates. The remainder of the paper is structured as follows. First, we define place attachment and explain different dimensions of this concept and provide a literature review where we present two hypotheses on how place attachment is related to people's valuation and opposition. Second, we describe the empirical setting and the design of the discrete choice experiment. Third, the modeling approaches are described before the results are presented. The paper ends with a discussion and conclusions with some implications for environmental policy and recommendations for future stated preference research.

2. Place Attachment Concepts and Hypotheses

2.1 Place Attachment Dimensions

The definition of place attachment varies with the setting examined by the researcher (Halpenny, 2010). However, one broad definition is individuals' psychological bond or attachment with a place in different ways (Brown and Perkins, 1992). We found the following two dimensions or aspects of place attachment used in the environmental psychology and ecosystem services strands of literature: i) functionality (place dependency) (Stokols and Shumaker, 1981), and ii) personal identification and emotional bonding (place identity) (Proshansky et al., 1983; Vaske and Kobrin, 2001; Halpenny, 2010). These dimensions are relevant because they are reflected in people's attitudes, behavior, and response to local environmental issues (Vorkinn and Riese, 2001; Stedman, 2002; Brehm et al., 2006; Devine-Wright, 2009; Halpenny, 2010; Ramkissoon et al., 2012, 2013; Ramkissoon and Mavondo, 2015).

Place dependency, the first dimension, describes attachment to a place in terms of how functional the place is to the performance of desired recreational activities (Stokols and Shumaker, 1981; Williams and Roggenbuck, 1989; Moore and Graefe, 1994). Place dependency depends on the recreational functionality of a place relative to other places (Halpenny, 2010). Thus, an individual will compare different places to evaluate the places' recreational functionality (Bricker and Kerstetter, 2000). If a place is highly functional for the performance of desired activities, the place provides more amenities necessary for conducting desired activities than other places (Vaske and Kobrin, 2001). The individual will then prefer and choose the place with high functionality, and she or he will develop a particular bond with the place.

Place identity (Proshansky et al., 1983), the second dimension, describes an individual's attachment to a place in relation to how an individual identifies herself with a place and the individual's emotions and feelings about the place. A place can be important for an individual's personal and social identification, and the more important it is, the stronger the place identity is (Ramkissoon et al., 2013; Bricker and Kerstetter, 2000; Hallak et al., 2012).

2.2 Place Attachment, Valuation, and Oppositional Behavior

Place disruption challenges individuals' place attachment (Brown and Perkins, 1992; Williams et al., 1992; Vorkinn and Riese, 2001; Devine-Wright, 2009; Cass and Walker, 2009; Clarke et al., 2018). Place disruption is defined as a noticeable transformation of a place in physical and, thus, psychological terms. People with higher levels of attachment to a place are more sensitive to place disruption, especially disruption of natural areas (Williams et al., 1992; Vorkinn and Riese, 2001). Sense of place and place attachment can be categorized as a cultural ecosystem service (MEA, 2005; Daniel et al., 2012). Cultural ecosystem services are non-material benefits of both a tangible and an intangible kind (MEA, 2005). Gee and Burkhard (2010) describe the process of moving from a *space* to a *place*, whereby a place provides new and enhancing benefits, such as attachment, place identity, and place dependence. Hence, place attachment is an underlying psychological factor that can be linked to preferences for a place, such as landscape changes (Walker and Ryan, 2008). The perceived benefits of a place that faces disruption are greater among individuals with stronger place attachment because the attachment in itself is an enhancing benefit (Hausmann et al., 2016). In addition, place attachment contributes to enhancing use-values as it depends on experience and the use of a place (Moore and Graefe, 1994).

Place disruption will result in negative changes in the environmental amenities provided by a place and thus in individuals' place attachment (Devine-Wright, 2009; Hausmann et al., 2016). For example, changes to a local environment caused by a wind farm will disrupt the local individuals' place attachment (Brown and Perkins, 1992; Williams et al., 1992; Vorkinn and Riese, 2001; Devine-Wright, 2009; Cass and Walker, 2009; Devine-Wright and Howes, 2010; Clarke et al., 2018) and this disruption is associated with a nonmarket economic cost (Hausmann et al., 2016). Furthermore, higher attachment involves a greater concern for a place and stronger place-specific pro-environmental behavioral intentions (Relph, 1976; Vorkinn and Riese, 2001; Walker and Ryan, 2008; Devine-Wright, 2009; Halpenny, 2010). Faccioli et al. (2020), for example, found that people with a stronger place identity tend to display a higher willingness to pay (WTP) for peatland restoration in Scotland.

Valuation of environmental goods and ecosystem services can be interpreted as a pro-environmental behavioral intention (Faccioli et al., 2020).

2.3 Hypotheses

Based on the above review and discussion, we formulate our first hypothesis as follows:

Individuals with stronger place attachment have a higher willingness to accept (WTA) for attributes associated with negative place-specific environmental impact (Hypothesis 1).

This hypothesis will be explored through a mixed logit model (cf. section 5).

As noted above, the NIMBY attitude has been used to explain local resistance against undesired local developments. However, environmental psychological research suggests that place attachment gives rise to the NIMBY attitude. Studies show that place attachment determines individuals' attitudes, perception, and acceptance of human-made developments in local natural environments. This has chiefly been explored related to the environmental impacts of local renewable energy projects (Williams et al., 1992; Vorkinn and Riese, 2001; Devine-Wright, 2009; Devine-Wright and Howes, 2010; Devine-Wright, 2011; Clarke et al., 2018). In particular, people with a stronger attachment to places facing disruption from local renewable energy developments tend to have lower acceptance (Vorkinn and Riese, 2001; Devine-Wright, 2009; Devine-Wright and Howes, 2010; Cass and Walker, 2009).

Thus, instead of defining local resistance as the NIMBY attitude, it can instead be "*conceived as a form of place-protective action, which arises when new developments disrupt pre-existing emotional attachment and threatens place-related identity process*" (Devine-Wright, 2009, p. 426). In other words, place attachment gives rise to local resistance. In our discrete choice experiment design, resistance can be identified through respondents who systematically choose the status quo option, which implies no wind farm construction, at zero reduction in municipal taxes (i.e., they *resist* the wind farm). In turn, place attachment could potentially explain why some respondents systematically choose the status quo option. We formulate our second hypothesis:

