Sari Janhunen

DETERMINANTS OF
THE LOCAL ACCEPTABILITY OF
WIND POWER IN FINLAND
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Abstract

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Wind energy is perceived as a promising electricity source that could provide environmental and social benefits. In general, the public acceptability of wind power is high. However, high general support does not automatically mean the acceptance of local development. Local host communities in Finland may express vocal opposition to wind farms.

This doctoral thesis explores the acceptability of wind power. The main research question hinges on the determinants of the social acceptability of local wind power in Finland. The thesis considers the research topic from various perspectives in order to provide a comprehensive view of the phenomenon. This doctoral thesis addresses the cognitive, emotional and behavioural components of wind power acceptability. In this study, the term acceptability refers to attitude, and the term acceptance refers to the resulting behaviour. The study discusses the role of location in the acceptability and acceptance of wind power. Also, an analysis of public participation in wind power projects sheds light on local wind farm acceptability. In addition, the study identifies the role of emotions in relation to wind farm development, particularly how such emotions influence expectations, experiences and behavioural intentions.

This thesis consists of two sections. The first section provides an overview of the dissertation, and the second section is comprised of five complementary research papers. Empirically, the study uses a multiple-case design, with one main case (two existing wind farms), two additional cases (two planned wind farms) and one hypothetical wind farm. The analysis is based on both quantitative and qualitative data, which were collected during the research process using surveys, interviews, the self-reported diaries of residents, measurements of wind turbine sound and measurements of wind speed, speed dispersion and direction.

This study’s main methodological and theoretical contribution is the application of mixed-method analysis to increase our understanding of the cognitive, emotional and behavioural drivers of the local acceptability of wind power. The results suggest that the acceptability of wind power is neither stable nor unconditional. Individuals experience cognitions and emotions that seem contradictory. In addition, the current wind farm
development process elicits strong emotions without offering any special forum in which to express them. Also, people perceive successful participation to be more than information distribution, and there seems to be a need for continued communication between residents and project developers after formal decisions are made.

**Keywords:** Wind power, acceptability, acceptance, local residents, second-home owners, participation, cognitions, emotions, behavioural intentions, support, opposition
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April 2018, Lappeenranta, Finland
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This thesis is based on the following papers. The publishers have granted the rights to include these papers in this dissertation.


The contribution of Sari Janhunen to the publications

I. Corresponding author. Made a research plan, organised data collection and collected the data. Drew conclusions with the co-authors and wrote most of the manuscript.

II. Made a research plan with the co-author and organised data collection. Was primarily responsible for the collection of the research data. Drew half of the conclusions and wrote half of the manuscript.

III. Corresponding author. Made a research plan, organised data collection and was primarily responsible for the collection of the research data. Wrote most of the manuscript.

IV. Corresponding author. Made a research plan with the co-authors. Wrote most of the manuscript.
V. Corresponding author. Made a research plan with the co-authors and was primarily responsible for the collection of the research data. Wrote the literature review, analysed the sound diary data and drew most of the conclusions.
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1 Introduction

1.1 Background

Greenhouse gases come from several sources, such as fossil fuel emissions, transport, industry, agriculture, forestry and waste management. Because greenhouse gas emissions play a significant role in the climate change process, the reduction of fossil fuel combustion is urgently needed. In an attempt to mitigate climate change, the energy generation capacity in the European Union (EU) is changing. In recent years, an increased share of wind energy, solar photovoltaics and other renewables such as biomass and geothermal resources has been taking the place of fossil fuels such as oil and coal and also gas and nuclear energy. Wind energy is perceived as a promising electricity source that could provide environmental and social benefits (IPCC, 2011). Since 2000, the new power capacity installed in Europe has been 443 GW, of which 30% has been wind power and 58% has been other renewable energy sources (Wind in power, 2015 European statistics).

Despite their geographically proximity, Nordic countries have differences in their implementation of renewable energy sources. Table 1 shows the wind power capacity of Finland as compared to other Nordic countries (Pineda and Tardieu, 2016). The installed wind power capacity has a wide range, from 3 MW (Iceland) to 6.5 GW (Denmark). Investments in wind power have also increased in Finland, and at the end of 2016, there were 552 wind turbines in Finland, with the total capacity of 1,533 MW. In 2016, the total energy demand in Finland was 85.1 TWH, and wind power production supplied 3.6% of this. These differences in wind power capacity highlight the different national bases in these countries’ energy market. In other words, Nordic countries operate within different contexts in the energy market. For instance, in Denmark, a substantial amount of electricity is produced by wind power, and Finland is a net energy importer, using biomass and forestry products, and is also building new nuclear power plants (Finnish Wind Power Association, 2016; Energiateollisuus ry, 2017; Sovacool, 2017).

Minister Lauri Tarasti’s report (TEM, 2012) identifies barriers to the development of wind power production in Finland. The report explains how national energy policies (especially feed-in tariffs) are gradually increasing wind power development. The report pinpoints existing barriers, such as local acceptability, air traffic and other traffic lines, radar distractions, noise, bird collisions and official permitting processes (TEM, 2012). This barrier-orientated report thus identifies the practical challenges for future installations in Finland. Current research, at least some of it, criticises this kind of positivist approach and aims to understand acceptability as a dynamic socio-technical phenomenon rather than focusing on the reasons for negativity towards wind power. Because renewable energy technologies such as wind farms are more decentralised than traditional technologies such as fossil fuels, renewable energy production tends to occur closer to people and residential areas. Thus, many more local siting and decision-making processes are needed in comparison to traditional power plants. Siting processes must
seek solutions for matters of trust, distributional justice and procedural justice. Research findings indicate that more engagement with the local community can result in trust, better decisions and greater legitimacy, which may then have positive effects on acceptability as well (Wüstenhagen et al., 2007; Ellis et al., 2007; Aitken, 2010a; Batel et al., 2013).

Table 1. Cumulative and new wind power capacity in Nordic countries (source: Pineda and Tardieu, 2016).

<table>
<thead>
<tr>
<th>Nordic country (MW)</th>
<th>2015 Installed</th>
<th>Total</th>
<th>2016 Installed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>234</td>
<td>5,063</td>
<td>220</td>
<td>5,227</td>
</tr>
<tr>
<td>Finland</td>
<td>379</td>
<td>1,011</td>
<td>570</td>
<td>1,539</td>
</tr>
<tr>
<td>Iceland</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Norway</td>
<td>7</td>
<td>822</td>
<td>16</td>
<td>838</td>
</tr>
<tr>
<td>Sweden</td>
<td>615</td>
<td>6,029</td>
<td>493</td>
<td>6,519</td>
</tr>
</tbody>
</table>

In general, the public acceptability of wind power is high. Opinion surveys in many European countries have shown very positive attitudes towards wind power (European Commission, 2014). Also, Finnish wind power attitudes, at the general level, are well-documented in repeated annual surveys conducted by Energiateollisuus ry (Finnish Energy). Remarkably, 71% of the respondents would increase the amount of electricity produced by wind, and only 12% would decrease it according to the latest survey (Finnish Energy, 2016). However, it is evident from previous research that high general support does not automatically mean that local wind power development will be accepted. Local host communities may express vocal opposition (see Wolsink, 2000; Warren et al., 2005; Jobert et al., 2007; Devine-Wright, 2009; Warren and McFadyen, 2010; Waldo, 2010). The difference between the high general public acceptability of wind power and its low local acceptability is called the social gap (Bell et al., 2005; Bell et al., 2013). This phenomenon is apparent in Finland. According to Finnish media coverage, “It is too easy to complain about wind power developments”\textsuperscript{1} (Turun Sanomat, 2016), and “[a] wind farm in [a] neighbourhood forced a family to move away”\textsuperscript{2} (Yle, 2015). In the last two years, many appeals regarding wind farm development have been heard in Finnish administrative proceedings. The Finnish Judicial Administration’s website reveals that the appeals mainly concern regional zoning but also include more detailed issues, such as

\textsuperscript{1} Translated from Finnish text by the author: “Tuulivoimasta valittaminen ’liian helppoa’.”

\textsuperscript{2} Translated from Finnish text by the author: “Tuulivoiman tulo naapurin ajo perheen kodistaan.”

Local wind power conflicts may reflect multiform relationships between Finnish people and their living environment. Most of Finland is countryside, and thus, Finnish people likely have connections to rural environments and positive perceptions of rural landscapes, which represent rural life and leisure activities (Peräinen, 2006; Vepsäläinen and Pitkänen, 2010). It is possible that a contradiction with these perceptions occurs because of visible changes in the rural landscape. Previous research has found that the use of natural resources is a significant cause of contradictory opinions among Finnish people. This phenomenon results from environmental risks, landscape changes at rural-urban interfaces and the related emotions (Soini et al., 2012; Lyytimäki and Peltonen, 2016; Korjonen-Kuusipuro and Meriläinen-Hyvärinen, 2016).

The trajectories of wind power development in Finland remain uncertain. It can be hypothesised that there are specific national factors related to wind power development that affect its implementation rate. These include general energy policy drivers, technological development and social factors at the level of individual perceptions, with one of these social factors being public acceptability (Breukers, 2006; Toke et al., 2008; Wolsink, 2007). Recent master’s theses explain how local opposition in Finland has many social, environmental and emotional explanations (Laitinen, 2014) and how wind turbines are perceived as landscape elements (Lahtinen and Mäensivu, 2011).

This thesis explores onshore wind power to ascertain the determinants of its local acceptability in Finland. The study rests on the notion that the technological and social dimensions are of equal importance in the implementation of wind power. The aim of this study is to create a knowledge base of relevant social factors in order to achieve a deeper understanding of wind power acceptability. The thesis resolves the research problem through studies focusing on attitudes, which are comprised of cognitions, emotions and conation. The context of the thesis is Finnish wind power development from 2012 to 2017.

1.2 The focus and positioning of the study

The research topic of this thesis is wind power acceptability in Finland. The research aims to examine public wind power acceptability from a wide viewpoint to achieve a comprehensive and long-term understanding of the local acceptability of wind power. The research addresses a socio-technical paradox, one in which the social dimensions of the situation are at least as important as its technological dimensions. This particular socio-technical paradox appears as a contradiction: high general acceptability with regard to wind power translates into opposition at the local level. The research on wind power acceptability has strong traditions in empirical studies using quantitative study methods. The previous literature has found numerous factors that affect acceptability, such as project characteristics and context, people’s environmental relationships, costs and benefits, information distribution, procedural justice and emotions (Devine-Wright,
General acceptability itself involves contradictions in that people may perceive wind turbines as a disturbance in the landscape while at the same time considering them acceptable because they represent an environmentally friendly method of energy production (Johansson and Laike, 2007). To explain this complex phenomenon, this thesis explores the social and cultural factors affecting attitudes related to wind power and also utilises more interdisciplinary research attempts. Despite widespread knowledge of wind power developments, previous research has not adequately explained the relevant social factors (Sovacool, 2014; Fournis and Fortin, 2016).

Also, the literature on wind power acceptability and attitudes has difficulties in defining terms. During the past three decades, social research on the adaptation of wind power technology has used terms such as support, opposition, attitudes, perceptions, acceptability and acceptance. The term social acceptability has been criticised because of its limited scope, which restricts potential findings. Past research on public opposition has aimed largely at achieving results that would indicate methods of overcoming or avoiding resistance. Social acceptability has been used in research attempts to identify barriers to wind power development (Aitken, 2010b; Wolsink, 2012; Petrova, 2013). Often, social acceptability is poorly defined in research publications. The concept may also be termed societal acceptability (Heiskanen et al., 2008), social acceptance or social acceptability (Warren et al., 2010), public or social acceptability (Wüstenhagen et al., 2007) or social acceptability (Strazzera et al., 2012). This research focuses on local acceptability, and the chosen terms are explained below.

To identify and understand the dimensions of local responses to wind power developments, this study differentiates between the social acceptability and social acceptability. The thesis relies on previous wind power research in which social acceptability has a broader interpretation than social acceptability (Huijts et al., 2012; Fournis and Fortin, 2016). In the current research, the aim is to build a coherent understanding of wind power attitudes with reference to the studies of Ajzen (2001). Attitudes have three components: (1) the cognitive component is the knowledge and beliefs a person holds about the attitude object, (2) the affective component is the emotions or feelings about the attitude object and (3) the behavioural component is one’s behavioural intention or response (Ajzen, 2001). This research uses Huijts et al.’s (2012) definitions for wind power attitude concepts: acceptability means attitude (a specific mind-set), and acceptance is a specific behaviour. In their framework, Huijts et al. (2012) also assert that acceptability (i.e., attitudes) is influenced by individuals’ affects, risks and benefits, as well as perceptions of costs and fairness. More specifically, acceptability means attitude; it is a specific mind-set (an evaluative judgement, see the definition of attitude below) towards wind power (Huijts et al., 2012). Accordingly, individual acceptability is a positive attitude on the part of an acceptance subject towards a specific acceptance object. Public acceptability refers to a positive attitude on the part of the public. Acceptance is an action-based construct and refers to behaviour regarding wind power projects. Acceptance refers to supportive behaviour rather than protests. In wind power cases, acceptability could mean supporting actions in specific wind power
developments or using electricity produced by wind power. Resistance refers to objective actions that are negative with respect to wind energy (Huijts et al., 2012).

In this thesis, an attitude is defined as a person’s summary evaluation of a phenomenon or an object, as captured in attribute dimensions such as good-bad, likeable-dislikeable, and harmful-beneficial. Hence, the definition of attitude in wind power contexts includes an appraiser as a subject and specific wind power attributes as an object. According to Eagly and Chaiken (2005, p. 745), an attitude is a “psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor”. Tendency describes one important feature of attitude: it is not necessarily short-term or permanent in nature. In the wind power context, acceptability thus has temporal features. Hence, acceptability is not necessarily stable during project development. Acceptability, like attitudes, can change over time. General attitudes towards wind power are, according to many surveys and public polls in Europe, very favourable (Ellis and Ferraro, 2016; European Commission, 2014). Favourable attitudes decrease as soon as local project plans are published. During this phase, various kinds of fears and worries emerge among members of the public. People may be concerned because of perceived local or personal impacts. After successful installation, acceptance increases (Wolsink, 2007). The dynamic nature of wind power attitudes is often presented as an up-facing parabola, which the wind power acceptance literature refers to as a U-curve (Wolsink, 2007). However, one should note two limitations in this regard. Firstly, progressive development is possible if project developers are able to solve emerging problems and concerns that arise during the planning phase (Wolsink, 2007). Secondly, as the previous discussion has suggested, attitudes and their measurement must be carefully considered when analysing changes in the course of the process. The relevant question is as follows: what specific attitudes should be measured? The differences between general and local acceptability do not demonstrate the development of public attitudes towards wind power. Rather, public attitudes are flexible, transitory, and adaptable (Aitken, 2010a).

In the next section, the theoretical background of the acceptability literature is compacted into three major frameworks that have garnered strong support among researchers, namely the social gap, place attachment, and questions of justice. The Not-in-My-Backyard (NIMBY) point of view is discussed in the wind power context because it is still used among both practitioners and scholars, even though it has little explanatory value (Wolsink, 2007; Devine-Wright, 2011). The theoretical framework of this thesis is presented in Chapter 2.