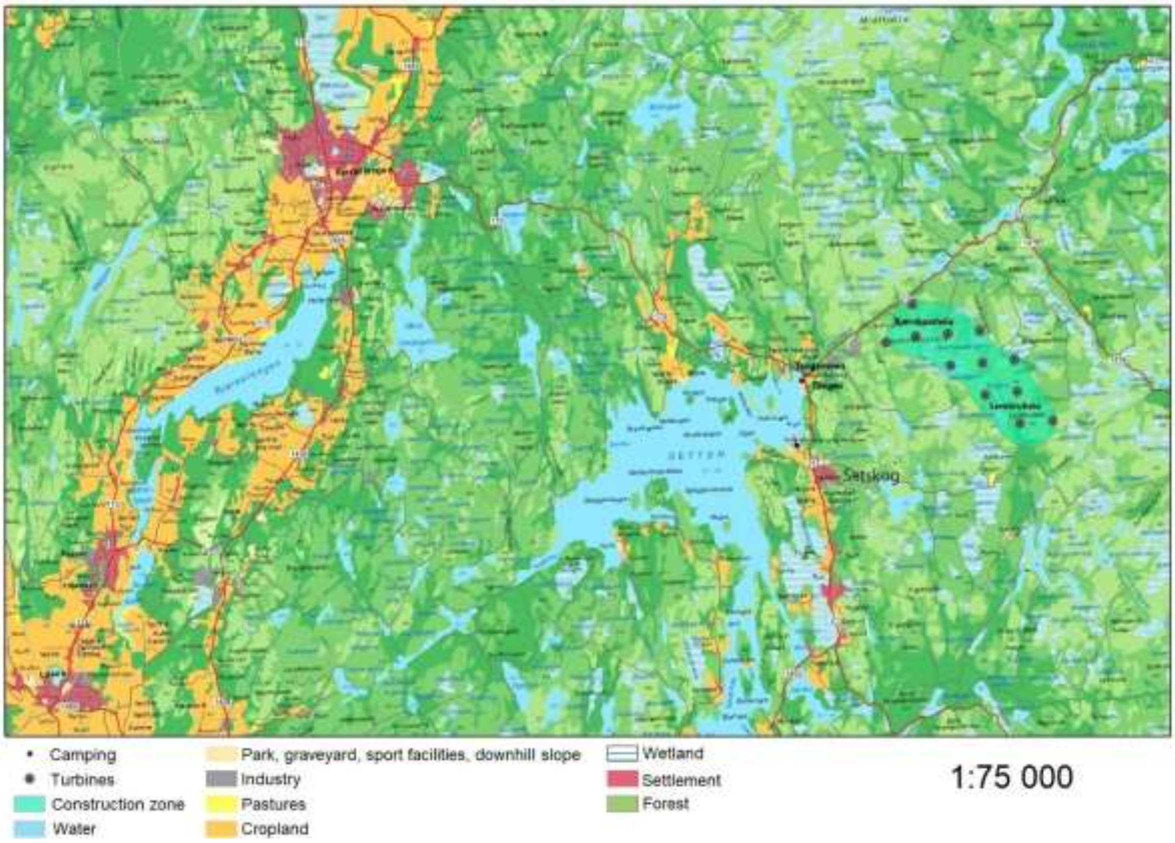
Place attachment significantly increases the propensity to systematically choose the status quo option describing "no construction of the proposed wind farm" in our discrete choice experiment (Hypothesis 2).

This hypothesis will be explored within a structural equation modeling (SEM) framework (cf. section 5).

3. The Empirical Setting

Our study area is the municipality of Aurskog-Høland, a rural area about 60 km east of Oslo, the capital of Norway. In 2018, the Norwegian Water Resources and Energy Directorate (NVE), the licensing authority, received a proposal to develop a wind farm here. The proposed wind farm site is in a forest area (Lembruheia and Bjørnbassheia), near the small village of Setskog with 750 residents in Aurskog-Høland. This forest area is used mainly by the local population of Setskog for recreational activities like hiking, skiing, fishing, and hunting. The construction zone covers about 3.2 km^2 and can accommodate about ten wind turbines. The site is close to Lake Setten, which is popular for recreational activities by people in Setskog and the municipality of Aurskog-Høland, with about 17,000 inhabitants. The lake is most popular in the summer when people enjoy bathing, canoeing, boating, camping, and fishing, but it is also used during the winter, e.g., for the annual ice-skating festival. Thus, Setskog provides several cultural ecosystem services and environmental amenities for the inhabitants of the whole municipality.

Figure 1. Map of the study area



The residential homes closest to the planned wind farm are located at a distance, as the crow flies, of 1.5 km. Figure 1 shows a map of parts of the municipality and, to the east in the map, the planned wind farm. This map was shown to respondents in the survey. The wind farm will provide some local economic benefits to the municipality, especially during the construction phase. However, the wind farm will have negative environmental impacts and thus affect municipal residents and recreational homeowners. Negative impacts include noise, visual intrusion, shadow flickering, disturbing blinking red lights at the top of the wind turbines, and loss of natural recreational areas. In addition, the wind farm will have a negative impact on biodiversity. The affected natural areas are important for the reproduction of wolves (*Canis lupus*) and the Eurasian lynx (*Lynx lynx*). Both species are endangered, according to the Norwegian national red list. Commercial tourism activities also face a negative impact from the wind farm.

4. Survey Questionnaire and Discrete Choice Experiment Design

We conducted a discrete choice experiment internet survey of the inhabitants in the municipality of Aurskog-Høland to value the environmental impact of the proposed wind power project. The survey questionnaire first asked the respondents general questions that could indicate place attachment, such as how many years, if any, they had lived in the municipality and in Setskog.

Respondents were then presented with information about the proposed wind farm consistent with the development plan that is available online (in Norwegian).[1] We used Figure 1 to help respondents visualize the potential size of the wind farm and to show its location. We then asked how far they live from the proposed area with alternatives, i.e., perceived proximity. To strengthen consequentiality, respondents were informed, before the discrete choice experiment, that the survey results could be important for decision-making related to the wind farm. Furthermore, the discrete choice experiment in this study exhibits an unusually high degree of relevance, as the design is constructed in line with an actual, proposed wind farm that has been discussed in public meetings with the residents in the municipality.

Further, questions related to outdoor recreation in Setskog and the municipality in general, i.e., frequency and activities, were asked. The questionnaire then presented statements (Likert-items) that together defined the two dimensions of place attachment discussed in 2.1; see Table 1. The statements for place dependency were adopted from Moore and Graefe (1994), whereas the statements for place

[1] https://webfileservice.nve.no/API/PublishedFiles/Download/201839912/2528787

identity were adopted from Ramkissoon et al. (2013). As recommended by Vorkinn and Riese (2001), we use seven-point Likert scales, with the endpoints “fully disagree” and “fully agree.” Place attachment was related to the small rural area (Setskog) where the wind farm was planned to be built.

Table 1. Attitudinal statements relating to different dimensions of place attachment

Construct and scale items	
Place dependency	
pdep1	I enjoy outdoor recreational activities in Setskog more than in any other area in Aurskog-Høland municipality
pdep2	I would not substitute Setskog for other areas in Aurskog-Høland municipality for the outdoor recreational activities I engage in there
pdep3	For the outdoor recreational activities that I enjoy most, I prefer the settings and facilities in Setskog
pdep4	Engaging in outdoor recreational activities in Setskog is more important to me than engaging in these activities in other areas in Aurskog-Høland municipality
Place identity	
pid1	I identify strongly with Setskog
pid2	I feel Setskog is part of me
pid3	Staying in Setskog says a lot about who I am
pid4	I am very attached to Setskog
pid5	I feel a strong sense of belonging to Setskog
pid6	Setskog means a lot to me

The attributes of the discrete choice experiment and their levels are listed in Table 2. They were determined by i) evaluating their case-specific relevance to the impact and development report made by the wind farm developer, ii) considering their relevance to the discussions held in two local focus-group meetings held at two separate locations in the local area, iii) reviewing existing stated preference literature on wind power externalities, and iv) following the stated preference guidance of (Johnston et al., 2017).