1.3 Literature review

The acronym NIMBY is widely encountered in scientific papers concerning social acceptance or the acceptability of wind power. NIMBY generally describes resistance to siting specific common-good projects close to one’s residential area, or “backyard”, while accepting similar projects elsewhere. The NIMBY phenomenon is dependent on the distance between wind turbines and people. If wind turbines are located in the vicinity of
people (in their backyards), opposition may increase regardless of the attributes of wind power development. In other words, NIMBY-motivated opponents have positive attitudes towards the application of wind power in general, but they oppose the construction of turbines in their own neighbourhoods. This negative relationship between general and local support for wind energy tends to be attributed to people’s selfish concerns about personal utility (Petrova, 2013; Wolsink, 2007). However, social science research finds NIMBY to be too simplistic an explanation because it does show the causes of such opposition, and the acronym is often used as a negative label. Because NIMBY has no conceptual models or robust theoretical background frameworks, it results in erroneous conclusions (reviewed by Petrova, 2013).

Bell et al. (2005) introduce the social gap concept in the context of wind power. This phenomenon appears in the fact that opinion polls show the high general acceptability of wind power, even though local developments meet resistance. The aim of Bell, Gray, and Haggett’s analysis (2005) is in line with the work of Wolsink (2007) in that the authors contest the assumption that NIMBYism is the only explanation for the social gap. They provide two more profound explanations, namely the democratic deficit and qualified support. Bell et al. (2005) still discuss NIMBY within the framework of the social gap and state that this social gap seems to depend on an individual gap between general attitudes towards wind power (entirely positive) and attitudes towards a particular wind power development (negative). NIMBYism, as an individual gap, stretches between collective rationality and individual rationality, which motivates individual behaviours (Bell et al., 2005). In other words, Bell et al. (2005) and Wolsink (2007) argue that there are individuals who are in favour of wind power but who are not willing to personally sacrifice anything in the case of a local proposal. However, it is an accepted fact that NIMBY is unable to add any analytical value and hence is not a successful explanation for the social gap or wind power attitudes on the whole (Ellis et al., 2007; Aitken, 2010b; Batel et al., 2013).

Bell et al. (2005) are able to find more balanced descriptions of wind farm opposition, and they explain the social gap via the democratic deficit, in which most locals accept the project but minority opposition leads to the delay or cancellation of the project (Bell et al., 2005; Bell et al., 2013). According to Bell et al. (2005), another explanation for the social gap is the principle of qualified support. The qualified support hypothesis claims that while people accept wind power on a general level, they still have doubts about it on a local level. Questions on typical opinion surveys do not necessarily register this conditional thinking. Qualified supporters believe that wind power is a good idea, but they also see practical limitations that should be taken into account (Wolsink, 2000). The theoretical basis for qualified support developed by Bell et al. (2005) presents one overwhelming viewpoint for future research. Local opposition may depend more strongly on local factors, such participation and decision-making procedures, than on general attitudes. Measurements of general attitudes, as they are currently conducted, may be inadequate in identifying more nuanced views.
Bell et al. (2013) have expanded the framework of the social gap through their findings on the democratic deficit with well-networked and well-resourced national interest groups, which may have strong commitments to working with local opponents to effectively oppose wind power developments. Thus, even opponents who are a minority both locally and nationally may be able to successfully block such a development. Also, Bell et al. (2013) explain the social gap by using heterogeneous types of attitudes, rather than any single attitude type. The authors show how the social gap is a mixture of large numbers of qualified supporters, some place protectors, a few unqualified opponents and, perhaps, some self-interested NIMBYs. These people may cooperate to oppose particular wind energy developments. Bell et al. (2013) suggest that these explanations would benefit from further analysis in terms of place- and landscape-related concerns, as well as perceived unfairness in local wind power developments. Next, place-based and trust-based explanations are briefly introduced.

Place attachments are meaningful emotional bonds between people and places. As processes, these attachments are socio-physical experiences at the behavioural, cognitive, and emotional levels in an individual’s own environment (Brown and Perkins, 1992). Place attachments are significant predictors of project acceptance and thus offer a complementary framework with which to explain local opposition. This framework draws on social and environmental psychological theory on place. Processes of place attachment and place identity may lead to protective actions. People may locally protect their own place by opposing actions when new developments disrupt pre-existing emotional attachments and threaten place-related identity processes (Devine-Wright, 2009, 2011; Upham, 2009).

Meanings and representations of energy technologies in relation to people’s acceptance and acceptability is not a technical question. Rather, it is a question within the field of science and technology studies, in which people’s own experiences and definitions are in focus (McLachlan, 2009; Devine-Wright and Howes, 2010). Interpretations of both place and renewable energy technology occur at different scales; they are multiple and lead to diverse logics of opposition and support. For instance, in the case of wave technology, place can be seen as economically vulnerable, as involving a sense of local ownership, as a resource and as nature. The interpretation of actual wave technology is related to its contested environmental status and capacity for electricity production and also to local, commercial, experimental, pioneering, industrial and natural issues (McLachlan, 2009). Wind farms represent nature/industry contradictions: place represents scenic beauty that provides a restorative environment, but wind farms, in contrast, represent an industrialised area (Devine-Wright and Howes, 2010). Anderson et al. (2017) discussed conflicting beliefs regarding the outcomes of plantation forestry in rural landscapes. If people felt that landscape was a place for nature conservation and amenity, they had more negative beliefs in this regard as compared to people who saw landscape in terms of production (Anderson et al., 2017). Fundamentally, Finnish people have a relatively strong relationship with nature (Tyrväinen et al. 2007), and exposure to nature causes restorative and well-being effects (Korpela et al. 2014). Finnish people’s bond to nature is related to their rural or urban background: the traditional rural view emphasises the use...
value of natural resources, and urban view value emphasises recreational benefits (Simula, 2012). Also, Batel et al. (2015) showed how energy technologies create urban-rural confrontations, which have associated landscape representations. As Batel et al. (2015) conclude, it is important that the dialogue regarding the relationship between places and landscapes “departs from asking what is the nature of ‘nature’, landscapes and places, to suggest that often people will defend a sense of place in certain places based on the construction of those places as having an essence that has to be preserved”.

In general, the more attached people are to a place, the more they experience place disruption during changes and the more they oppose such proposals (Devine-Wright and Howes, 2010, Vorkinn and Riese, 2001). More specifically, it seems that one predictor of objections is active place attachment (Devine-Wright, 2013, Bailey et al., 2016), which refers to a reflective and self-conscious bond rather than a traditional bond (an unselfconscious taken-for-granted bond). These people perceive collective protest against place change as “active localism”, which is the foundation for their personal bond to a given place (Bailey et al., 2016). Also, the correspondence between place and infrastructure-based meanings is important. A lack of congruence may result in negative feelings and objections. Congruence, in contrast, leads to acceptability and support (McLachlan, 2009; Devine-Wright and Howes, 2010; Anderson, 2013; Batel et al., 2015).

Place-related social identities may also become visible in local wind power conflicts between residential groups. Newcomers may oppose the plans, but people with extensive family histories may be more supportive. Newcomers are seen as a group of people who do not understand the place in the same way as those who have lived there for a long time do (Colvin et al., 2016). Recently, Devine-Wright and Batel (2017) examined new people-place relationships in responses to energy infrastructure projects. They extend the theory of place attachments by showing significant regional, national and global aspects of these attachments, in addition to local aspects. According to their results, “individuals with stronger national than local or global attachments were less likely to support European grid integration; those with relatively stronger global attachment were most likely to support decentralised energy and those with relatively stronger local attachment were most likely to protest against a nearby power line” (Devine-Wright and Batel, 2017, p. 110).

Communities’ responses to energy technology are unique and involve more than the physical proximity between residential areas and power stations. A place-based approach means that residents’ various perceptions of the local project are taken into consideration. This provides profound and context-sensitive material regarding people’s perceptions of energy technologies (Batel and Devine-Wright, 2015). The focus is on individual and group responses to energy infrastructures but also on people’s relationship to place. Affected communities are not always within close proximity to wind turbines. Rather, affected communities may be widely separated geographically but still share common views on place and have common interests (Bristow et al., 2012). Second-home owners and permanent residents may both reside at same place but place attachment differs between these groups. Stedman (2006) found that second-home owners exhibit higher
levels of place attachment; they have experience in the area and important social relationships. However, permanent residents form their attachments through social networks and feelings of community. These findings questions regarding whose perspectives should be considered with respect to rural development (Stedman, 2006; Vepsäläinen and Pitkänen, 2010).

Environmental conflicts typically involve tensions between actors (Laine and Peltonen, 2003). The subject of conflict is rather common in wind power research. Usually, research on wind power conflicts focuses on the tensions between wind power supporters, who highlight environmental benefits and the self-sufficiency of energy, and those who oppose wind power developments and emphasise the harmful effects on the local environment and people (Wüstenhagen et al., 2007; Gross, 2007; Firestone, 2012). This research highlights the significance of perceived justice in the planning and location selection processes and its effects on the acceptability of wind power (Wolsink, 2007). Wind power development can also include other types of conflicts, such as competing private or public interests (Bergek, 2010).

Environmental justice can be defined through distributional, recognitional and procedural justice. All these shape the local acceptability of technology (Lima, 2006; Walker, 2009; Jenkins, 2016). These three tenets are related to the “what”, “who” and “how” of energy justice. Distribution justice concerns siting and access to energy. Recognition includes the fair representation of individuals. Procedural justice refers to access to decision-making processes. For procedural justice, it is essential that local stakeholders’ voices are heard (Jenkins, 2016). Successful results and better outcomes stem from collaborative approaches rather than from specific or top-down decision-making (Wolsink, 2007; Agterbosh et al., 2009; Hindmarsh, 2010). Local residents will oppose the project if they perceive that the decision-making process prioritises external economic interests or global environmental goals while ignoring local annoyances, risks for citizens, scenic value or nature protection. There is evidence that a high level of participatory planning improves public acceptability and successful implementation. Also, stable, supportive networks are likely to result. However, for project acceptance and success, the absence of opposing networks is essential, even more so than the presence of supporting networks (McLaren Loring, 2007; Agterbosh et al., 2009).

In sum, the existing research literature on wind power development is precise in describing perceptions (Devine-Wright, 2005; Ellis and Ferraro, 2016), but explanations do not seem properly address all attitudinal views. In addition, the wind power literature sometimes favours thinking in which opposition to wind power is a misconstruction, and the research typically aims to find ways of overcoming opposition. Given this kind of thinking, opponents are labelled deviant or misinformed (Aitken, 2010b; Ellis et al., 2007). Wind power planning processes have been especially criticised for lacking a conceptual framework and methods (Zaunbrechter and Ziefe, 2016). Thus, reviewing frameworks from previous research suggests the first research gap in current wind power research: limitations in understanding social acceptability as a complex process and acceptance as a result of social acceptability (Cowell et al., 2011; Huijts et al., 2012). The
second research gap stems from explanations of the social gap and place attachments in relation to wind power developments (Bell et al., 2005; Devine-Wright, 2009). Given that general acceptability and local acceptability do not necessarily correlate and understanding that they measure different attributes, it should be clear that they are not comparable. The focus should rather be on explanatory frameworks, such as qualified support, and place protection attitudes in order to understand the underlying drivers of acceptability. Empirical research is especially needed near proposed or operating developments because people living near wind turbines experience the impacts of wind power. People with strong place attachments do not oppose development because of landscape or noise impacts (Devine-Wright, 2011). The opposition is also not grounded in NIMBY thinking. Instead, these people oppose wind power development because of their personal meanings attached to place (Bell et al., 2013; Devine-Wright, 2009). The third research gap is that wind power acceptability research is centred on cognition. However, the formation of attitudes is a complex combination of cognition and emotion (Ajzen, 2001). Previous research has neglected the role of emotions, and an understanding of a more holistic view — including behavioural perspectives — is still lacking. Research literature on emotions related to wind power is surprisingly limited despite expansive studies across different disciplines (Cass and Walker, 2009; Waldo, 2010).

1.4 The objectives of the study and research questions

This work is built on qualified support (Bell et al., 2005; Bell et al., 2013) and place-related meanings of wind power (Devine-Wright and Howes, 2010), and the emphasis is on the attitudes (acceptability of wind power) and experiences of people living near wind farm developments. The aim of this research is to examine local wind power acceptability. The key objective is to study local perceptions of wind power, which are divided into three components: cognitive, affective and behavioural responses to wind power.

This research adopts a socio-technical approach, which enables culturally sensitive analysis (Sovacool, 2014). The socio-technical perspective considers how the technical features of wind power interact with its social features; in this study, these are human perceptions of the major environmental and social impacts. However, economic factors are, for the most part, left out of the analysis. This study highlights chosen factors and the interactions between them. This means that not all potential factors, interactions and influences are analysed. Because this study is situated in Finland, the national planning practices of wind farms and people’s strong relationships with nature guided the selection of relevant research questions. The aim of this study is to contribute to the literature on wind power acceptability and also to increase the knowledge available to the managers of wind farms and policy makers. Overall, the core of the thesis consists of five separate research projects, which answer three research questions.

The main research question is as follows:

What are the socio-technical determinants of the local acceptability of wind power in Finland?
The objectives of the study and research questions

The aim is not to find solution that fits all cases but rather to increase our understanding of local acceptability and its psychological determinants in Finland. This means that different determinants are important in different contexts. The main research question is addressed through the following sub-questions:

SQ1. What is the role of location in the acceptability and acceptance of wind power?

The first aim of this sub-question is to analyse attitudes toward wind power among local Finnish residents and owners of second homes. The second aim of the sub-question is to focus on perceptions of two environmental impacts of wind power: noise and landscape changes.

SQ2. How is participation in the wind farm project perceived, and how does it predict wind farm acceptability?

This second sub-question aims to examine perceptions of participation levels in local wind farm planning processes. Additionally, the aim of the sub-question is to study the factors affecting the acceptability of an operating wind farm in order to examine whether perceived participation predicts local wind farm acceptability.

SQ3. What is the role of emotions in the acceptability and acceptance of wind power?

The aim of the third sub-question is to explore emotions in the wind power debate in four separate Finnish cases. The goal is to understand what kinds of emotions are connected to wind power expectations and experiences, what the emotions connected to wind power developments mean, and what connections there are between emotions and wind power landscape photos. Additionally, the aim is to study how wind turbines sited in various landscapes affect peoples’ intentions to support or oppose proposed wind turbines.

The research subtopics, research questions, objectives and individual publications are listed in Table 2.
Table 2. Research objectives and questions.