We defined and presented information about each attribute sequentially in the survey. The number of turbines has been used as an attribute in several discrete choice experiments, e.g., Meyerhoff et al. (2010), García et al. (2016), Brennan and Van Rensburg (2016), and Dugstad et al. (2020). In the survey, the attribute was presented with information about wind turbines’ effects on their local environment. The effects presented were i) biodiversity impact, ii) recreational impact, and iii) landscape changes in terms of infrastructure and paved roads. Thus, the attribute represents the impact on multiple cultural ecosystem services, such as non-use values, recreational values, and landscape values. However, the respondents were also informed that the wind turbines will generate noise, shadow flickers, ice shedding during winter, and continuous blinking lights. The respondents might thus also value these respective externalities. Manipulated photos of the landscape with and without wind turbines were shown to the respondents after the attribute was introduced; see Figure A.1 in Section A.1 in the Appendix.

Table 2. Attributes and levels

Attribute	Levels
Turbines	0 (Status quo)
	2
	4
	6
	8
	10
	12
Turbine height	No construction (Status quo)
	150 meters
	200 meters
	250 meters
Power line and environment	No construction (Status quo)
	Overhead lines in forests and residential areas
	Underground lines in forests and residential areas
	Overhead lines in forests, underground lines residential areas
	Underground lines in forests, overhead lines in residential areas
Reduction in annual municipal taxes	No changes (Status quo)
	NOK 500 (USD 50)
	NOK 1000 (USD 100)
	NOK 2000 (USD 200)
	NOK 4000 (USD 400)

Note: USD 1 = NOK 9.5 PPP adjusted.

The height of the turbines represents a change in visual intrusion or aesthetic values. The respondents were informed that taller turbines are more visible from a distance. Height has also been used as an attribute in several studies, e.g., Dimitropoulos and Kontoleon (2009), Meyerhoff et al. (2010), Vecchiato (2014), and Brennan and Van Rensburg (2016). The respondents were shown two photos sequentially of the landscape with twelve wind turbines seen from Lake Setten. In the first photo, the wind turbines were shorter, illustrating a height of 150 meters. In the second photo, they were taller, illustrating a height of 250 meters; see Figure A.2 in Section A.1 in the Appendix. In other respects, the two photos were identical. The initial photo was taken from the developer’s license application and edited. We included the two photos to make it easier for the respondents to visualize the aesthetic impact of taller wind turbines seen from a relatively short distance.

According to the development plan, the wind farm will require an estimated 15 km of power lines (excluding underground cables between the turbines). The power lines will transect forested and

residential areas, resulting in further landscape changes. However, the power lines may be constructed as overhead power lines or be buried as underground cables. It is uncertain whether the inhabitants associate underground cables with less visual intrusion and lower environmental impacts than overhead power lines. Contingent valuation studies in Norway indicate that people strongly prefer replacing overhead power lines with more expensive underground cables, but that preferences vary with the type of landscape the power lines run through, see, e.g., Navrud et al. (2008). We, therefore, decided to include an attribute representing the visual impact of the power lines associated with the wind farm in different landscapes. Few discrete choice experiment studies of wind power externalities include the added visual impact of the power lines needed for wind power developments, so little is known about preferences for power lines in the respective context (Grimsrud et al., 2021).
The monetary attribute is defined as a reduction in residents' annual municipal taxes. The respondents were told that the wind farm would generate increased revenues to the municipality through, e.g., property tax, but that some of the revenues would be used to compensate for the negative environmental impact. The monetary attribute is non-voluntary and realistic, as recommended in Johnston et al. (2017). We used a WTA compensation format to mitigate protest responses. Compensation for the negative impacts might seem fairer and more realistic for the residents than a WTP to avoid negative impacts format. Implicitly, we define the property rights for an unchanged environment to the residents in the municipality. This is sensible as the municipality has arranged public meetings with the residents to discuss, vote, and express their opinion of the proposed wind farm.[2] Several previous discrete choice experiment studies on wind power externalities have also used the WTA approach successfully; see Brennan and Van Rensburg (2016), Garcia et al. (2016), Brennan and van Rensburg (2020), and Dugstad et al. (2020).

An example choice card is displayed in Figure A.3 in Section A.1 in the Appendix. The choice cards had three scenarios: two wind farm construction scenarios with specified reductions in annual municipal taxes and a status quo situation without the new wind farm. The status quo implied that the proposed wind farm area would remain unchanged. As this option will not increase revenues for the municipality, reductions in municipal taxes were set to zero. Each respondent answered six choice cards. We had four blocks and thus, in total, 24 cards. A D-efficient design was programmed in Ngene (ChoiceMetrics, 2018), with priors indicating the expected directions of the coefficients (Scarpa and Rose, 2008). Respondents also registered their socio-economic characteristics at the end of the survey.

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[2] Both "WTA to have" and "WTP to avoid" formats, all else equal, were tested when the survey launched with the purpose of comparing the designs. However, we immediately had to withdraw the WTP format survey because several people protested and complained. We did not receive any complaints against the WTA format survey design.

5. Modelling Approach

To examine Hypothesis 1, we first use structural equation modeling (SEM) to estimate and predict the respondents' factor score of the latent construct of place attachment. The theoretical model estimated to predict individual-specific place attachment factor scores is displayed to the left in Figure 2. SEM is a well-established multivariate statistical approach often used in psychological research that simultaneously integrates confirmatory factor analysis (CFA) and multiple linear regression analysis (Anderson and Gerbing, 1988; Jöreskog and Sörbom, 1989; Bagozzi and Yi, 2012; Hair et al., 2019), where the CFA is used to verify an unobservable latent phenomenon from observable indicator variables. In other words, a model consists of a structural component (the multiple linear regression analysis) and a measurement component (the CFA). SEM explains relationships among multiple variables of a theoretically specified model and commonly uses maximum likelihood estimation (Hair et al., 2019).

Using SEM and the user-written package Lavaan in R (Rosseel, 2012), we define place attachment as a second-order latent variable, determined by place identity and place dependency[3], to depend on some exogenous variables. Important and incorporated exogenous variables are i) socio-economic characteristics (age, gender, education) (Faccioli et al., 2020), ii) an indicator of whether the respondents use the affected areas in Setskog for recreational purposes (more than ten days last year), iii) residential proximity to the wind farm (Vorkinn and Riese, 2000), and iv) the number of years the respondents have lived in Setskog since place attachment and its dimensions evolve and grow stronger over time (Moore and Graefe, 1994; Bricker and Kerstetter, 2000; Hammitt et al., 2004).

The factor score of place attachment is then predicted for each respondent such that it can be incorporated in the discrete choice model. Here, we first estimate a baseline mixed logit model in WTP-space (Train and Weeks, 2005), where the non-monetary attribute coefficients are assumed to follow a normal distribution, including the status quo option, as the people can have positive and negative preferences. The cost attribute is assumed to follow a positive log-normal distribution, constraining people to have the same sign of the preference parameter, as people should get a positive utility of more money (see Section A.2 in the Appendix for a technical description). As the mixed logit model estimation relies on simulations, we use 2000 scrambled Sobol draws (Czajkowski and Budzinski, 2019)

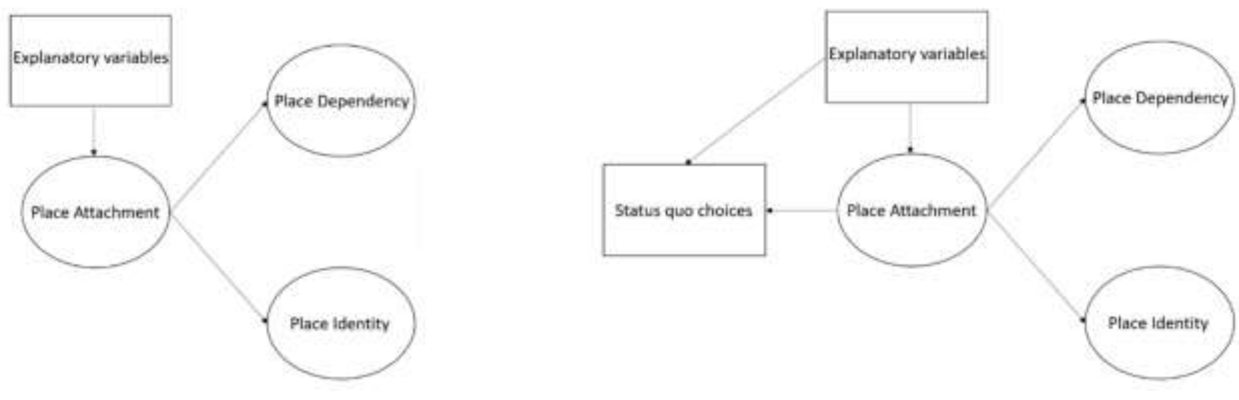
[3] A second-order latent variable is a latent variable that is composed of two underlying latent constructs that share similarities but measures different components of a psychological process.

Second, we estimate a mixed logit in WTP-space with equal specification and assumptions as previously specified, but here we incorporate the predicted factor score of place attachment and interact it with each attribute level. Thus, our primary modeling approach uses a two-step sequential approach rather than a simultaneous one. A simultaneous approach generally requires utilizing the hybrid choice modeling framework, which integrates a structural component, a measurement component, and a discrete choice component within the same estimation (Ben-akiva et al., 2002). However, hybrid choice models have been criticized for their complexity and cost of estimation, see Mariel and Meyerhoff (2016). Since we have a relatively small sample and work with a complex second-order latent variable structure, the hybrid choice model framework would introduce additional and unmanageable complexity.

To examine Hypothesis 2**,** i.e., whether place attachment can give rise to resistance to the proposed wind farm, we extend the SEM model used to predict the latent score of place attachment that was described earlier in this section by including an additional structural model. This model is visually explained to the right in Figure 2. The additional structural model defines a dummy coded variable equal to one if the respondent chooses the status quo (no wind farm) option in every choice situation and zero otherwise, to depend on place attachment and the same set of explanatory variables as previously described.

The no wind farm construction variable is binary. We thus use the weighted least square mean and variance adjusted (WLSMV) estimator, which is integrated into the user-written package Lavaan in R; see Rosseel (2012) for a further description. This implies that the binary structural model of status quo choices is a probit link function.

Figure 2. Left: Theoretical model to predict place attachment score to be included in the mixed logit model. Right: Theoretical model of place attachment on status quo choices



6. Results

Survey participants were recruited both by telephone and through a web panel by the Norwegian survey sampling company NORSTAT to increase the sample size from a limited local population. The participants recruited by telephone were subsequently sent an e-mail with a link to the online survey. The data collection was conducted in March of 2020 and had a response rate of 34 percent. The usable sample consists of 308 respondents. Surveys of local environmental problems in small communities are expected to produce modest sample sizes such as ours because the population sampled from is small. This makes it more challenging to uncover significant relationships and get precise and valid welfare estimates. It can also affect the external validity of welfare estimates.

6.1 Socio-economic Characteristics

The socio-economic characteristics of the survey participants versus census statistics for the local population are displayed in Table 3. As can be seen, our sample has a somewhat larger share of males, higher income, and more individuals with at least three years of university education than the general population. For this reason, any direct utilization of the valuation results from our analysis in a benefit-cost analysis of the proposed wind farm should be made with caution. Our analysis is primarily intended to illuminate the importance of the place attachment concept.

Table 3. Socio-economic characteristics of the sample and the population

Variable name	Definition	Sample	Population
Gender			
	Male	59%	50%
	Female	41%	50%
Education			
	University education (3 years+)	45%	20%
	Upper secondary school	50%	42%
Annual gross median household income		USD 93 750	USD 68 125

Note: In accordance with the OECD, the PPP adjusted exchange rate of USD 1 = NOK 9.5 was used to calculate the median household income in USD.

6.2 Modelling results

As explained in Section 5 and visualized to the left in Figure 2, we use SEM to predict the respondents' score of place attachment, where place attachment is specified to depend on some explanatory variables. The results of this first-stage procedure are displayed in Table 4. The fit of the model (see Table 4) satisfies the criteria listed in Hu and Bentler (1999). We can see that place attachment increases with the number of years the respondents have lived in Setskog and proximity to the planning area. Place attachment is further stronger among respondents who use the area for recreation. This makes sense, as place attachment grows stronger with experience and familiarity. The socio-economic variables do not significantly explain variation in place attachment. We also use this first-stage analysis to evaluate the validity of the measurement models. In SEM, validity refers to how accurately the indicator variables measure what they are supposed to measure (Bagozzi et al., 1991; Bagozzi and Yi, 2012). We assess and discuss the validity in Section A.3 in the Appendix. The results support the validity of the measurement models. We are thus comfortable with using the items to define the latent constructs and incorporate the overall latent construct of place attachment in the mixed logit model.

The two estimated mixed logit models are displayed in Table 5, which we from now on refer to as MMNL and PAMMNL, without and with place attachment, respectively. The models were estimated using the Apollo package in R (Hess and Palma, 2019).[4] Each attribute is specified to be categorical, except the number of turbines attribute. For the categorical attributes, the attribute level associated with the least environmental impact is kept as the baseline value. The models are estimated in WTP-space, but the status quo coefficient is specified in preference space due to difficulties with convergence when specified in monetary terms.

In both models, the WTA coefficients for the non-monetary attributes are significant and negative, whereas the coefficient for the status quo option is positive, sizeable, and significant (see Table 5). This indicates that compensation is necessary in order to avoid reduced welfare with i) more turbines, ii) taller turbines, and iii) additional overhead power lines or combinations of overhead and underground power lines instead of using underground power lines solely. The last finding is consistent with Liebe et al. (2015) and Zawojska et al. (2019). The sample is willing to accept a sizeable increase in annual municipal taxes to avoid the proposed wind farm. This is not surprising, as the status quo option was chosen sixty percent of all the choice situations, indicating a status quo bias (Samuelson and Zeckhauser, 1988; Meyerhoff and Liebe, 2009). Fifty-five percent consistently chose the status quo option in each scenario. This is probably a result of the relatively modest monetary compensation defined in the cost attribute, as this was contingent on the payment vehicle. Respondents who systematically chose the status quo option were asked why with alternatives provided. The main reason chosen is “that the cost of the alternative construction plans was too high compared to their benefit,” which indicates valid preferences for the status quo option.