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Research objectives</th>
<th>Data collection</th>
<th>Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQ1. What is the role of location in the acceptability and acceptance of wind power?</td>
<td>To analyse attitudes towards wind power among local Finnish residents and owners of second homes.</td>
<td>Planned WF - Mixed method: surveys (N=100) and interviews (N=14)</td>
<td>I, IV, V</td>
</tr>
<tr>
<td></td>
<td>To analyse how emotions caused by wind turbines sited in various landscapes affect peoples’ intentions to support or oppose proposed wind turbines.</td>
<td>Hypothetical WF Customers of electricity company - Surveys (N=503)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To use diaries to gather information about the audibility of WT noise indoors.</td>
<td>Two operating WFs - Mixed method: diaries (N=22), acoustic and wind measurements</td>
<td></td>
</tr>
<tr>
<td>SQ2. How is participation in the wind farm project perceived, and how does it predict wind farm acceptability?</td>
<td>To examine perceptions regarding levels of participation in local wind farm planning processes, as well as to analyse the relationship between participation and local wind farm acceptability.</td>
<td>Two operating WFs - Mixed method: surveys (N=289) and interviews (N=22)</td>
<td>III</td>
</tr>
<tr>
<td>SQ3. What is the role of emotions in the acceptability and acceptance of wind power?</td>
<td>To explore emotions in the wind power debate in four separate Finnish cases.</td>
<td>Two planned WFs and two operating WFs - Interviews (N=47)</td>
<td>II, IV</td>
</tr>
<tr>
<td></td>
<td>To analyse how emotions caused by wind turbines sited in various landscapes affect peoples’ intentions to support and oppose proposed wind turbines.</td>
<td>Hypothetical WF Customers of electricity company - Surveys (N=503)</td>
<td></td>
</tr>
</tbody>
</table>
2 The theoretical background

This section will provide an overview of the theoretical premises of public perceptions of wind power. The section begins with a discussion of acceptability and acceptance levels of wind power. The literature review in Section 2.2 is based on published material and divided into three subsections that follow the research dimensions of this thesis: individuals’ cognitive and emotional functions and individual behavioural responses related to wind power. Finally, the theoretical frame of the dissertation is described, and the core content is summarised.

2.1 The two levels of wind power acceptability

The current literature seems somewhat inconsistent in its differentiation of the dimensions of wind power acceptability. Attitudes toward wind energy in general and attitudes toward specific projects are inevitably different because current research assesses attitudes via different objects. In other words, wind energy attributes reside at different levels of abstraction: at the general level, the focus is on large questions, such as energy security and environmental protection, while at the local level, the focus is more practical and concerned with direct impacts, such as noise, landscape changes or disturbances during the construction of the wind farm. However, there is evidence that these acceptability levels correlate with one another: It seems that attitudes toward wind energy projects are dependent on general attitudes toward wind power (Wolsink, 2000; Johansson and Laike, 2007; Jones and Eiser, 2009; Bidwell, 2015).

In this thesis, attitude levels are separated into two levels: general acceptability and local acceptability. Local acceptability has various determinants, the most significant of which are explored in the studies in this thesis (Figure 1).
General acceptability

- Towards wind power as an energy-producing technology

Local acceptability

- Location – landscape, noise
- Participation – planning, decision-making
- Emotions – relating to wind power or landscape

Figure 1. Illustration of the two levels of wind power acceptability.

2.2 Wind power acceptability as a three-component attitude

Attitudes are both conscious and unconscious evaluations of objects, which may be material, social or ideal. Conscious attitudes may be self-reportable, and unconscious attitudes may be accessible only through indirect methods (Hitlin and Pinkston, 2005). This means that people may have different thoughts about the attitude object simultaneously. Also, it is widely acknowledged that attitudes have three components — cognition, affect (emotions), and behaviour — which form positive or negative associations through experiences and associations with other attitudes and objects (Fabrigar et al., 2005; Hitlin and Pinkston, 2012). People hold both positive and negative dispositions towards an attitude object. This is called ambivalence, and this construct means conflict within the cognitive component in which opposing beliefs simultaneously pull in opposite directions or create a conflict between cognition and affect (Ajzen, 2001).

Therefore, people may have conflicting beliefs about wind power and/or feel both positively and negatively about it.

The three components of attitudes can be seen as three types of potential responses to the attitudinal object. This classical view of attitudes holds that an attitude consists of separate cognitive, affective and behavioural components (Smith, 1947; Breckler, 1984). In contrast, the contemporary view emphasises the independent entity of the attitude as a concept (Crites et al., 1994). This view holds that instead of having separable roles, all three components form a general evaluative summary of the available information (Fabrigar et al., 2005). As Hitlin and Pinkston (2005, p. 325) summarise, “Attitudes are, in this view, compilations of beliefs, feelings, and behavioural predispositions that combine in complicated ways towards developing an overall positive or negative sense of an object.”

This research acknowledges the evaluative aspects of attitudes, in this case the acceptability of wind power. Also, cognitive, emotional and behavioural responses are used to identify the drivers of wind power evaluations. However, cognitive, emotional and behavioural responses are seen as interacting with attitudes rather than being part of
2.2 Wind power acceptability as a three-component attitude

them. In the upcoming chapters, the main idea is to underscore the interrelationship among the three attitude components and wind power acceptability.

2.2.1 Elements derived from cognitive bases of wind power attitudes

Cognition, as an attitude component, refers to beliefs that one holds about the attitude object. The majority of previous research regarding the acceptability and/or acceptance of wind power focuses on cognitive-based evaluations (Devlin, 2005; Coleby et al., 2009; Ladenburg and Möller, 2011; Ek et al., 2013). However, whether cognitive evaluations or emotions should be used to determine an attitudinal response depends on the individual’s preference and the attitudinal object in question (Ajzen, 2001).

As previously discussed, there is a difference between general and local acceptance levels. Opposition toward wind power seems to activate when people are actually confronted with wind turbines (e.g., Wolsink, 2000; Wolsink, 2007). The specific costs, benefits and risks of wind energy production are considered when evaluating the impacts of a specific project (Wolsink, 2007a; Perlaviciute and Steg, 2014). Wind turbines are situated in open areas, and as large machines, they impact the environment. These impacts may increase public concerns. In other words, wind turbines are a source of annoyance for some people. People typically express concerns about how the project will affect aesthetics, noise levels, the socioeconomics of nearby communities, tourism, commercial fishing, wildlife and other ecological features (Firestone and Kempton, 2007; Gee and Burkhard, 2010; Haggett, 2011; Devine-Wright, 2014). Landscape type (e.g., Wolsink, 2007a; Wolsink 2007b) and scenic evaluations of wind turbines’ effect on the landscape (e.g., Jones and Eiser, 2009; Jones and Eiser 2010; Wolsink, 2007a) are found to be especially important determinants of local attitudes toward wind farms.

Almost all papers concerning the wind power planning process recommend a high level of public participation (Coleby, et al., 2009; Devine-Wright, 2011; Devlin, 2005; Wolsink, 2007). Better public engagement can result in better decisions and greater legitimacy and trust, which may enhance a wind power project’s acceptance. Perceptions of procedural fairness (e.g., being heard, receiving adequate information, being treated with respect and perceiving unbiased decision-making) may affect outcome fairness (e.g., the development of the wind farm), and vice versa (Gross, 2007). Increasing participation and procedural fairness may increase the local acceptability of the outcome or create a sense of outcome fairness (Aitken, 2010a). Neglecting local interests may turn conditional wind farm supporters into objectors (Wolsink, 2007). Community members desire public participation (Coleby et al., 2009) and also policy responsiveness and accountability (Hindmarsh & Matthews, 2008).
Noise annoyance means negative reactions to environmental noise. The concept of annoyance is associated with emotions, cognitions and behaviours and expresses long-term dissatisfaction, disturbance or bother, which is often the sum of several negative variables (Guski, 1999; Hoeger et al. 2002). Feeling annoyed can be considered an emotion, but the relationship between exposure and subjective experience is moderated by cognitive variables, such as attitudes (Lima and Marques, 2005). One important issue in the wind power context is wind turbine sounds. Earlier research suggests that wind turbine noise and visual aesthetics cause annoyance for people living near wind farms. Also, negative attitudes towards the impact of wind turbines on the landscape are associated with noise annoyance (Pedersen and Waye, 2008; Pedersen and Larsman, 2008; Pawlaczyk-Luszczyńska et al., 2014). It appears that the annoyance caused by wind turbines is more related to visual impacts and attitudes than to wind turbine noise as such (Knopper and Ollsson, 2011). However, the correlation between annoyance and sound pressure levels has been confirmed in many studies (Nissenbaum et al., 2012; Pawlaczyk-Luszczynska et al., 2014; Pedersen and Persson Waye, 2004; Pedersen and Persson Waye, 2007; Pedersen et al., 2009; Shepherd et al., 2011).

Increasing the distance between residential areas and wind turbines decreases the perceived sound pressure annoyance (Onakpoya et al., 2015). In other words, increasing distance is one factor that mollifies nearby residents’ concerns about wind turbine noise. As with sound pressure levels, a consensus on an actual threshold distance has not yet been found (Rand and Hoen, 2017).

It seems that wind turbine sound annoyance is — in addition to visibility, sound pressure levels and distance — dependent on certain other factors as well. Annoyance relates to general wind power attitudes (Janssen et al., 2011; Pawlaczyk-Luszczyńska et al., 2014a). The recent literature also offers evidence supporting the theoretical relationship between noise annoyance and economic benefits (Van den Berg et al., 2008; Janssen et al., 2011), noise sensitivity (Michaud et al., 2016d), landscape changes and well-being (Van den Berg et al., 2008; Pawlaczyk-Luszczynska et al., 2014a) and stress and sleep disturbances (Van den Berg et al., 2008). In terms of wind turbine noise, people are also concerned about possible adverse health effects (Pedersen and Persson Waye, 2004; Michaud et al., 2016).

2.2.2 **Elements derived from emotional bases of wind power attitudes**

Emotions are part of every human experience and social relationship (Turner and Stets, 2005). They provide useful information about the desirability of an action (Loewenstein and Lerner, 2003) and form a link between moral standards and moral behaviour (Tangney, Stuewig; Mashek, 2007). Immediate emotions may include factors such as aesthetic values, which are difficult to articulate (Loewenstein and Lerner, 2003). For example, landscape amenity arguments are subjective and can be seen as a personal prerogative (Woods, 2003), but subjective argumentation regarding landscape issues may be inconsistent with the prevailing argumentation policy. This means that individuals may have the right to give their opinions on landscape changes, but they may avoid using
arguments based on aesthetics if prevailing views on the landscape are based on productive and active use (Botterill and Cockfield, 2016).

Emotions are short-term psychological and physiological states that are experienced through the appraisal of a situation, physiological changes, gestures that express these emotions to other people and linguistic names (Sharp and Kidder, 2005). Emotions arise when the brain makes body systems active, showing how biological processes are involved in the production of emotions (Turner and Stets, 2005). In addition, emotions are understood as culturally constructed, and hence, cultural differences shape our expressions and interpretations of emotions (Hochschild, 2008; Turner and Stets, 2005). This means that people evaluate feeling and context according to certain “feeling rules” that are rooted in their culture (i.e., they recognise particular feelings, and they also know what emotion should be experienced in a certain situation) (Hochschild, 2008). “Thus, experience, behavior, interaction, and organisation are connected to the mobilisation and expression of emotions” (Turner and Stets, 2005).

Theories of emotion vary in how they determine and categorise emotional stimuli and how emotions are perceived. Basic emotion theories assume that some emotions are universal to all humans (Brosch et al., 2010). Turner and Stets (2005) characterise basic emotions as follows: they are present in other primates, have a distinctive physiological response, have distinctive universal antecedent events, show coherence in autonomic and expressive responses, are quick in their onset, are brief in duration, generate an automatic appraisal of the stimulus and are experienced as events happening to the self, beyond one’s full control. Happiness, fear, anger and sadness — and often surprise and disgust — are included in the list of basic emotions (Turner and Stets, 2005). Combinations of these basic emotions form other, non-basic emotions (Brosch et al., 2010).

*Dimensional theories of emotion* focus on valence and arousal. This approach distinguishes between negative and positive emotions at different intensities, which reflect motivational systems (Brosch et al., 2010).

As the definition of emotion as a concept shows, emotions involve both biological and cultural processes. Emotions are formed as a result of judgements (Turner and Stets, 2005). An early cognitive appraisal theory of emotion (Schachter and Singer, 1962) asserts that for experiences that do not have an immediate explanation, people will label this state and describe their feelings in terms of the cognitions available to them at the time. However, when there is an explanation for the experience, then people are unlikely to label the feelings in terms of alternative cognitions. Also, when a person is experiencing a situation that elicited an emotion in the past, they will react emotionally only if they are in a state of physiological arousal (Schachter and Singer, 1962). Siemer et al. (2007, 599) encapsulate the heart of appraisal theories: “It is the way a person interprets a situation — rather than the situation itself — that gives rise to one emotion rather than another emotion.” Appraisal influences both emotional intensity and emotional quality. Regarding emotion regulation, this would indicate that changes in the
The theoretical background

appraisal process will result in changes in both the intensity and quality of emotions (Siemer et al., 2007).

Loewenstein and Lerner (2003) distinguish between two different ways in which emotions affect decision-making. The first is “expected emotions”, which are predictions of the emotional consequences of decision outcomes. The second is “immediate emotions”, which are experienced at the time of decision-making. Immediate emotions likely incorporate moral or aesthetic values, which are difficult to articulate (Loewenstein and Lerner, 2003). Moral emotions reflect personal interpretations of the world and of right and wrong. Moral emotions commonly arise in situations in which people perceive unfairness (Tangney et al., 2007).

People constantly evaluate the significance of their experiences in terms of their personal well-being (Lazarus, 1991). The outcome of an appraisal of person-environment relationships may be favourable or unfavourable. Coping is a process via which people attempt to alter circumstances to make them more favourable (Lazarus, 1993). However, people’s emotional responses to the same situation can differ depending on their personal appraisals of the situation (Siemer et al., 2007). Recent research findings do not separate emotions from cognitions or consider emotions to be irrational; rather, they show how emotions and cognitions are entwined (Håkonsson et al., 2008). To sum up, emotions support cognitive functioning because rationality first requires emotional processing (Lazarus, 1993; Håkansson, 2008). Affective events lead to appraisal processes, which heighten emotions and coping behaviours (Schachter and Singer, 1962; Lazarus, 1993). The source of an affective experience is relevant. Affective experiences provide information about attitudes if cognitions and sensations are related to an attitude object (Schimmack and Crites, 2005).

The role of emotions involved in the response to energy technologies has attracted less attention than cognitive appraisals. In a study by Keller et al. (2012), the relationships between the content of spontaneous associations with nuclear power plants, gender and the acceptability of nuclear power plants were analysed. Respondents who favoured nuclear power plants mainly associated them with energy, appearance descriptions and necessity. Opponents of nuclear power plants had more concrete and diverse cognitive and mental associations with risk, negative feelings, accidents, radioactivity, waste disposal, military use and negative health and environmental impacts. The results show how the affective nature of the association was related with the acceptability of replacing nuclear power plants. More recently, Ruiz et al. (2017) found that negative emotions and low levels of perceived benefits generated opposition to oil drilling projects. Negative emotions were created by perceived low levels of benefits and procedural injustice, as well as by perceived risk. Appropriate information, in contrast, helps increase oil drilling project acceptability (Ruiz et al., 2017).

Few evaluations of emotions have been conducted by wind power researchers. Emotion-related wind power research requires elevating the significance of emotions to that of knowledge (Truelove, 2012), especially as a factor that encourages action (Cass and
2.2 Wind power acceptability as a three-component attitude

Walker, 2011; Waldo, 2012). In Finland, only Minna Näsman (2011) has written about Finnish emotions regarding wind power as part of her research on environmental conflicts. Näsman examines the significance of worldviews in environmental conflicts and analyses the environmental conflict associated with wind power construction in Korppoo. Näsman calls for a discussion in which emotions are referred to by their real names. Näsman’s research touches on the social and cultural significance of emotions regarding the interactions between various stakeholders because according to Näsman (2011), officials are not able to discuss their emotions in their official roles.

2.2.3 Elements derived from behavioural bases of wind power attitudes

The definition of acceptance as a result of acceptability follows the logic of the theory of reasoned action (TRA). This framework describes and predicts volitional behaviour. The key concept is intention, which in this model, is the most important predictor of behaviour. Acceptability (i.e., attitudes) is antecedent to the intention to accept sustainable technology, which in turn is a strong predictor of actual acceptance (i.e., behaviour such as supporting or opposing sustainable technology). In addition to acceptability, intentions to accept are influenced by social norms (e.g., perceived social pressure to accept), perceived behavioural control (e.g., perceptions of how much one can actually achieve by supporting/opposing sustainable energy technology) and personal norms.

With respect to wind turbine attitudes, both positive and negative evaluations must be included in the analysis. There is reason to suppose that both may converge into supportive and/or oppositional intentions. Opposition to wind farms can be explained by factors related to personal attitudes and the specific context. In a study by Strazzera et al. (2012), the factors affecting opposition to wind farm development included identification and attachment to place. Because place attachment is a complex phenomenon incorporating emotional bonds or attachment between individuals and places (Altman and Low, 1992), it may explain oppositional or supportive behaviours. Devine-Wright and Howes (2010) assert that the contradiction between wind power development and place is experienced as a threat to human identity for those people with strong place attachment. This results in negative attitudes and oppositional behaviour toward wind power development. Regarding supportive behaviour, a similar relationship with place attachment has not been found (Devine-Wright and Howes, 2010). Furthermore, a wind farm’s perceived economic benefits to the local community have a significant positive impact on public attitudes towards it (e.g., Jones and Eiser, 2009; Jones and Eiser, 2010), and they increase intentions to support the wind farm project (e.g., Bidwell, 2015; Guo et al., 2015; Baxter et al., 2013). In contrast, Read et al. (2013) suggest that behavioural intentions to oppose wind farm developments are most significantly affected by past oppositional behaviour and the influence of other community members. Attitudes relating to the proximity of wind turbines, visual perceptions and sense of place did not significantly predict oppositional behaviour in their study (Read et al., 2013).
The role of aesthetic perception and landscape change as responses to wind power developments remains a social controversy (Wolsink, 2007). Despite qualified planning and good design, people may perceive the impacts in particular places negatively, which affects the acceptability of this energy technology (Cowell et al., 2010; Devine-Wright and Howes, 2010; Devine-Wright and Batel, 2013). Wind turbines and transmission lines are often perceived as negative landscape elements in rural environments (Devine-Wright and Batel, 2013; Cowell et al., 2010; Soini et al., 2011). Previous empirical studies have concerned visual or aesthetic perceptions of wind turbines, but only a few works have taken one step further and dealt with respondents’ attitudes (Kontogianni, Tourkolias, Skourtos, and Damigos, 2014; Palmer, 2015; Thayer and Freeman, 1987; Wolsink, 2007a) or behavioral intentions (Johansson and Laike 2007) related to wind power developments. In addition, few studies have analysed the role of emotions. Specifically, Maehr, Watts, Hanratty and Talmi (2015) investigated emotional responses to the visual impact of wind turbines. They concluded that the psychophysiological response to wind turbines does not differ from that to other industrial constructions but that wind turbines are rated as more calming and less aversive than some other industrial constructions.

Community acceptance of wind power refers to the local level, particularly residents and local authorities (Wüstenhagen et al., 2007), and it depends on the stage of project development (Wolsink, 2007; Wilson and Dyke, 2016). Concrete decisions are most often made at the local level, and the processes involve many people, including wind energy developers, local stakeholders and regional authorities (Toke et al., 2008). Community acceptance is necessary for successful wind farm development. A lack of participation often leads to negative attitudes: “A lack of communication between the people who shall live with the turbines, and the developers, the local bureaucracy, and the politicians seems to be the perfect catalyst for converting local skepticism, and negative attitudes into actual actions against specific projects” (Krohn and Damborg, 1999, p. 959). It should also be kept in mind that the complex nature of participatory engagement starts at the renewable energy policy-making level, where practices have a history of industrial interests (Agterbosch et al., 2009; MacArthur, 2015).

2.2.4 The research framework

In sum, the reviews of the literature and previous frameworks (see Chapter 1.3) show how wind power attitudes have three components that interact with one another: cognition, emotions, and behaviour. Also, the reviews reveal certain research gaps. A general theoretical framework was built for this thesis to respond to the identified research gaps (Figure 2). It seems that the more precise use of constructs is needed to examine the development of acceptability and resulting acceptance. Additionally, this dissertation shares Wolsink’s (2013) idea that attitude objects that gain general acceptability and local acceptability are completely different and should be evaluated in terms of different attributes.

In the research framework of this thesis, the role of emotions is studied in two different ways. Expected emotions consist of predictions of the emotional consequences of wind
2.2 Wind power acceptability as a three-component attitude

Power development. Immediate emotions are experienced during the development process or during the operation of a wind farm. Finally, local acceptance is affected by immediate emotions and also by the general and local acceptability of wind power.
Figure 2. The research framework.
3 Research methodology

This chapter describes the methodological choices of this study (for detailed methodological approach and experimental design descriptions, see the publications). This dissertation uses multiple research methods and is comprised of five publications, which examine the acceptability of wind power in Finland. The aim of this chapter is to foster knowledge of wind power acceptability using various research approaches.

3.1 Research strategy

This is a multidisciplinary, empirical research project that uses primary data. The purpose of this research project is to understand a complex real-world phenomenon. Therefore, a mixed-method approach was chosen as the main research orientation. This mixed-method research orientation has certain strengths: it can help to obtain a richer and more comprehensive picture of the phenomenon, to create generalisations and avoid methodological or personal bias, and to improve upon single methods (Johnson and Onwuegbuzi, 2004). A summary of the research design is presented in Table 3. Three of the publications are mixed-method studies. Publications I and III are guided by the qualitative analysis of interviews and the quantitative analysis of surveys. Publication V combines residential diaries of wind turbine (WT) sounds, interviews and measurements of noise and wind. Publication II includes a qualitative analysis of interviews, and Publication V includes a quantitative survey analysis. Publications I and V address the cognitive elements of acceptability. Publication II focuses on emotions. Publication IV addresses both the emotional and behavioural elements of acceptability.
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3 Research methodology

Table 3. Research design.

<table>
<thead>
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<th>Publication</th>
<th>Dimension of acceptability</th>
<th>Research approach</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI: Owners of second homes, locals and their attitudes towards future rural wind farms</td>
<td>Cognitive</td>
<td>Mixed-method</td>
<td>Questionnaires (N=100) and interviews (N=14)</td>
</tr>
<tr>
<td>PII: Calm and storm: Emotions as part of the social acceptability of wind power</td>
<td>Emotional</td>
<td>Qualitative</td>
<td>Interviews (N=47)</td>
</tr>
<tr>
<td>PIII: The acceptability of wind farms: The impact of public participation</td>
<td>Cognitive</td>
<td>Mixed-method</td>
<td>Questionnaires (N=582) and interviews (N=22)</td>
</tr>
<tr>
<td>PIV: Exploring behavioral intentions related to wind power landscapes with a particular focus on the role of emotions</td>
<td>Behavioural</td>
<td>Quantitative</td>
<td>Questionnaires (N=503)</td>
</tr>
<tr>
<td>PV: Audibility of wind turbine noise indoors, evidence from mixed-method data</td>
<td>Cognitive</td>
<td>Mixed-method</td>
<td>Diaries, interviews (N=22); acoustic and wind measurements</td>
</tr>
</tbody>
</table>

3.2 Ethics

Before conducting the Lappeenranta-Merijärvi case study, the ethical considerations were examined. The application for ethical review for research involving human participants was assessed in the LUT Academic Council on 9.12.2014. The ethical application included descriptions of the research questions and data collection methods, including the questionnaire and diary forms, data management processing and a clarification regarding the responsible researchers. The cover letter of the questionnaire, the research plan, an assessment of related ethical questions, the written consent form to participate (for the participants) and the form indicating a written commitment to sound research ethics (for the researchers) were included as attachments.

The research process generated personal data. The participant’s consent was obtained for involvement in the research. Firstly, the cover letter of the survey provided participants with information about the research and their rights before they completed the questionnaire. The contact details of the responsible researchers were mentioned in the cover letter. The cover letter/information sheet was reviewed by individuals who were
outside the project. Refusal to participate was allowed both before or during the research. The contract documents were filed.

The cover letter emphasised that all kind of individual data were important and would be treated confidentially. Anonymity and confidentiality were maintained by using participant numbers or pseudonyms. The researchers made certain that no specific individuals were identified as wind power supporters or opponents in public, either during the project or afterward. However, this research had no potential risks (e.g., physical, psychological, social, legal or economic) to the participants or subjects associated with the proposed research. It was also not probable that there would be any potential risks to researchers as a consequence of undertaking this proposal that would be greater than those encountered in normal day-to-day life.

Other data collection processes for two additional studies (questionnaires and interviews in Ruokolahti and Kotka) and a hypothetical case did not require preliminary ethical review. However, the guidelines for conducting responsible of research were followed in all studies. The data management was principally equal to that of the Lappeenranta-Merijärvi case study.

3.3 Descriptions of the studied wind farms

The empirical case studies were carried out in Finland near two onshore wind farms located close to residential areas and near two planned onshore wind farm areas. Ownership of vacation residences in Finland is common, and residences tend to be located in rural areas by a lake or the sea. This makes Finland a unique and interesting context in which to study attitudes towards rural wind farms. The operating wind farms were Tuulimuukko in Lappeenranta (called WF Lappeenranta in the following sections) and Ristiveto in Merijärvi (WF Merijärvi). These wind farms were selected because the wind turbines were large-scale, they were operating at the same time and residents had experience with wind turbine sounds. WF Lappeenranta and WF Merijärvi became operational in mid-2013. The planned wind farms were located in Kotka (WF Kotka) and in Ruokolahti (WF Ruokolahti). These wind farms were in the planning stage at the same time, but they represented very different locations because WF Kotka is an urban wind power development and WF Ruokolahti is rural. Table 4 presents the selected wind farms. WF Lappeenranta has seven 3 MW turbines, and WF Merijärvi has six 2.3 MW wind turbines. Thus, the sizes of the installations were quite small in relation to many commercial wind energy facilities. The planned wind farms, WF Kotka and WF Ruokolahti, are planned to be larger.

The research questions rely on the experiences and expectations of individuals who live near operating or planned wind turbines. This research approach revealed some interesting differences between residential places. These differences are likely to have connections to place attachment (Altman and Low, 1992). However, the empirical studies of this thesis are limited by the fact that it was not possible to test emotional reactions without including place-dependent emotions. Additionally, interviews were performed in
3 Research methodology

retrospect; those who were interviewed were looking back on their emotions connected with the wind farm planning and building processes. Nevertheless, it was necessary to study the cause-and-effect relationships between emotions. These three reasons generated a need to extract the research context from place-related attachments. While the experimental method is appropriate for determining causes and effects, this method was modified in order to test the connections between emotions and perceptions about wind turbines in a certain landscape, as well as intentions to support or oppose this kind of wind energy production. Hypothetical wind farms were created, and they consisted of two wind turbines that were placed in a landscape photograph via photo manipulation.

Table 4. Selected wind farms and hypothetical wind turbines.

<table>
<thead>
<tr>
<th>Wind farm</th>
<th>Capacity</th>
<th>Planning phase during data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lappeenranta</td>
<td>7 WTs, 21 MW</td>
<td>Operational since 2013</td>
</tr>
<tr>
<td>Merijärvi</td>
<td>6 WTs, 13.8 MW</td>
<td>Operational since 2013</td>
</tr>
<tr>
<td>Kotka</td>
<td>6-9 WTs, 27 MW</td>
<td>Planned</td>
</tr>
<tr>
<td>Ruokolahti</td>
<td>9 WTs, 27 MW</td>
<td>Planned</td>
</tr>
<tr>
<td>Hypothetical</td>
<td>2 WTs</td>
<td>Hypothetical</td>
</tr>
</tbody>
</table>

The Finnish political and cultural context and especially environmental law guided our research interest in perceptions of procedural justice. The other two forms of environmental justice, recognition and distributive justice, are not on special focuses in this study. All the studied wind farms required a zoning process, and in Kotka, the environmental impacts also were assessed. Both the planning and assessment processes included public consultation sessions, and project developers provided some additional information sessions during planning. For instance, in Ruokolahti, three public consultation sessions were held during the planning process. People were invited to the meetings via personal letters and newspaper announcements. The municipal officials were able to give their statements, and the residents were about to give their opinions of the zoning plan (for more detail, see Publication I). However, all the details of the planning processes were not collected from the studied wind farms. The focus of the analysis is not to describe the exact planning process but rather to examine residents’ perceptions of procedural justice. Human perceptions of the planning process do not necessarily correspond to the number of meetings held. Thus, in this work, the data consist of the residents’ interpretations of the studied constructs, especially procedural justice (Johnson and Onwuegbuzie, 2004).
This research uses a multiple-case design. The reason for using a multiple-case design was to avoid vulnerability: the data are not simply unique, and findings can be generalised to other contexts (Yin 2009). The case study is not a method in itself but rather a design frame that may integrate several methods (Johnson and Onwuegbuzi, 2004). The aim was to understand the complexity of the research contexts. Data include one main case (Lappeenranta-Merijärvi), two additional studies with questionnaires and interviews (Ruokolahti and Kotka) and a hypothetical case. Table 5 shows the various stages and methodologies used during the years of data collection. The survey and interview datasets are named according to the study areas: Interviews in Ruokolahti = I_R, interviews in Kotka = I_K, interviews in Lappeenranta = I_L and interviews in Merijärvi = I_M; survey in Ruokolahti = S_R, hypothetical survey = S_H, survey in Lappeenranta = S_L and survey in Merijärvi = S_M. In the next sections, the methods applied in this research project are introduced. Even though mixed-methods research can be seen as one of the three major “research paradigms” (quantitative, qualitative and mixed-methods research), the data collection is described here according to observational methods: surveys, interviews, diaries and measurements. The method of analysis method was selected based on the data type.
Table 5. Data collection from 2012 to 2015.