[4] See http://www.apollochoicemodelling.com/ for help and code examples for estimating various discrete choice models.

Table 4. The SEM model used to predict the latent score of place attachment. Standardized coefficients are displayed

			Place Attachment
Structural component			
Age			-0.057 (0.053)
Years lived in Setskog			0.285*** (0.056)
Male			-0.007 (0.052)
University education (3 years+ completed)			-0.084 (0.051)
Recreation (10 days or more last year)			0.272*** (0.052)
Proximity: 0 to 4 km			0.119** (0.059)
Proximity: 5 to 9 km			0.126** (0.051)
Proximity: 10 to 15 km			0.111** (0.052)
Measurement components			
	Indicator variable (mean)		Standardized factor loading
Place dependency			
	pdep1 (2.896)		0.849*** (0.018)
	pdep2 (3.039)		0.774*** (0.024)
	pdep3 (2.955)		0.905*** (0.012)
	pdep4 (2.487)		0.939*** (0.010)
Place identity			
	pid1 (2.438)		0.942*** (0.007)
	pid2 (2.315)		0.927*** (0.008)
	pid3 (2.341)		0.951*** (0.006)
	pid4 (2.744)		0.928*** (0.008)
	pid5 (2.484)		0.978*** (0.003)
	pid6 (2.445)		0.978*** (0.003)
Place attachment			
	Place dependency		0.948*** (0.027)
	Place identity		0.917*** (0.027)
Validity statistics	Place dependency	Place identity	Place attachment
Average standardized factor loading	0.867	0.951	0.933
Average variance extracted	0.742	0.904	0.870
Composite reliability	0.920	0.983	0.930
Observations	308	308	308

Notes: *p<0.10, **p<0.05, ***p<0.01. Standard errors (SE) are given in brackets. Proximity is measured from the respondents' residence to the planned wind farm construction area. A proximity of above 15 km is used as the baseline. RMSEA = root mean square error of approximation = 0.082; CFI = comparative fit index = 0.956; TLI = Tucker-Lewis index = 0.947; SRMR = standardized root mean square residual = 0.024; Chi-squared test statistics (p-value) = 320.340 with 105 degrees of freedom (p-value = 0.00).

We can see that the PAMMNL model has a better fit in terms of adjusted Rho-square and AIC but is punished with higher BIC because of more parameters. Thus, from now on, we consider and discuss the results in the PAMMNL model. Here, we find that respondents with an average place attachment score demand NOK 312 per wind turbine installed. On the other hand, the WTA for 200- and 250-meter wind turbines, compared to 150-meter turbines, is NOK 1900 and 1650, respectively, which indicates diminishing marginal disutility of taller turbines.

The WTA of overhead power lines instead of underground power lines is around NOK 6800 among respondents with an average place attachment score. They prefer to use underground power lines solely rather than using a combination of both underground and overhead power lines. This points to environmental concerns regarding the use of overhead power lines.

Table 5. Mixed logit models estimated in WTP space

	MMNL	PAMMNL
Main effects		
Status quo	8.882*** (2.682)	7.671*** (1.430)
Turbines	-446.256*** (1.397)	-312.752*** (14.360)
Height 200 meters	-1289.790*** (3.261)	-1900.314*** (87.062)
Height 250 meters	-1016.543*** (392.904)	-1649.729*** (96.684)
Overhead lines	-6249.015*** (22.796)	-6831.233*** (69.171)
Overhead forest, underground residential areas	-3582.125*** (8.973)	-4646.156*** (479.278)
Underground forest, overhead residential areas	-2539.815*** (4.986)	-3227.779*** (34.926)
Municipal taxes	-7.902*** (0.243)	-7.985*** (0.257)
Interaction effects		
Status quo x LV	-	10.071*** (1.810)
Turbines x LV	-	-160.188*** (21.902)
Height 200 meters x LV	-	-1020.830*** (185.216)
Height 250 meters x LV	-	-1297.612*** (318.994)
Overhead lines x LV	-	-910.270*** (213.328)
Overhead forest, underground residential areas x LV	-	-698.199*** (246.295)
Underground forest, overhead residential areas x LV	-	-1203.495*** (45.394)
Municipal taxes x LV	-	0.000 (0.000)
Standard deviations of random parameters		
Status quo	23.852*** (7.034)	22.090*** (3.718)
Turbines	124.574*** (0.379)	129.736*** (19.396)
Height (200 meters)	189.869*** (1.185)	190.846*** (60.349)
Height 250 meters	119.862*** (35.154)	432.021 (766.879)
Overhead lines	26.465 (96.026)	843.658*** (70.550)
Overhead forest, underground residential areas	75.571 (65.836)	64.607 (119.637)
Underground forest, overhead residential areas	173.928*** (25.075)	24.688 (235.653)
Municipal taxes	1.927*** (0.179)	2.262*** (0.163)
Log-likelihood	-805.784	-788.053
Adjusted Rho-Square	0.581	0.586
AIC	1699.570	1680.110
BIC	1942.530	1967.240
Observations	1848	1848

Notes: *p<0.1, **p<0.05, ***p<0.001. LV = Latent variable. Standard errors (SE) are given in brackets. Coefficients are displayed in NOK, where NOK 9.5 is equal to USD 1, PPP- adjusted.

Further, in PAMMNL, we can see that the interaction terms between the non-monetary attributes and place attachment are significant and negative. On the other hand, the interaction term between the cost attribute and place attachment is not significant. This indicates that people with stronger place attachment have an even higher WTA for i) more wind turbines, ii) taller wind turbines, and iii) overhead power lines or combinations of overhead and underground power lines. This is consistent with Hypothesis 1**.** The significant interaction term of the status quo variable suggests that people with stronger place attachment are willing to accept an even higher increase in annual municipal taxes to avoid the proposed wind farm. This supports Hypothesis 2, as it also indicates that people with stronger place attachment are more inclined to choose the status quo option and value this option higher.

The latent construct of place attachment is normalized to have a mean of zero and a standard deviation of one. We can thus interpret the interaction effects in terms of how much WTA changes if place attachment changes by one standard deviation away from the mean. WTA per turbine then increases significantly with NOK 160. Thus, the actual WTA among people with 1 SD deviation above the mean is NOK 472. WTA for 200 meters and 250 meters tall turbines increases with NOK 1021 and NOK 1300 if place attachment increases with one standard deviation, respectively, while WTA for overhead power lines increases by about NOK 900. We further conduct a robustness check for whether place attachment affects WTA. First, we simulate and extract the conditional WTA estimates of the non-market attributes for each respondent from the RPL model (without place attachment) in Table 5. Then, we run a separate linear regression for each non-market attribute, where simulated WTA is the dependent variable. As explanatory variables in these regressions, we include the predicted score of place attachment from the model in Table 4, as well as the other explanatory variables used in this model. The results are displayed in Table A.1 in Section A.4 in the Appendix. As can be seen, place attachment has a significant, sizeable, and negative effect in each regression, which indicates that place attachment is associated with higher WTA for the non-market attributes.[5]

Place Attachment and Status Quo Choices

The SEM probit regression that shows how place attachment affects systematical status quo choices (Hypothesis 2) is displayed in Table 6 (i.e., the model to the right in Figure 2). We display the

[5] We recognize the issues of using the conditional WTA estimates, in particular because we have relatively few choice situations. Accuracy of the conditional estimates depend on the number of choice situations. There are good discussions on this in Mariel et al. (2021) and Sarrias (2021). However, we still think this is relevant to include as a robustness analysis.

standardized coefficients for interpretational convenience. The fit of the model (see Table 6) satisfies the criteria listed in Hu and Bentler (1999) and Hair et al. (2019).

The probit structural component shows that place attachment exerts a sizeable and significant influence on the choice of the status quo option in each choice situation. The standardized coefficient is 0.39. Thus, if place attachment increases with one standard deviation, the likelihood of choosing this option in all choice scenarios increases with a 0.34 standard deviation. As a robustness check, we further find a strong correlation (0.30) between the binary variable for systematical status quo choices and the predicted place attachment score. We can also see that the same explanatory variables in the structural model of place attachment are significant as in Table 4. This increases the robustness of the results.

Table 6. Place attachment on systematical status quo choices. Standardized coefficients are displayed

	Status quo	Place Attachment
Structural components		
Place attachment	0.385*** (0.076)	
Age	0.109 (0.070)	-0.044 (0.055)
Years lived in Setskog	-0.056 (0.076)	0.294*** (0.053)
Male	-0.072 (0.069)	-0.006 (0.054)
University education (3 years+ completed)	-0.014 (0.068)	-0.082 (0.053)
Recreation (10 days or more last year)	0.197* (0.095)	0.265*** (0.044)
Proximity: 0 to 4 km	0.022 (0.094)	0.115** (0.055)
Proximity: 5 to 9 km	-0.038 (0.083)	0.148*** (0.045)
Proximity: 10 to 15 km	-0.172*** (0.064)	0.115** (0.051)
Measurement components		
	Indicator variable	Standardized factor loading
Place dependency		
	pdep1	0.853*** (0.018)
	pdep2	0.752*** (0.027)
	pdep3	0.913*** (0.012)
	pdep4	0.958*** (0.009)
Place identity		
	pid1	0.958*** (0.008)
	pid2	0.950*** (0.009)
	pid3	0.949*** (0.008)
	pid4	0.934*** (0.010)
	pid5	0.961*** (0.006)
	pid6	0.959*** (0.006)
Place attachment		
	Place dependency	0.958*** (0.023)
	Place identity	0.913*** (0.024)

Notes: *p<0.10, **p<0.05, ***p<0.01. Standard errors (SE) are given in brackets. Proximity is measured from the respondents' residence to the planned wind farm construction area. A proximity of above 15 km is used as the baseline. RMSEA = root mean square error of approximation = 0.031; CFI = comparative fit index = 0.943; TLI = Tucker-Lewis index = 0.973; SRMR = standardized root mean square residual = 0.025; Chi-squared test statistics (p-value) = 147.843 with 114 degrees of freedom (p-value = 0.02).

7. Discussion and Conclusion

Environmental psychologists have conducted research about place attachment and its dimensions for decades (Relph, 1976; Lewicka, 2011). Environmental psychological research stresses that place attachment should be taken into consideration in studies that examine people's response to place-specific environmental impact, especially related to local renewable energy projects (Vorkinn and Riese, 2001; Devine-Wright, 2009). However, this concept has largely been neglected in conventional economics.

By incorporating place attachment in a mixed logit model, we find that people with stronger place attachment demand higher compensation in the form of reduced annual municipal taxes for more extensive wind power scenarios. This is consistent with our defined Hypothesis 1, which states that stronger place attachment implies higher WTA for attributes associated with negative place-specific environmental impact. More extensive scenarios imply more severe local impacts on the landscape, biodiversity, and cultural ecosystem services, which include place attachment (Hausmann et al., 2016).

A secondary and related explanation for our finding is that undesired changes to a place will disrupt the local individuals' place attachment and this disruption has an economic cost (Hausmann et al., 2016). Though we are unable to discern the effects with certainty, people with stronger place attachment could attach a higher value to negative environmental impacts because they are also implicitly valuing changes in their place attachment, among other cultural ecosystem services. For example, people with higher place dependency to Setskog engage in outdoor recreational activities in Setskog because the area provides more of the amenities necessary for their desired activities than other places. With a wind farm installed in Setskog's natural areas, the recreational functionality and the environmental amenities will be negatively affected. Thus, the inhabitants' place dependency and place attachment will change negatively. Likewise, a new wind power development might feel alien and may 'weaken the local character' (Devine-Wright, 2009), which again changes the inhabitants' place identity and place attachment negatively (Devine-Wright, 2009; Hausmann et al., 2016). The changes will have implications for economic values (Hausmann et al., 2016).

Hypothesis 1 was formulated based on a review of environmental psychological and ecosystem services research. As our results support Hypothesis 1, we argue that place attachment provides insightful information about the construct validity in local or place-specific stated preference research (Bishop and Boyle, 2019). In other words, our analysis demonstrates that environmental psychological constructs can be used as a part of construct validity evaluation of stated preference welfare estimates.

In general, expectations of how latent constructs affect the welfare estimates can be established by reviewing context-related environmental psychological and ecosystem services theory and literature. Theoretically and empirically relevant constructs can then be incorporated into stated preference research to test whether the established expectations by the researcher(s) are confirmed. Since the results correspond with defined expectations in our case, it strengthens construct validity.

We further hypothesized (Hypothesis 2) that place attachment drives the decision to systematically choose the status quo option describing “no construction of the proposed wind farm” in our discrete choice experiment. The results do indeed support Hypothesis 2. This demonstrates that place attachment shapes oppositional behavior in a discrete choice experiment context, which again can be referred to as the NIMBY effect, particularly because we find that place attachment depends positively on residential proximity to the wind farm. However, based on our findings, we argue that the view of place attachment as a concept for shaping oppositional behavior should be nuanced. Instead, our results indicate that the so-called oppositional behavior could be explained by place attachment, making people care and value the impacted areas more. Hence, place attachment could be seen as a legitimate and rational reason for opposing the disruption of natural areas and for systematically choosing the status quo option in place-specific discrete choice experiments on accepting environmental impacts.[6] This should be further explored, but it indicates that stated preference researchers should carefully consider psychological factors that drive respondents to systematically choose the status quo option and oppositional behavior. One could perhaps then use the information to make designs that mitigate this form of behavior and get more reliable welfare estimates.