<table>
<thead>
<tr>
<th>Year of data collection</th>
<th>Study area</th>
<th>Methodology* and the data names of interviews and surveys</th>
<th>Material and information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-2013</td>
<td>Ruokolahti WF</td>
<td>S, I, D, M</td>
<td>Local residents and second-home owners; emotions.</td>
</tr>
<tr>
<td>2013</td>
<td>Kotka WF</td>
<td>I, K</td>
<td>Emotions</td>
</tr>
<tr>
<td>2014</td>
<td>Hypothetical</td>
<td>S, D</td>
<td>Emotions; landscape perceptions; behavioral intentions</td>
</tr>
<tr>
<td>2014-2015</td>
<td>Lappeenranta WF</td>
<td>S, I, D, M</td>
<td>Emotions; participation in planning process; perceptions of WT sound</td>
</tr>
<tr>
<td>2014-2015</td>
<td>Merijärvi WF</td>
<td>S, I, D, M</td>
<td>Emotions; participation in planning process; perceptions of WT sound</td>
</tr>
</tbody>
</table>

* S = survey, I = interview, D = diary, M = physical measurements, S_R = survey in Ruokolahti, S_H = hypothetical survey, S_L = survey in Lappeenranta, S_M = survey in Merijärvi, I_R = interviews in Ruokolahti, I_K = interviews in Kotka, I_L = interviews in Lappeenranta, I_M = interviews in Merijärvi, D_L = diaries in Lappeenranta, D_M = diaries in Merijärvi, M_L = physical measurements in Lappeenranta, M_M = physical measurements in Merijärvi.

3.3.1 Interviews

The aim of the interviews was to explore the expectations regarding wind power and local wind farms or perceptions of a local operating wind farm. Almost all the contacted persons were willing to participate in the study. The interviews were semi-structured, meaning that certain themes and questions were included but the interviewees could share their expectations and experiences freely within the given framework. However, the interviewer (or interviewers) encouraged all the interviewees with brief additional questions, prompting them to provide more details. The interviews lasted 45 minutes on average. The interviews were recorded and transcribed verbatim.

The interviews in Ruokolahti (I_R) and Kotka (I_K) focused on expectations. The 21 interviewees were living near planned wind turbines. The interviews were conducted in 2013. Those interviewed included locals, owners of second homes, corporate interests
3.3 Descriptions of the studied wind farms

and municipal politicians and officials. All the interviewees were asked questions related to the following six themes: 1) attitudes (impact of wind power at the siting area and social acceptance, including whose acceptance counts); 2) ownership and fairness (property prices, who suffers and who benefits economically); 3) everyday activism (personal actions and experiences of activism); 4) interaction (successfulness of interactions between different stakeholders); 5) knowledge (sufficiency and source of information and the use of knowledge) and 6) tolerance (fears, health effects, personal tolerance of nuisance). Future expectations of wind power were also discussed. The key themes of the interviews in Ruokolahti and Kotka are found in Appendix B1.

The interviews in Lappeenranta (I_L) and Merijärvi (I_M) focused on experiences and perceptions. The aim of the interviews was to explore the residents’ perceptions of the local wind farm. The interviewees were selected because their permanent homes were close to a wind farm and they could make observations about the turbines (their average distance to the nearest wind turbine was 1400 m). Thus, the interviews were focused experiences with wind power. The total number of interviewees was 22. Interviews were held during the spring and winter of 2015 in the respondents’ homes, except for one interview, which was conducted via phone. The interviewees were permanent residents in the local community. All those residents who kept a diary about the audibility of the wind turbine sounds were interviewed. Principally, they did not have any other specific role in relation to the local wind power development process, except for one interviewee, who was a landowner and hence derived some monetary benefit from the wind power company through its tenancy on his land. All the interviewees were asked questions related to the following three themes: 1) emotions, cognitions and behaviour in the wind power context (such as opportunities to participate in the wind farm planning process, general attitudes towards wind power and intentions to support or oppose wind power developments); 2) experiences and changes (such as perceived changes in respondents’ perceptions of wind power after the local wind farm construction) and 3) personal values. The key themes of the interviews conducted in Lappeenranta and Merijärvi are found in Appendix B2.

All the interviews were coded with Atlas.ti software, Version 7.5.13. The coding process included reading and interpretation, resulting in the categorisation of the findings. For Publication I, the data were analysed by reading the material and identifying the points at which the interviewees discussed the environment and the landscape. For Publication II, the data were analysed using interpretive phenomenological analysis (IPA; Smith and Osborn, 2008). The procedure consisted of two stages. Firstly, emotional expressions were captured, and secondly, the analysis was focused on contexts in which emotions were present. For Publication III, the data were categorised in terms of the International Association of Public Participation’s “IAP2 spectrum of public participation” regarding tokenism and empowerment. The concept of the IAP2 spectrum is presented in Figure 3.
3.3.2 Surveys

The quantitative empirical data were collected with surveys. The aim of the surveys was to study a wider group of Finnish people to explore the affective and cognitive drivers of wind power acceptability. For this purpose, a sample of individuals was selected so as to draw some inferences about the wider population.

The aim of the survey in Ruokolahti was to collect data about the differences and similarities in attitudes toward wind power among local residents and owners of second homes. The survey was comprised of three sections, which collected data on the following: 1) the socio-demographic backgrounds of the respondents, 2) their attitudes toward wind power in general and 3) their attitudes towards the local wind farm project plans. The questionnaire used in the Ruokolahti survey is presented in Appendix A. The municipal population register was used to obtain the mailing information. A total of 241 survey questionnaires with cover letters (one per landowner) were mailed, together with a hearing notification concerning the municipal zoning process in June 2012. An Internet survey similar to the mail survey was conducted via Webropol 2.0 software. The survey questionnaires were also freely available at the municipal centre and local library of Ruokolahti. Sixty-seven completed questionnaires were returned, and 45 responses
were received via the Internet survey. Thus, the total number of respondents was 112. Consequently, the response rate for the mailed questionnaires was 27%.

Various non-parametric tests were used to identify potential differences between locals and owners of second homes. Cross-tabulation was used to analyse differences in background knowledge, attitudes towards different forms of energy production and attitudes towards wind power in general and the construction of the WF Ruokolahti. Pearson’s Chi-square test or Fisher’s exact test was used to assess the statistical significance of the observed differences between locals and owners of second homes: Fisher’s exact test was used if the proportion of cells with an expected cell frequency of less than five exceeded 20%. The Mann-Whitney U-test was used to analyse the differences in the potential effects of the proposed WF Ruokolahti. The distance between the property and the location of the proposed wind farm was controlled, and “I don’t know” responses were filtered out before the analyses.

The survey near operational wind farms in Lappeenranta and Merijärvi were descriptive and represented a cross-sectional view of the important factors associated with “real-life” local wind farms. The survey questionnaire was loosely based on Pawlakcy-Łuszczyńska, Zaborowski, Zamojska-Đaniszewska and Waszkowska’s (2014) study, with additional questions concerning participation during the wind farm planning process (Jami and Walsh, 2016). The questions analysed for Publication III are found in Appendix A2. The aim of the survey was to study the perceived opportunities for participation in the local wind farm planning process to further analyse the factors affecting the acceptability of the operating wind farm. Thus far, few studies (e.g., Firestone, Kempton, Lilley, and Samoteskul, 2012; Johansson and Laike, 2007) have examined the relationship between perceived past participation and local project acceptability during the operational phase.

Wind power acceptability was examined through two measures: the impact of the wind farm on the landscape and the impact on well-being. The perceived impacts on the landscape and human well-being guide evaluative judgements of wind power and hence shape acceptability (Huijts et al., 2012). The population register was used to obtain postal information regarding the targeted sample: all residents aged over 18 in Merijärvi (N = 812) and approximately the same number of residents (N = 810) aged over 18 living in postcode areas near the Lappeenranta wind turbines. Survey questionnaires with cover letters were posted to the residents for the first time in December 2014 and for a second time in January 2015. The total number of responses was 582. Thus, the response rate achieved was 35.5%. An ordinary least squares regression (OLS) model was used to explore the predictors of local wind farm acceptability, as measured by effects on perceptions of landscape and well-being.

The surveys investigated the experiences and expectations of individuals living near operating or planned wind turbines. This research approach revealed some interesting differences between residential locations. These differences are likely to have connections to place attachment, which is an emotional relationship between people and
Research methodology

places (Altman and Low, 1992). However, the empirical studies of this thesis have a limitation. It was not possible to test emotional reactions independent of place-dependent emotions. Additionally, interviews were performed in retrospect. Those being interviewed were looking back on their emotions connected to the wind farm planning and building processes. However, there is a need to study the cause and effect relationships between emotions. Thus, there is a need to extract the research context from place-related attachments. While the experimental method is appropriate for determining cause and effect, this method was modified to measure aesthetics and their connections with emotions. This hypothetical research design, in which researcher does not have complete control over the variables, is called a quasi-method or, in this case, a quasi-experiment (Field and Hole, 2003, p. 66). In this thesis, the third survey attempted to allocate participants into groups in order perform experiments regarding perceptions of wind turbines using photo manipulation, with one group being held as a control. In other words, the study treatment was the appraisal of landscape photos without and with wind turbines.

A pilot survey regarding a hypothetical wind farm was conducted in Finnish in summer 2014. The respondents were students from the Lappeenranta University of Technology. The total number of respondents was 171, both male (the majority) and female, and they came from the Schools of Business and Energy Technology. The primary study was adjusted based on the pilot study and conducted with the customers of a Finnish electricity company prior to the end of September 2014. A total of 622 electricity company customers completed the questionnaire. After excluding the respondents with substantial missing data or identical ratings for all items, a final sample of n = 503 was obtained.

A cover letter containing the link via which to access the online survey was attached to the monthly email newsletter of a Finnish electricity company at the beginning of September 2014. The number of newsletters sent was approximately 25,000. The link was also available on the frontpage of the company’s website. The questionnaire was a part of a larger survey regarding landscape preferences, wind power attitudes and place attachment.

The survey was comprised of four sections: 1) the demographics of the participants were assessed; 2) participants answered questions assessing their attitudes toward wind power and other forms of renewable energy at the general level; 3) one out of four landscape photographs was randomly assigned to each participant; below the assigned photograph, the participants were asked to assess the emotions aroused by the landscape photograph and 4) the same landscape photograph with digitally added wind turbines was assigned to each participant, and participants were again asked about the emotions elicited. Respondents’ perceptions about corresponding wind power production, the emotions raised by the photograph, and respondents’ intentions to support and oppose the proposed kind of wind power production were assessed. The questionnaire for the hypothetical survey is found in Appendix A3.
3.3 Descriptions of the studied wind farms

Because the electricity company is located in the Eastern part of Finland, in a geographical area called Lake Finland, the landscape photographs were taken by the authors within its sphere of operations. Photographs were taken in locations that represent typical Lake Finland landscapes (see, e.g., Käyhkö et al., 2004; Raivo, 2002) but are not famous or well-known. The landscape photographs used were as follows: 1) a forest scene, 2) a summer cottage scene with a lake in the foreground and a forest in the background, 3) a countryside scene with a road in the foreground and buildings and some forest in the background and 4) a street view of a small town with some cars and trees. All the photographs were taken and manipulated by the authors.

Analysis of covariance (ANCOVA) was used to test whether landscape type affects the perceived aesthetics of proposed wind turbines, whether the immediate emotions caused by the inclusion of wind turbines in a landscape are determined by aesthetic perceptions and whether the emotions aroused by aesthetic considerations related to proposed wind power development have a significant impact on behavioural intentions.

3.3.3 Diary as a data collection method

The structured diaries were used to gather data about the residents’ perceptions of the WT sounds near operating wind farms. This study was part of the Lappeenranta-Merijärvi case study, in which sound was also measured. The diary method represents a longitudinal method, even though the study period was relatively short. The diary method was built on daily written accounts of WT sound audibility. The data collection was conducted during winter/spring 2015. The sound diary was designed to assess the audibility of WT noise at the homes of local residents. The number of diary keepers was 20. Six of the diary keepers were from Lappeenranta, and fourteen were from Merijärvi. The majority of them were male (11), and 17 of them lived at a distance no longer than 2 km from the nearest WT. The remainder lived at a distance of from 2 km to 2.5 km from the nearest WT. Sound diaries gathered information about the audibility of WTs indoors on a scale from 0 (no sound) to 3 (very loud). Diary keepers assessed the audibility once in an hour during waking hours. The diaries were kept during two- or three-week periods, following the sound measurement arrangements. The sound diaries were synchronised with the five sound measurement locations: one or two diaries were kept in a house outside which a WT sound measurement microphone was installed. The other sound diaries were kept in houses in close proximity to the ongoing measurement. Wind measurements were performed using WindCube v2 ground-based Lidar. Lidar was situated along the direction of the predominant upwind from the WF so that the turbines disturbed the measurements as little as possible. In Figure 4, the measurement arrangements are illustrated. The number of diary entries per diary keeper was calculated. Also, the diary entries were analysed in relation to other measured physical characteristics of WT sound.
Figure 4. Data collection arrangements in Publication V.

Table 6 combines the three sub-research questions and research methods of this work. Data collection is planned to help answer the many research questions. For instance, this study uses interview material I_L (interviews in Lappeenranta) in Publications II (wind power emotions) and III (procedural justice as participation).
### 3.3 Descriptions of the studied wind farms

Table 6. Research questions and data.

<table>
<thead>
<tr>
<th>Research question</th>
<th>Data source</th>
<th>Data collection*</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQ1. What is the role of location in the acceptability and acceptance of wind</td>
<td>Planned WF Ruokolahti</td>
<td>- Mixed method: S_R (N=100) and I_R (N=14)</td>
</tr>
<tr>
<td>power?</td>
<td>Hypothetical WF: Customers of electricity company</td>
<td>- S_H (N=503)</td>
</tr>
<tr>
<td></td>
<td>Two operating WFs: WF Lappeenranta and WF Merijärvi</td>
<td>- Mixed method: diaries (N=22) and acoustic and wind measurements</td>
</tr>
<tr>
<td>SQ2. How is participation in the wind farm project perceived, and how does it</td>
<td>Two operating WFs: Lappeenranta and WF Merijärvi</td>
<td>- Mixed method: S_L and S_M (N=289) and I_L and I_M (N=22)</td>
</tr>
<tr>
<td>predict wind farm acceptability?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SQ3. What is the role of emotions in the acceptability and acceptance of wind</td>
<td>Two planned WFs: WF Ruokolahti and WF Kotka</td>
<td>- I_R, I_K, I_L, I_M (N=47)</td>
</tr>
<tr>
<td>power?</td>
<td>Two operating WFs: WF Lappeenranta and WF Merijärvi</td>
<td>- S_H (N=503)</td>
</tr>
<tr>
<td></td>
<td>Hypothetical WF: Customers of electricity company</td>
<td></td>
</tr>
</tbody>
</table>

*S_R = survey in Ruokolahti, S_H = hypothetical survey, S_L = survey in Lappeenranta,
S_M = survey in Merijärvi, Interviews_R = interview in Ruokolahti, I_K = interviews in
Kotka, I_L = interviews in Lappeenranta, I_M = interviews in Merijärvi.
4 Summary of the publications and their key results

This chapter introduces the synthesis of the key results derived from the five publications that constitute the second section of the dissertation. The publications illustrate the phenomenon under study from different perspectives in order to respond to the main research question of this dissertation: What are the socio-technical determinants of the local acceptability of wind power in Finland? Each paper addresses a specific research sub-question, all of which are presented in Table 2. Publication I focuses on residential status in relation to wind power attitudes. Publication II explores the emotions related to wind power. Publication III explores the participation process. Publication IV explores the relationship between landscape aesthetics and intentions to behave in a certain way. Publication V returns to questions of location but focuses on WT noise.

The most central findings from the publications are as follows:

1) Different meanings of location are operationalised based on residential status and perceptions of noise and landscape change.

Local permanent residents and second-home owners perceive that they have quite similar levels of knowledge on energy forms, and both groups were interested in energy issues. Among those who live close to a local wind farm, second-home owners had more negative expectations about place image, landscape change, tourism, economy and property values (Publication I). In response to WT sound as a cognitive dimension, the key result is a bit surprising: most of the results show that the sound is not audible indoors (Publication V).

2) Procedural justice can be a form of environmental justice and a way to manifest citizen power.

Local residents were passive in seeking information and participating in wind farm projects. However, they also report that they did not perceive opportunities for participation. Those who participated perceived the effects on personal well-being negatively. The participation process remained at the level of tokenism. During the operation of the wind turbines, some residents negotiated for monetary compensation for the community (Publication III).

3) Wind power emotions occur in different stages of wind power developments, especially in relation to landscape aesthetics.

Local residents had experienced many types of emotions regarding wind power, and the same interview could reveal both positive and negative emotions on this subject. These emotions differed according to the state of the wind power project, and expectations and experiences shaped the feelings attached to wind power. There are many emotional responses attached to the practicalities of wind power (Publication II). Taking into consideration both cognitions and emotions could aid in understanding perceptions of the
landscape changes caused by wind power developments, as well as their relevance in the acceptance of wind power (Publication IV).

4) General attitudes towards wind power explain local acceptability

General attitudes towards wind power are positive (Publications I, II, III and IV) and explain local acceptability (Publications I, III and IV).

Of these four findings, the first, the second and the fourth results relate primarily to the cognitive component of attitudes. These results explain the relationship between local communities and wind power developments in many ways. The third result represents the affective component of attitudes and helps to explain behavioural intentions regarding wind farm development.

In this chapter, the aim is not to repeat the results of the original articles but rather to elaborate on the findings in relation to wind power attitudes. In other words, this chapter provides an overall discussion of the findings regarding three attitude components: cognitions, emotions and behavioural intentions. Ajzen and Fishbein (2005, p.177) indicate that one dimension of attitudes cannot represent the complexity of this construct. Therefore, the findings presented here are components of a complex relationship between cognitions, emotions, behavioral intentions and wind power acceptability. Consequently, the study serves to expand the current literature on the definitions of wind power acceptability and acceptance. Table 7 summarises the main dimensions of the study.

Table 7. The main dimensions of the study

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Publication</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>Publications I, III and V</td>
<td>Local acceptability is dependent on residential status. Local people do not perceive participation opportunities as successful. WT noise is seldom audible indoors and does not explain acceptability.</td>
</tr>
<tr>
<td>Affective</td>
<td>Publications II and IV</td>
<td>Residents perceive many different emotions in regard to wind farm projects. Also, emotions are part of the aesthetic evaluation process.</td>
</tr>
<tr>
<td>Behavioral</td>
<td>Publication IV</td>
<td>Emotions affect intentions to support or oppose wind power development.</td>
</tr>
</tbody>
</table>

The empirical data are presented based on Publications I–V. The datasets are referred to as they are named in Chapter 3 (for example, I_R means interview data near Ruokolahti WF). In the next chapters, the tables and images are taken from the original publications.
4.1 Cognitive bases of wind power attitudes

The cognitive elements of the attitudes and the interrelationships between cognition and wind power acceptability cannot be measured directly (Huijts et al., 2012). This work explores the relationship between communities of interest and the location of wind power developments. This study examines perceptions about the placement of wind farms. In this study, location is not a single one-dimension construct but rather involves questions of residential status, distance, audibility and participation in planning processes. More specifically, location is seen as a physical siting solution and also as the perceived experiences of noise.

The location research began with an analysis of residential status. In Publication I, the attitudes of local people and owners of second homes regarding rural wind power were studied. The findings reveal that locals and owners of second homes are interested in energy questions and have quite similar levels of knowledge about wind power in general. Solar power was considered to be by far the most favourable energy form in both stakeholder groups. The locals ranked wind power second in this regard, whereas those with second homes considered it the least favourable option. Thus, locals appear to favour wind energy more strongly than owners of second homes, whereas the latter prefer hydro-power and even nuclear power and fossil fuels to wind power. Locals and owners of second homes share positive attitudes toward wind power in general (Publication I).

The proposed wind farm project in Ruokolahti provoked polarised responses. Distance from the proposed wind farm seemed to affect the respondents’ attitudes: those with a second home in close proximity to the proposed site seemed to have more negative expectations about the WF’s impact on Ruokolahti (for example, its impact on Ruokolahti’s image, the landscape, tourism, the economy and property values) than the locals. The most striking differences between the two groups concerned perceptions of the landscape: only slightly over 10% of the locals expected the Ruokolahti landscape to be ruined if the wind farm were constructed, as compared to the vast majority of those with a second home (Publication I).

The research setting proved to be fruitful in that the survey analysis revealed differences between the groups in question, which we were able to discuss in more detail in the interviews. We were also able to suggest potential underlying reasons for the differing views. These findings support the idea that local people are not an integrated whole (Aitken, 2010b); rather, they have different views on the local situation. Perceptions about one’s own environment affect attitudes towards energy production. Local permanent residents see their environment in both practical and personal terms. For these people, wind power development creates the chance for new jobs and a sustainable future. For owners of second homes, the area has different social, aesthetic and cultural meanings, which could be disturbed by new large-scale wind power development. Some of the owners of second homes have family roots in Ruokolahti. These people often want to maintain traditions and stability in the rural landscape. Other owners of second homes seek a new place with which to bond and in which to spend free time. The majority of the
owners of second homes were not willing to tolerate the changes in the environment caused by wind power development (Publication I).

In Publication I, the findings show how second home owners have been more active in seeking information about local wind-farm projects. Both residential groups had the same information material and principally similar opportunities for participation. Owners of second homes appear to be keener to attend information sessions about the construction of wind power plants at a distance less than 2 km from their summer cottages. To better understand the residents’ perceptions of the planning process, procedural justice was further studied in Publication III. The research group consisted of people living permanently at close proximity to operating wind farms. The findings show that local permanent residents knew of available wind power information but were not very interested in seeking out such information. The interviewed residents stated how they had been quite passive and had not participated in the official consultation sessions. It seems that non-participation was a conscious choice. On the other hand, according to the survey results, the residents did not perceive opportunities for participation. This is in line with the recent results of Ruiz et al. (2017), in which perceptions of an unfair process had a moderate effect on the rejection of an oil drilling project. These researchers did not examine whether there was more acceptance on the part of respondents who actually participated in decision making as compared with respondents who had not participated the decision making regarding the oil drilling project (Ruiz et al., 2017). Thus, this work sheds new light on the complicated role of participation: those who perceived opportunities for participation evaluated the impact of wind farm on their personal wellbeing more negatively. Those who had participated felt that residents’ opinions had not been taken into account (Publication III). It seems that the opportunity for participation does not necessarily indicate that people experience that their concerns and interests are taken into account.

The findings prove that it is not realistic to expect a fully public decision-making process for a wind power development when the project owners are private companies (see also Bidwell, 2016). The results of this study indicate only limited participation at the lower levels of the IAP2 spectrum, which are closer to tokenism than empowerment (for the IAP2 spectrum, see Chapter 2, Figure 3). The second stage of tokenism (consultation) seems to have had two problems: it was developer-controlled and unable to provide two-way communication. Also, the impact of the consultation suffered from a lack of interest on the part of residents, although the meetings were public and participation was not limited (Publication III). One reason for this inactivity may have been the small size and number of the wind turbines, leading to lower motivation to engage in participation. It is possible that local residents only expected minor impacts.

Some residents felt that the installation process had been very tough and had caused a great deal of harm because of practical difficulties, such as closed roads during working days or interference with television reception. It seems that the communication between residents and the developer was insufficient. Some residents became activated, gathered information and invited community members to meetings to discuss the issue. This
happened near the Merijärvi wind farm after the official planning process and the final decision made by public officials. The aim was to obtain some compensation for using the village for wind energy production. As a result, these community members managed to consult with the company and obtain some money for the development of the village (Publication III). This study extends the time perspectives of location and acceptability questions in wind power projects beyond the official decisions. Thus far, the research dynamics of wind power attitudes focus mainly on the time period between the planning and operation of wind farms (for instance, Wolsink, 2007). The findings also indicate the need for two-way communication after installation decisions. It seems that a formal participation process does not activate residents, either because it is too complicated or because residents feel that empowerment in decision-making is difficult or even impossible. Residents wanted monetary compensations, and these community benefits seemed to play a role in people’s perceptions of the wind farm in this study. People may have very ambivalence views on such benefits, the developers who offer them and the reasons for receiving them (Cass et al. 2010). Money may pose a problem when it is not clear who will benefit from the community fund. Aitken (2010c) demands institutionalised guidance regarding community benefits. Such benefits could be a routine part of renewable energy development, and there would be fewer claims that community benefits represent bribes on the part of developers (Aitken 2010c).

The third cognitive perspective in this study focuses on WT noise, which is one of the most important issues in wind farm location. This study approached noise perception as a cognitive process and explored the audibility of wind turbine sounds. However, the results were somewhat surprising in that the wind turbine noise was only rarely audible indoors. Fourteen of 19 diary keepers did not hear it at all. This is in line with (unpublished) interviews with residents who have had experiences with local wind turbine sounds. Most of them related that they never heard wind turbine sounds inside, though they did hear these sounds outside. The total number of diary entries, as well as entries indicating audible WT noise, are presented in Table 8. As shown, the percentage of hours in which WT noise was audible ranged from 0% to 14.61%.
Table 8. Total number of diary entries indoors (entries indicating WT noise audible indoors, % of entries). L denotes Lappeenranta, and M denotes Merijärvi.

<table>
<thead>
<tr>
<th>Sound measurement location</th>
<th>Diary keeper</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>208</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10, 4.81%)</td>
<td>Failed in diary keeping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>206</td>
<td>234</td>
<td>101</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>(0, 0.00%)</td>
<td>(0, 0.00%)</td>
<td>(0, 0.00%)</td>
<td>(0, 0.00%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3</td>
<td>142</td>
<td></td>
<td>237</td>
<td>122</td>
<td>293</td>
</tr>
<tr>
<td>(0, 0.00%)</td>
<td>(4, 1.69%)</td>
<td>(0, 0.00%)</td>
<td>(0, 0.00%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4</td>
<td>188</td>
<td></td>
<td>293</td>
<td>311</td>
<td>160</td>
</tr>
<tr>
<td>(0, 0.00%)</td>
<td>(0, 0.00%)</td>
<td>(0, 0.00%)</td>
<td>(0, 0.00%)</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td>M5</td>
<td>26</td>
<td>308</td>
<td>340</td>
<td>178</td>
<td>356</td>
</tr>
<tr>
<td>(0, 0.00%)</td>
<td>(45, 14.61%)</td>
<td>(43, 12.65%)</td>
<td>(0, 0.00%)</td>
<td>(28, 7.67%)</td>
<td></td>
</tr>
</tbody>
</table>

The diary markings of audible WT sound were studied more deeply. The average values of wind turbine sound pressure levels increase with audibility, but the values at each level are all within one standard deviation. Given this overlap, it is clear that for individuals, the sound pressure level is not a sufficient metric for evaluating the audibility of wind turbine noise indoors. The most severe annoyances were reported mostly at sound pressure levels above 40 dBA. There were weak indications that a combination of a shear exponent between 0.3 and 0.5 and a turbulence intensity between 0.1 and 0.2 could also be connected to sound pressure levels above 40 dBA. The wind characteristics under consideration were wind speed and direction at hub height, wind shear and turbulence intensity. The findings indicate that regarding the annoyance and audibility of wind turbine noise, the direction of the turbine with respect to the observer may be a key factor (Publication V).

This publication makes one important contribution: the mixed-methods approach was successful in studying the indoor audibility and annoyance of wind turbine sounds. Combining self-reported sound diaries with physical measurements of sound and wind characteristics was a novel method and provided interesting results. Some evidence was
found indicating that in addition to sound pressure levels, amplitude modulation and wind characteristics (especially the direction of the turbine with respect to the observer) play some role in the audibility of WT noise. In general, the research reveals that people who live near wind turbines are able to isolate themselves at home and do not typically hear wind turbine sounds indoors.

These findings have an interesting meaning in relation to wind power acceptability. This study hypothesises, on the basis of prior literature, that cognitive variables (in this case, audibility) affect annoyance and, furthermore, that annoyance affects wind power acceptability (for instance, Lima and Marques, 2005; Pawlaczyk-Luszczyńska et al., 2014). Noise annoyance is a psychological phenomenon and defined as an individual reaction to sounds (Ouis, 2001; Skagerstrand et al., 2017). Thus, building an annoyance measurer is difficult because so many factors affect the human perceptions of sounds. These factors include acoustical factors; non-acoustical factors, such as time of the day or year and past experience, and also attitudinal factors (Ouis, 2001; Laszlo et al., 2012). In this study, the aim was to measure annoyance as cognitive process using audibility measurements.

In light of the preliminary survey results (in which annoyance was found) and audibility results of this study (in which the sound was seldom audible indoors), it is reasonable to discuss the view of annoyance as cognition. If residents are not able to hear the sound, they presumably are not able to think or make rational decisions about the noise. Therefore, WT sound annoyance, in these study areas, is perhaps based on either emotion or both emotion or cognition.

Publication II continues to explore the two-fold nature of annoyance. The following is an example of an emotion concentration. The interviewee describes how he attempts to oppose wind power through personal behaviour and mentions the emotions of annoyance, feeling good and anger:

“Well, not really either, but you can sort of let some anger out there. I guess not then. There’s Don Quixote fighting windmills, but if you can even slightly hinder the effort, it feels good. Because you know that you are right in certain things, so that’s why it causes anger many times. And it crosses the threshold, so you grab it, go sit by a computer and write a newspaper article. And I have written enough back in the day that I know for a certainty that I can get something published in the opinion section of the paper if I really want to. I can even get it published in Helsingin Sanomat if there is a really compelling need.”

In the next section, the emotional elements of this wind power study are discussed. Also, the discussion addresses the borderline between cognition and emotion. For instance, when discussing residents’ positive and negative views (in Publication II), the language used describes not only emotions but also cognitions. This shows how cognitions and
emotions are entwined, and researcher did encounter difficulties in interpreting such results.

4.2 Emotions as bases of wind power attitudes

To understand the role of emotions in wind power acceptability, Publication II analysed four data sets of interviews (I_R, I_K, I_L and I_M). The majority of the interviewees at Ruokolahti were summer residents because there were few permanent residents in the planned wind power area. At Kotka, the interviewees were permanent residents near the planned wind power area. The nearest residential areas to the existing wind turbines at Lappeenranta and Merijärvi were also inhabited by permanent residents.