Interestingly, in the stated preference literature, distance decay effects have been used to explain spatial preference heterogeneity (Glenk et al., 2020) and to verify the NIMBY effect, see, e.g., Klinglmair et al. (2015) and León et al. (2016). However, as environmental psychological research stresses that the NIMBY effect can be shaped by place attachment, distance decay effects and spatial preference heterogeneity can also, at least to some extent, be explained by place attachment (De Valck et al., 2018; Faccioli et al., 2020). People who reside closer to a place threatened by physical disruption are more likely to have stronger place attachment because they use the place more, e.g., for recreation, and generally spend more time there (Vorkinn and Riese, 2001). Thus, they value the place’s environmental amenities higher, as they have use-values, which typically are larger than non-use values (Bateman et al. 2006. Our results support this reasoning. We find that place attachment

[6] We believe that increasing the values in the cost attribute metric would most likely have decreased the number of systematical status quo choices among people with strong place attachment.

dimensions depend positively on proximity to the area where the wind farm is planned to be built. As we also found that place attachment is associated with higher valuation estimates, our findings indicate that place attachment shapes spatial heterogeneity in preferences and valuation of environmental impacts and cultural ecosystem services. De Valck et al. (2018) acknowledge the importance of using place attachment to explain spatial heterogeneity in stated preference valuation, whereas a similar review by Glenk et al. (2020) omitted such a discussion. However, this issue should also be explored further.

The findings of this study have both policy and environmental management implications. Measuring people's place attachment to areas affected by human interventions in local environments, e.g., proposed renewable energy projects, in addition to valuation of the implied environmental impacts, can result in more efficient environmental policy and management decisions (Williams et al., 1992; Restall and Conrad, 2015). First, it is helpful to understand why conflicts and resistance emerge (Williams et al., 1992; Restall and Conrad, 2015). Second, the decision-makers are reminded of the involvement of the public in places (Williams et al., 1992). This implicitly provides researchers and decision-makers with a better understanding of the distributional implications and equity considerations of local developments in natural areas or with proximity to residential areas, such as renewable energy initiatives (Faccioli et al., 2020). Third, a more complete picture of the meaning of places (especially natural areas) is achieved, as not only economic values are emphasized, but also emotional, symbolic, and spiritual values (Williams et al., 1992; Arias-Arévalo et al., 2018). Interestingly, with spatial mapping of place attachment to different areas considered for local wind power projects, it is possible to identify areas where both the weakest and the strongest place-protective behavior will be observed and hence mitigate potential conflicts. Our results further suggest that it is then possible to some extent to identify highly valued natural areas and environmental amenities and identify distributional effects. Perhaps this could also contribute to defining the extent of the market for local environmental goods, i.e., where WTP drops to zero (Glenk et al. 2020).

We would like to end with some recommendations for future research. Firstly, we recommend that future research also assess the importance of place attachment in local people's response to and valuation of *different* human interventions on place-specific environments, i.e., outside the realm of renewable energy, and assess how place attachment changes economically and psychologically with different types of interventions. This would contribute to evaluating whether our findings are generalizable to other settings. It would further be interesting to evaluate how place attachment is related to improvement in place-specific environmental conditions, e.g., restoration efforts. This has been examined in a rather broad perspective in Faccioli et al. (2020), who find that WTP for peatland restoration increases with place identity to Scotland. However, it would be interesting to examine other place attachment dimensions in a local context, as place attachment is initially a local concept (Vorkinn and Riese, 2001). Other psychological factors that can explain the NIMBY effect and spatial preference heterogeneity, such as psychological ownership of natural areas (Matilainen et al., 2017), could also be explored. This will give us a better understanding of why we observe resistance in discrete choice experiments.

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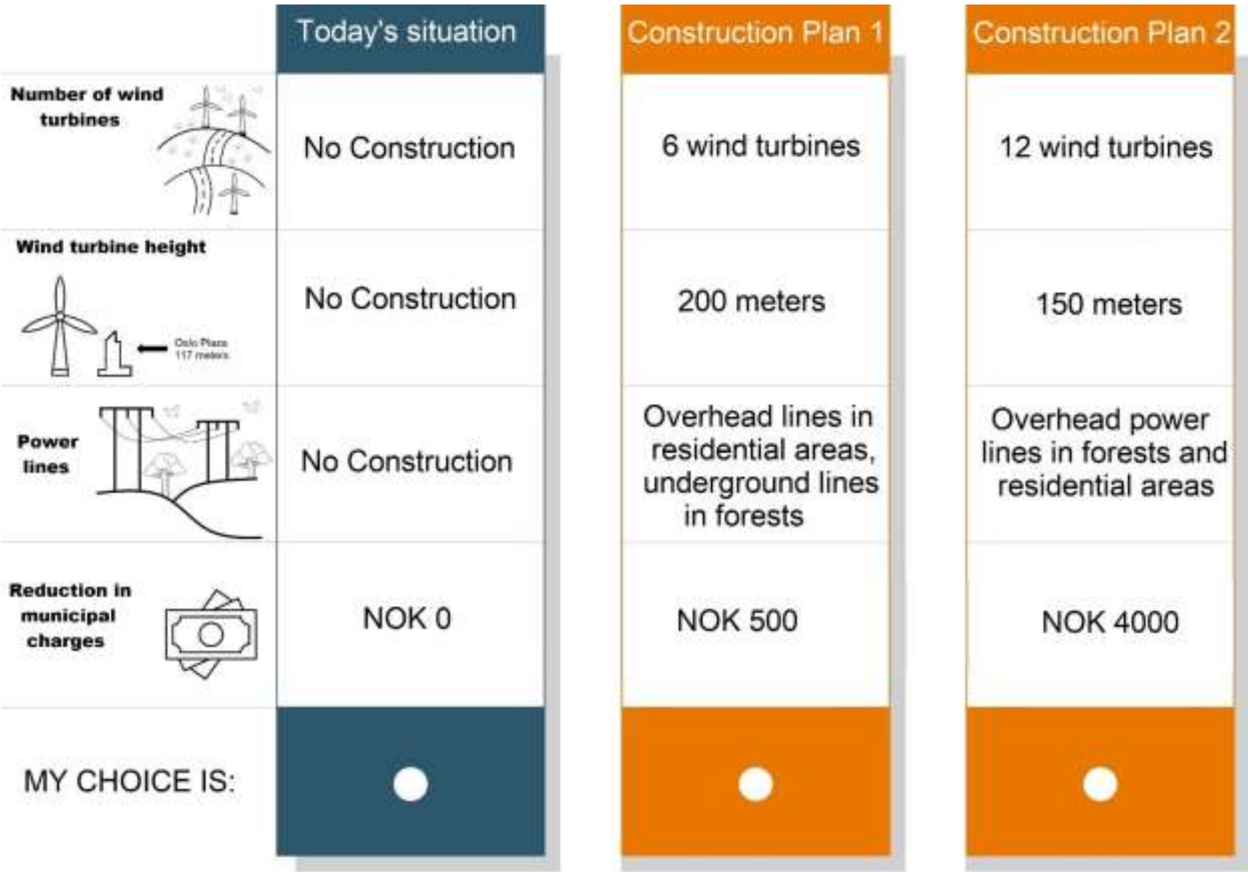
Appendix

A1. Figures

Figure A.1 Illustrated landscape change with wind turbines. Initial unedited photo: 1551920279/Raland (Shutterstock)

Figure A.2. Illustration photo of landscape changes with the wind farm with 150-meter and 250-meter turbines

Figure A.3 Example of a choice card



A.2 Technical description of mixed logit

Let the representative respondent i's indirect utility function derived from choosing alternative k in choice situation t be expressed as:

$$V_{ikt} = \alpha_i c_{ikt} + \boldsymbol{\beta}_i \boldsymbol{x}_{ikt} + \boldsymbol{\gamma}\mathrm{LV}_{ikt} + \epsilon_{ikt}\ ,$$

where vector $\boldsymbol{\beta}_i$ and scalar α_i are estimable preference parameters that vary across individuals, while $\boldsymbol{x}_{ikt}$ is a vector of attributes and c is the cost of alternative i. The utility is also specified to depend on the factor score of place attachment (LV), where $\boldsymbol{\gamma}$ is a vector of parameters that denotes how place attachment affects preferences. The random component of the utility function is defined by ϵ_{ikt}, which is assumed to be independent and identically distributed (iid) and follow a type 1 extreme value distribution with constant variance $\pi/6$.