The interview material was characterised by a diverse range of emotions and even conflicting emotions. Interviewees had experienced many types of emotions regarding wind power, and the same interview could reveal both positive and negative emotions about this subject. Emotions differed according to the state of the wind power project, and expectations and experiences shaped the feelings attached to wind power. At a general level, interviewees felt mostly positively about wind power, with slight reservations. On a project-specific level, few felt only positive feelings about building wind turbines, and the majority of the emotions experienced were negative. Frustration and annoyance were often associated with potential participation in the wind power process. However, indifference about wind power and wind turbines was also observed (Publication II).

The study shows that there are many emotional responses to the various practicalities of wind power. Emotions were primarily investigated through four central themes: economy, location and scenery, interaction and daily life. Nearly all of the interviewees discussed the economic profitability of wind power in some way. Emotions were most often associated with interviewees’ thoughts on the use of tax revenue to support wind power and questions about the rationale behind using feed-in tariffs. Generally, interviewees did not accept feed-in tariffs as a concept, and they considered financial support for wind power to be too high in relation to support for other forms of energy production (Publication II).

In the interviews on wind power, respondents often expressed negative emotions, such as sadness, fear or anxiety, regarding changes to locations and scenery. These types of emotions were typical, especially with people who had lived in the same area their entire lives. The research included people who lived in both urban and rural environments, as well as local people and summer residents. Of these, the summer residents and, perhaps surprisingly, the urban Kotka residents had the most doubts regarding changes in the landscape. Successful interactions during construction created a positive experience among the interviewees, and this influenced positive views on wind power. Unsuccessful interactions, in turn, influenced negative views on wind power. Residents were sometimes upset with the lack of interaction between different actors or the lack of events that allowed for interaction. This analysis of the wind power emotions could also explain
4.2 Emotions as bases of wind power attitudes

Residents’ passiveness in the participation process (Publication III). The interviews reveal the significance of the relationships between members of the community: if the wind turbine is not going to be located on one’s land, there is no desire to interfere in the matter at all (Publication II). In other words, people do not want to interfere in neighbours’ affairs. Collective emotions are created by shared experiences in the community (Lawler et al., 2014).

The study shows that emotions are not yet sufficiently recognised — perhaps deliberately — in Finnish wind power discussions. The role of emotions should be better understood and addressed in wind power projects. The study’s methodological contribution shows that examining the emotions associated with wind power developments through spoken language benefits broader knowledge on environmental conflicts because emotions are a significant motivator of action in conflict situations and often escalate situations.

The management of wind power construction in its current form does not include a special forum for addressing emotions associated with changes, and thus, emotions can simply be bypassed. This could be caused by emotions not being recognised as “rational arguments” but also because the implementation of wind power construction projects under political oversight takes the form of top-down processes. In these processes, the main focus on the top level is resolving environmental problems, and on the project level, the focus is on financial issues and comprehensive environmental impact assessments. Compassion could help us understand the complexity of wind power development projects.

This study shows that perceived aesthetics impact emotions. The publication describes how emotions can affect behavioural intentions in different ways. Surprise was not a significant predictor of intentions to support or oppose development. However, the level of happiness significantly predicted intentions to support, while sadness significantly predicted opposition. Also, it seems that the perceived aesthetics of wind turbines had a direct impact on behavioural intentions (Publication IV).

Furthermore, the findings in Publication IV indicate the significant role of perceived aesthetics in the emotions respondents experienced when the wind turbines were added to the landscape. Table 9 presents the means and standard deviations of the emotions that arose due to the landscape photographs featuring wind turbines.

Table 9. Means and standard deviations of emotions elicited in various landscapes.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summer cottage</th>
<th>Forest</th>
<th>Town</th>
<th>Countryside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness M (SD)</td>
<td>40.41 (36.92)</td>
<td>45.01 (36.89)</td>
<td>30.65 (32.35)</td>
<td>46.56 (36.72)</td>
</tr>
<tr>
<td>Sadness M (SD)</td>
<td>49.12 (37.06)</td>
<td>43.55 (38.41)</td>
<td>46.57 (40.06)</td>
<td>43.94 (39.95)</td>
</tr>
<tr>
<td>Surprise M (SD)</td>
<td>48.59 (35.68)</td>
<td>39.73 (36.67)</td>
<td>52.79 (35.86)</td>
<td>41.48 (35.12)</td>
</tr>
</tbody>
</table>
As shown, the average scores for happiness and surprise had a wider range than the scores for sadness. It seems that the respondents scored the highest in happiness (46.56) if the wind turbines were located in the countryside. Conversely, the town landscape received much lower scores for happiness (30.65). The average surprise ratings ranged from 52.79 (town) to 39.73 (forest). Thus, it seems that the respondents were more surprised if the wind turbines were located in a town than if they were located in a forest. On average, the highest sadness scores were given to the summer cottage landscape (49.12), and the lowest sadness scores were given to the forest landscape (43.55, Publication IV).

Table 10. Means and standard deviations of perceived aesthetics in various landscapes with wind turbines. **p < .05.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summer cottage</th>
<th>Forest</th>
<th>Town</th>
<th>Countryside</th>
<th>Kruskal-Wallis test’s H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived aesthetics</td>
<td>M (SD)</td>
<td>34.8 (31.8)</td>
<td>44.4 (33.9)</td>
<td>33.5 (31.3)</td>
<td>38.7 (31.7)</td>
</tr>
</tbody>
</table>

As shown in Table 10, on average, the perceived aesthetics ranged from 44.4 (forest) to 33.5 (town), and the differences between the landscapes were statistically significant (Kruskal-Wallis test’s H = 8.169, p < .05). The scale ranged from 0 to 100, meaning that the mean value of the perceived aesthetics of the proposed kind of wind power production was quite low in all of the landscape types used (Publication IV). However, according to previous studies, aesthetic responses as such are largely emotional. In other words, aesthetic response, as such, has an emotional basis. Emotions and aesthetics are associated, even without the involvement of cognitive processes. This means that many emotions arise prior to cognition and constitute the initial level of response to the environment (Zajonc, 1980; Ulrich, 1983).

This finding underscores the importance of aesthetic considerations and emotions in the acceptance of wind power. Aesthetic perceptions presumably have some power to promote or slow down a proposed wind power project and could have practical implications, for example, in developing the public participation process regarding a wind power project.

4.3 **Behavioural intentions in relation wind power development**

To demonstrate behavioural intentions in relation to the most significant impact of wind farms, landscape change, this chapter presents findings from Publication IV. The results revealed that the emotions aroused affect behavioral intentions in different ways. Surprise was not a significant predictor of intentions to support or oppose development. Instead, the level of happiness experienced based on the landscape with the proposed wind
4.4 General attitudes towards wind power and a critical view of NIMBY

Turbines significantly predicted intentions to support, while sadness significantly predicted opposition. Also, it seems that the perceived aesthetics of wind turbines had a direct impact on behavioral intentions as well (Publication IV).

Thus, it seems that in the context of wind power developments, aesthetic values may be shown via immediate emotions. Following Siemer et al.’s (2007) view about the appraisal process, it seems that it is not the landscape type that arouses the emotion but rather the way a person interprets a landscape with wind turbines. Furthermore, our results suggest that emotions related to aesthetic considerations predict intentions to behave in certain ways regarding wind-power-related issues. This finding is in line with Loewenstein and Lerner’s (2003) explanation of how immediate emotions affect decision-making. According to the results, happiness because of wind turbines in a landscape increased intentions to support the proposed wind power development, whereas sadness predicted oppositional behavior. In contrast, surprise because of wind turbines in a landscape did not seem to impact behavioral intentions (Publication IV).

4.4 General attitudes towards wind power and a critical view of NIMBY

This study examines the local acceptability of wind power. However, to prove a definitional difference between attitude levels, general attitudes are briefly discussed as well. General attitudes toward wind power and local attitudes are directed towards different objects (Johansson and Laike, 2007), but this is not always fully understood. For instance, the object of general attitudes is wind power as energy source, but the object of local attitudes is impacts such as landscape change and noise. General attitude has an effect on local attitudes, or attitudes towards a specific project (Wolsink, 2000; Johansson and Laike, 2007; Jones and Eiser, 2009). This study also examines general attitudes and finds them to be positive: the interviewed residents perceive wind power as generally acceptable (Publication II), and survey responses confirm this finding in response to expectations and experiences (Publications I, III and IV). However, it seems that the general attitude towards wind power was the single most significant predictor of well-being as a measure of local wind farm acceptability (Publication III).

The results reveal that the NIMBY discussion is unable provide any successful explanation for wind power attitudes (Ellis et al., 2007; Aitken, 2010b; Batel et al., 2013). Second home owners are not “people with selfish concerns”. Rather, they have views that can be discussed and resolved (Publication I). This also applies to the role of emotions. Residents in this study are not irrational NIMBYs merely because wind farms arouse various emotions. The findings show that emotions are difficult to separate from cognitions; in fact, these two are entwined, and emotions support cognitive functioning because rationality first requires emotional processing (Lazarus, 1993; Håkansson, 2008). It seems that people attempt to avoid the stereotypically irrational or emotional NIMBY label, especially regarding economic issues, because the interviewed residents preferred “rational talk”. The significance of emotions was downplayed, or they were completely
denied. The downplaying or denial of emotions in economic speech can be interpreted from two perspectives. From one perspective, discussing financial factors is considered a “rational” way to discuss the benefits and negative effects of this type of energy production. A person who is able to talk about financial issues is able to demonstrate knowledge, reasoning and rationale-based arguments. Economic speech may also be used to engage in equal interactions with project developers and other stakeholders. The goal is to discuss matters with rational thinking, and the effect of emotions in these interactions is minimised, played down or even feared (cf. Buijs and Lawrence, 2013; Cass and Walker, 2009). In contrast, it is possible that the impact of the economic, mechanical concept of man is reflected in the wind power discussion, which according to Näre (1999, p.11), has long produced research that does not recognise emotional reactions (Publication II).

The residents interviewed in this study are not ignorant NIMBYs (Devine-Wright, 2005). In Publication III, the survey considers non-participation resulting from a lack of opportunity to participate, whereas the interviews showed that residents were aware of participation opportunities and that non-participation was a choice. In Publication I, the majority of the respondents reported being very interested in energy issues, and both locals (77.8%) and owners of second homes (63.5%) who lived at a distance less than 2 km from a proposed wind farm actively sought information. Residents perceived their own knowledge about wind energy to be good (Publication I). As one owner of a second home said:

Yes, there is enough information available about wind power, facts like how it works and what it is. Certainly, a lot of information is available. This project is a case apart, how it’s proceeding.
5 Discussion and conclusions

Energy-related issues have attracted extensive interest in the past few years, mostly because of the large environmental impacts associated with energy use. Energy, especially renewable energy, is thus seen as an essential factor for sustainable development. Public attitudes generally show strong support for the implementation of renewable energy, especially wind power, as a substitute for fossil fuels. However, the actual development of projects appears to be complicated and face challenges related to local acceptability. This dissertation has explained this phenomenon as a social problem and investigated, as its main interest, local acceptability and the resulting acceptance. Public perceptions of wind power were studied, especially in light of the largest concerns of the local community regarding their local environment. The previously identified concerns include participation during the planning process, landscape changes and wind turbine sounds (Wolsink, 2007).

The purpose of this dissertation is to shed light on the local acceptability of wind power in Finland. The main research question was as follows: What are the socio-technical determinants of the local acceptability of wind power in Finland? The main research question has been answered through three sub-questions. These sub-questions were explored in five research publications, which all contribute to answering the main research question. The individual publications are listed in the second part of this dissertation.

This fifth chapter discusses the determinants of the local acceptability of wind power in Finland. The methodological and theoretical contributions and managerial implications are discussed. This section will conclude with a reflection on the limitations of the studies and suggestions for future research based on the findings of this research project.

5.1 Answering the research questions

5.1.1 Sub-question 1 – Location of wind farms

Sub-question 1 (SQ1) analyses the role of location in the acceptability and acceptance of wind power. The dissertation shows two aspects of location. First, the residential groups inside the community have different place-related beliefs. Wind-power plans may offend these perceptions about place. Devine-Wright (2011, p. 60) writes, “. . . residents and visitors do not engage with a site, they engage with a place that is simultaneously material and psychological, objective and subjective”. This dissertation contributes to the view that the public is not an integrated whole (Aitken, 2010b; Wüstenhagen et al., 2007) by introducing a new local stakeholder group, owners of second homes. Publication I shows how permanent residents and owners of second homes have different attitudes towards local wind farms because they attach different meanings to the places where wind farm developments are planned. The most significant difference between the two groups concerns perceptions of the landscape: Only a minority of permanent residents expected
the Ruokolahti landscape to be ruined if the wind farm were to be constructed, whereas the vast majority of owners of second homes shared this expectation. This dissertation found that those who have a second home a short distance away from planned wind turbines had more negative expectations. Thus, this dissertation contributes to studies that have discussed the influence of the distance between people and wind turbines (Devine-Wright, 2005; Jones and Eiser, 2010; Meyerhoff et al., 2010). This dissertation also contributes to the current literature on wind power siting, which distinguishes wind power from other renewable energy technologies and views siting as a multifaceted problem in which many landscape and visual impacts are central concerns (Pasqualetti, 2001; Wolsink, 2007; Firestone et al., 2015). Wind turbines are large constructions. They are built on a large number of wind farms and may be located in scenically attractive areas, all of which causes conflicts (Lothian, 2007). This dissertation also contributes to the literature on human perceptions of wind turbine sounds in wind power locations. Earlier research suggests that wind turbine noises and visual aesthetics cause annoyance for people living near wind farms. These factors have a joint effect because noise is perceived as more annoying when wind turbines are visible from one’s home (Pedersen and Persson Waye, 2004; Pawlaczyk-Łuszczyńska et al., 2014). This dissertation reveals that in the studied locations, wind turbine sounds are very seldom audible indoors. Thus, it was not possible to draw further conclusions about the relationship between wind turbine sounds and annoyance or acceptability. However, sound pressure levels and sound characteristics seemed to have an impact on wind turbine sound audibility.

5.1.2 **Sub-question 2 – Participation in the planning process**

Sub-question 2 (SQ2) identifies the role of participation in local wind farm acceptability. Consequently, this paper extends existing research that views public participation as a hierarchy of ways in which citizen power may be manifested (Aitken et al., 2016; Arnstein, 1969; Jami and Walsh, 2014). The study in Publication III found evidence of tokenism during the local planning processes. The evidence shows that people chose not to participate in planning processes, as well as how they failed to perceive opportunities for participation. More specifically, people were informed about the details of planned wind farm development, but they remained passive because they perceived no opportunities for further participation. Those who did perceive an option to participate also negatively perceived landscape effects and effects on well-being, indicating the low acceptability of local wind farms in their view. This thesis adds to the existing literature on participation processes by emphasising the right to participation (Hindmarsh and Matthews, 2008; Jami and Walsh, 2017), the need for participation in the planning phase, and even the need for continued participation after initial planning. This all constitutes the second determinant of wind power acceptability, the right to participate, though this right does not substantially promote the acceptability of local wind farm development. The need for active participation opportunities may continue beyond the planning phase.
5.1.3 Sub-question 3 – Emotions and local wind power development

The third sub-question (SQ3) focuses on the role of emotions in the acceptability and acceptance of wind power. This thesis provides an improved understanding of the model generally presented in wind power research on local acceptability (Wüstenhagen et al., 2007) by including the role of emotions. In Publication II, many emotional responses emerged during discussions the planning, construction and operational phases of wind farms. There were more negative emotions than positive emotions expressed in the interviews (cf. Tuovila, 2005). Interviewees had fears and concerns about not being listened to. These thoughts were also associated with clear expressions of anger. Consequently, this paper extends existing research indicating that the emotions of anger and concern about being heard are linked with a sense of injustice (Cass and Walker, 2009). This would appear to have a major impact on motivating people to take action against wind power. Publication IV shows how emotions affect behavioural intentions: surprise was not a significant predictor of intentions to support or oppose development, while happiness significantly predicted intentions to support, and sadness significantly predicted opposition. The perceived aesthetics of wind turbines had a direct impact on emotional responses and on the emotions caused by wind turbines. Furthermore, our results suggest that emotions related to aesthetic considerations predict intentions to support or oppose wind power production. This finding is in line with Loewenstein and Lerner’s (2003) description of how immediate emotions affect decision-making.