In Equation (1), we are working in preference space. To avoid issues of not having finite moments when one has heterogeneous preferences for the cost attribute in preference space (Daly et al. 2012), we find it more convenient to work in WTP-space (Train and Weeks, 2005). By defining WTA as the ratio of the preference parameters for the non-monetary attributes and the cost preference parameter $\boldsymbol{\omega} = \boldsymbol{\beta}_i/\alpha_i$, we can re-specify Equation (1) as follows:

$$V_{ikt} = \alpha_i c_{ikt} + \alpha_i \boldsymbol{\omega} \boldsymbol{x}_{ikt} + \boldsymbol{\gamma}\mathrm{LV}_{ikt} + \epsilon_{ikt} .$$

Now, let $\boldsymbol{\Theta}$ represent a vector of all random parameters and $\boldsymbol{\Omega}$ represent their means and variances, where the random parameters have joint distribution $f(\boldsymbol{\Theta}|\boldsymbol{\Omega})$. Then, the probability of choosing alternative k in a sequence of choices $(\boldsymbol{y}_i)$ is:

$$P(\boldsymbol{y}_i|x_{ikt}, c_{ikt}, \boldsymbol{\Omega}) = \int \prod_{t=1}^{T} \frac{\mathrm{e}^{\alpha_i c_{ikt} + \alpha_i \boldsymbol{\omega} \boldsymbol{x}_{ikt} + \boldsymbol{\gamma}\mathrm{LV}_{ikt}}}{\sum_{j \in C} \mathrm{e}^{\alpha_i c_{ijt} + \alpha_i \boldsymbol{\omega} \boldsymbol{x}_{ijt} + \boldsymbol{\gamma}\mathrm{LV}_{ijt}}} f(\boldsymbol{\Theta}|\boldsymbol{\Omega}) d(\boldsymbol{\Theta})$$

We need to integrate over all possible values of $\boldsymbol{\Theta}$, as this is unobserved. The integral cannot be solved analytically and must be solved by the means of simulation. In each model, we use 2000 scrambled Sobol draws (Czajkowski and Budzinski, 2019).

A.3 Assessing validity using structural equation modeling

Assessing the validity of the measurement models is an indispensable validity diagnostic in psychological research using confirmatory factor analysis (CFA) and structural equation modeling (SEM). Validity is often subdivided into convergent validity and discriminant validity (Nusair and Hua, 2010). Convergent validity refers to whether the items of a latent construct are correlated (Nusair and Hua, 2010). Convergent validity is confirmed by the size of the standardized factor loadings and the average variance extracted (AVE) (Fornell and Larcker, 1981). AVE measures how much of the variance is captured by a latent variable in relation to measurement error. To confirm convergent validity, the standardized loadings should be greater than 0.7 (Hair et al., 2010), whereas the AVE should exceed 0.5 (Fornell and Larcker, 1981). Discriminant validity quantitatively evaluates whether related latent variables (e.g., dimensions of place attachment) measure different psychological phenomena (Fornell and Larcker, 1981; Hair et al., 2010). Discriminant validity is confirmed if the squared correlation between pairs of the latent variables is less than or equal to the AVE (Fornell and Larcker, 1981).

The model displayed in Table 4 (which also holds for the model displayed in Table 6) satisfies the established fit criteria in the SEM literature (Hu and Bentler, 1999). We also have internal consistency, as each latent variable has a composite reliability score above 0.7 (Bagozzi and Yi, 2012). The results in Table 4 indicate strong convergent validity. Each item has a standardized loading above the required threshold of 0.7. In addition, the AVE is above 0.5 for each latent variable. The results also confirm the discriminant validity of the latent variables, as the squared correlation between the variables (0.76) is less than the average variance extracted. Thus, these factors combined are strong indications of validity.

A.4 Conditional WTA regressions simulated from MMNL model

Table A.1. Linear regression of WTA, place attachment, and explanatory variables

Attribute (WTA)	Number of turbines	200 meters tall turbines	250 meters tall turbines	Overhead lines	Overhead forest	Underground forest
Variables						
Place	-125.208***	-488.668***	-589.362***	-410.433***	-416.383***	-463.631***
attachment	25.448	112.760	122.250	107.642	84.251	92.309
Age	-2.837*	-13.162**	-11.321	-19.395***	-12.941**	-11.994**
	1.466	6.522	7.046	7.390	5.299	5.367
Years lived	1.742	3.902	7.982	9.790	8.458	7.072
in Setskog	2.290	9.887	11.386	7.7311	6.428	7.926
Male	2.787	4.754	78.172	-381.406*	-152.691	-51.931
	44.439	197.108	212.534	210.861	156.424	162.755
University	43.318	139.255	188.099	269.577	212.081	181.258
education	45.965	203.324	218.322	218.976	163.291	169.502
Recreation	-150.864*	-652.291**	-729.564*	-310.309	-405.759*	-528.141**
	65.639	283.424	301.834	318.579	242.883	249.006
Proximity:	69.462	352.177	354.756	-7.944	102.054	219.271
0 to 4 km	104.302	404.173	535.870	331.658	286.978	351.556
Proximity:	57.532	83.491	333.886	-35.839	142.934	182.725
5 to 9 km	113.498	389.646	568.462	311.661	357.735	402.412
Proximity:	152.821**	726.849***	759.330***	130.143	310.674	507.474**
10 to 15 km	58.925	277.025	278.612	250.180	192.136	214.669
Constant	-323.625***	-701.219*	-586.119	-	-	-
	89.019	387.600	424.257	5079.626***	2892.917***	1971.639***
				460.321	330.856	330.159
Observations	308	308	308	308	308	308
Adjusted r-square	0.107	0.090	0.104	0.058	0.096	0.109

Notes: *p<0.1, **p<0.05, ***p<0.001. Standard errors (SE) are given in brackets. Coefficients are displayed in NOK, where NOK 9.5 equals USD 1, PPP- adjusted. Also, note that place attachment is normalized to have a mean of zero and a unit standard deviation. Thus, the displayed place attachment coefficient is the effect (in NOK) on WTA when place attachment changes with one standard deviation.