5.1.4 Determinants of the local acceptability of wind power in Finland

The findings of the thesis describe certain social and cultural factors that shape the key determinants of local wind farm acceptability in Finland. The studies show individual differences between local residents, residential groups and wind farm cases, but the findings also show some important determinants of Finnish wind power acceptability. In some other social and cultural context, the determinants or their relative importance could be different. Also, it is important to note that not all possible factors were analysed. Rather, the determinants are presented as an evaluative summary of cognitive, emotional and behavioural factors. The thesis shows that it is not wind power technology as such that gives rise to acceptability; rather, it is how an individual interprets the situation. This situation, in the Finnish wind power context, is constructed based on place-related meanings and perceptions about landscape and noise, which constitute the first determinant. The second determinant is participation in the planning processes, which remains important after the initial planning process. The third determinant is the role of emotions in various phases of wind power development. In addition to local determinants, general acceptability seems to relate to local acceptability.

5.2 Methodological and theoretical contributions

The contribution of this study resides in its interdisciplinary research approaches. Using mixed methods, the research developed beyond simple collaboration to integrate data,
methodologies, perspectives and concepts from multiple disciplines. Mixed methods provided fruitful research settings when, for example, the survey analysis revealed differences between the respondent groups. We were able to discuss these perspectives in detail during the interviews and thus find potential underlying reasons for the differing views. Thus, the results of this study offer a far more fundamental and diverse understanding of this real-world problem than would be possible within one scientific discipline. The study’s emphasis was on attitudes (i.e., wind power acceptability) and the cognitive, emotional and behavioural experiences of people living near wind farm developments. Attitudes are complex mental structures, and the chosen approach demonstrated many ways to find new quantitative and qualitative methodological combinations with which to study them.

This thesis identified emotions regarding wind power developments as a research gap. So far, little has become known about what kinds of emotions wind power evokes and how these emotions are manifested. Firstly, the current study contributes to wind power emotion research methodology by proving that emotions have a strong linguistic foundation (Publication II). Also, in Publication II, IPA proved to be useful in analysing emotions from interview data. Secondly, in relation to landscape changes, Publication IV quantitatively isolated emotional responses to wind turbines. The Internet survey with photo manipulation was able to show the effect of landscape changes without obvious place-related bias. These findings underscore the importance of aesthetic considerations and emotions in the acceptance of wind power.

The third contribution is methodological. In Publication V, diary keeping regarding sound proved to be a successful method of collecting daily data on the audibility of wind turbine sounds. This study managed to record data on experiences with wind turbine sounds for a relatively long period. Diary keeping indoors for two to three weeks was a novel methodology, combining field measurements of sound levels, sound recordings and human perceptions. The diaries also proved to be valuable because they provided discussion topics for interviews and the opportunity to check the validity of recorded sound data.

5.3 Managerial implications

The current thesis has several managerial implications, particularly for people who affect the development of the wind power sector, such as representatives of ministries, parliament, wind electricity production companies and the wind turbine industry. It is necessary for these representatives to understand what the general attitude is – in this case, the acceptability of wind power – and what it means to manage this attitude in relation to wind power development. Because wind power acceptability is a summary evaluation of local developments, acceptability can be seen as an opportunity rather than a barrier. Acceptability is neither stable nor unconditional, and individuals can hold cognitions and emotions that seem contradictory. These complex attitudes suggest that it is reasonable to focus on communication during planning. The current thesis proves that
managerial knowledge is needed during the entire process of wind farm development, from planning to energy production.

The management of wind power construction in its current form does not include a special forum for addressing the emotions associated with the changes caused by wind power development. Such an omission effectively bypasses these emotions. When discussing wind power, cognition and emotions appear to be the opposite sides of the same coin. Wind power implementation should recognize the contexts associated with strong emotions because bypassing emotions can escalate situations into broader and longer environmental conflicts. This is evident because as shown in Publications II and IV, negative experiences with the wind power construction process can help create negative views on landscape changes and wind power in general.

The results of Publication I are of potential use to the managers of rural wind farms. It seems to be essential to recognize that stakeholders have different views and expectations regarding the rural landscape depending on whether they live there permanently or only in their free time. Owners of second homes in close proximity to the proposed site seem to have especially negative attitudes toward landscape changes. Other factors include expected impacts on image, tourism, economy and property values.

If the aim is to increase the acceptability of renewable energies to mitigate climate change, it seems that the participation process should be further developed. According to Publication III, residents perceive successful participation to be something beyond mere information distribution. The current official participation process seems to reach only a minority of residents, while the majority remain rather passive. Special attention should be paid to increasing awareness of and advanced planning for wind energy development while investing in continuous public participation. Publication III reveals that the need for participation does not expire after the wind farm planning process. Project developers should be prepared to continue communication with residents after successful decisions, especially during the various wind farm construction phases.

5.4 Limitations and suggestions for future research

The selected study methodology included challenges associated with recall error in Publications II and III. In both the surveys and interviews, participants were asked to recall events that had occurred several years prior. The results represent a cross-section of two specific timespans: (1) the implementation of the survey and interviews and (2) project development and participation processes that occurred several years prior. This means that data may contain systematic errors regarding the objective recall of project development flow. However, our research question was designed to observe the past experiences of laypersons. This recall bias is difficult to evaluate systematically, but it must be acknowledged.

Perceived participation could be examined separately from project acceptability. In these cases, attitudinal views could actually be influenced by the memory of past judgements

...
made several years before, prior knowledge, external information or newly stored judgements. This means that acceptability may be a confounding variable for the recalled outcomes of perceived participation. Thus, we found it essential to test the regression model using perceived past participation, general attitudes towards wind power and current local wind farm acceptability. Local wind farm acceptability was measured using a simplified model of perceived landscape and well-being impacts. The model is based on previous findings from the past literature about how wind power attitudes are shaped by opportunities to participate during the development process and also non-market externalities, such as well-documented landscape impacts and not-so-well-known impacts on subjective well-being. In addition, there may be different interpretations of the major concepts used in this study, such as participation, landscape, physical health and personal well-being. Hence, it would be important to conduct similar studies with other wind farms and provide respondents with some guidance regarding the meanings of the study variables.

Successful interactions during construction created positive experiences among the interviewees, and this was reflected in their positive views on wind power. Unsuccessful interactions were reflected in negative views on wind power. These experiences and emotions also had impacts on the relationships between people. This effect should be examined more closely through additional research. For now, we should emphasise sympathy, which can help both local people and stakeholders associated with wind power construction understand various perspectives and encourage positive interactions.

The systematisation of the research framework and its analysis has some limitations in this study. One of these is the lack of factors such as social norms, perceived behavioural control and personal norms in the Theory of Reasoned Action framework in Publication IV (Ajzen, 1991; Huijts et al., 2014). The consideration of these factors could help create more detailed knowledge on the relationship between emotions and the acceptance of wind power development. Also, the interview questions about fear and concern were not formulated in the best possible way. A better formulation for the question would be, instead of asking, “What (and how much) frightens or concerns you regarding wind power?”, to ask more generally “Does wind power make you feel any (negative emotion)? Why?” The research approach was based on appraisal theories of emotions, which state that emotions are determined by a complex set of evaluations. However, fear is also an immediate emotion and thus may cause increased perceptions of risk (Loewenstein and Lerner, 2003; Ruiz, 2017, p. 6). It is possible that the selected question in this study caused misinterpretations and that interviewees were not willing to reveal their interpretations of personal fears.

Publication II contains a suggestion for future research. The analysis of emotions should be deepened by transcribing and coding the emotions that were expressed in a non-narrative format during the interviews. These include, for example, changes in emphasis, pauses and sighs when speaking. In analysing these non-narrative emotional expressions, the notes made by the interviewer during the interviews are also important.
Publications II and III justify a deeper examination of emotional processes from different perspectives because people’s experiences are largely based on emotions. If the use of renewable energy sources such as wind power is to be further increased, forums must be created in which people feel that they are heard. At the same time, an atmosphere must be created in which the experiencing and sharing of emotions is possible without stigma. It would be interesting to increase knowledge on the local acceptability of wind power through participatory action research, for example, which would create opportunities for the broader consideration and use of experiences and emotions in wind power planning processes.

In Publication IV, hypothetical wind turbines were created via photo manipulation. Despite careful work with the photographs, it is possible that photographic experiences with wind turbines are a bit different from experiences with turbines in a real-life landscape. Additionally, the ability of respondents to evaluate their own emotions differs among individuals. It is important to conduct a similar study with a different population. Also, in the future, different kinds of landscape types and emotional descriptors (beyond the basic emotions) could be studied to provide additional nuance.
References


References


References


References


Publication I

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Owners of second homes, locals and their attitudes towards future rural wind farm

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Owners of second homes, locals and their attitudes towards future rural wind farm

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HIGHLIGHTS

• Studies acceptability of wind power between local residents and owners of second home.
• Survey data complemented with semi-structured interviews.
• The attitudes differ between locals and owners of second homes in a rural area.
• New information regarding differences in wind energy attitudes between Finnish second home owners and locals.

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ABSTRACT

Wind power has been identified as one of the most promising sources of renewable energy. However, its diffusion has not been as rapid as anticipated. The objective here is to analyse attitudes towards wind power among Finnish local residents and owners of second homes. First, we assess their existing knowledge of and level of interest in energy issues and wind power. Second, we analyse potential differences in attitudes between the two stakeholder groups when it comes to wind power in general and the proposed wind farm in particular. The study draws on both quantitative survey data and qualitative interview data. One of the key findings concerns the different perceptions among locals and owners of second homes in a rural area. Both groups were interested in questions of energy production and accepted wind power in general. Nevertheless, the proposed project in Ruokolahti seemed to polarize attitudes. This paper offers new insights into attitudes to wind energy among Finnish locals and owners of second homes in the same area.

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1. Introduction

Energy efficiency and renewable energy production have become major targets in many countries worldwide (Ladenburg et al., 2013; Rosenberg et al., 2013), and wind power has been identified as one of the most promising sources of renewable energy (Klick and Smith, 2010; Wang and Sun, 2012). Wind power has been strongly emphasized in Finland in recent years, and is supported through investment subsidies, information guidance offered to energy companies and consumers, and the funding of technological research (Holttinen, 2004; Varho and Tapio, 2005). However, in reality the growth has not been “as fast as anticipated or hoped for” (Varho and Tapio, 2005, p. 1931). The literature identifies many factors that explain the lack of adequate investment in wind energy (see e.g., Dimitropoulos and Kontoleon, 2009), including legislative efficacy and potentially mixed signals, and opposition to wind farms (see e.g., Dimitropoulos and Kontoleon, 2009; Smith Stegen and Seel, 2013).

The objective of this paper is to analyse attitudes to wind power among Finnish local residents and owners of second homes. Ownership of free-time residences in Finland is high: at the end of 2012 there were almost half a million of them, and 58 of the 336 municipalities had more free-time residences than permanently occupied dwellings. Free-time residences tend to be located in rural areas on the shore of a lake or by the sea (Official...
Statistics of Finland (OSF), 2012). This makes Finland a unique and interesting context in which to study attitudes towards rural wind power. Although not fully explaining opposition to wind power, many previous studies report “backyard motives” as a significant factor in its social acceptance. Jones and Eiser (2010), for example, studied the gap between general attitudes to wind power and attitudes to the development of wind turbines at identified sites. They found that when the development was “out of sight” it was considered on the general level, but as soon as the turbines became visible, attitudes changed. Visibility and concerns about detrimental effects on the landscape heavily influenced the endorsement of these sites. Ek (2005) has studied the preferences for off-shore wind power and more recently Ladenburg (2008, 2009, 2010) and also Aravena et al. (2014), who, found out that respondents favour (far-off) offshore wind turbines. Meyerhoff et al. (2010) found the minimum distance from wind turbines to residential areas to affect significantly on respondents’ choices. On the other hand, Devine-Wright (2005) found no apparent relationship between living in close proximity to a planning area and attitudes to wind power. Thus, it seems that the effect of distance and visibility on attitudes is not consistent.

It should also be borne in mind that attitudes towards wind power are dynamic in nature: they change in a U-shaped pattern (Wolsink, 2007). People are generally positive about it when there are no real plans to build a wind farm, but attitudes turn negative when projects are announced. However, they may turn positive again once the wind farm has been built (Wolsink, 2007). Fokaides et al. (2014) even found some evidence of a YIMBY (Yes in my backyard) effect in their post-construction analysis, as local residents were more favourable to the erected wind farm than those living further away. In general, situations in which a high level of general support for wind energy turns into objection to a specific project tend to provoke misunderstandings. Planners tend to see this as a gap between consumer preferences and the default acceptance of environmental innovation (Kanzig et al., 2013). Recognition of the dynamic nature of public attitudes and giving people the opportunity to contribute to planning processes with their local viewpoints and knowledge should help to avoid such misunderstandings (Svensson and Stolley, 2010).

In addition, the public should not be treated as an integrated whole in the gauging of attitudes to wind power: they belong to or represent different stakeholder groups such as inhabitants, local authorities, companies, land owners or environmental organizations, and hence could be characterized as disunited (Aitken, 2010; Winterthagen et al., 2007). Socio-demographic variables such as income level, gender and level of education may have an effect (Ladenburg, 2010; van der Horst and Tuke, 2010) or seem negligible (Johansson and Laake, 2007). However, studies comparing different stakeholder groups appear to be rather rare. Table 1 summarizes the existing research on wind power in which two stakeholder groups are compared. These studies comparing different demographic groups have enhanced understanding not only of the different groups and their characteristics but also of their attitudes.

With regard to Finland, there have been numerous surveys to chart Finnish attitudes to energy production (e.g. Kiljunen, 2009) and some previous studies on attitudes to wind power, but they are rather general in nature. One example is the recent work of Koentius and Ollikainen (2013), who investigated public preferences for renewable-energy technologies (wind power, hydro power and energy from crops and wood). They found regional differences, but wind power was still the most popular. Large-scale attitude surveys and polls such as these primarily give a general picture, but, as stated above, on the local level positive attitudes may turn into opposition, often because of environmental impacts such as noise or landscape effects (Krohn and Damborg, 1999). In sum, it seems that, there is a research gap when it comes to studies comparing attitudes to wind power in two or more stakeholder groups. There is also a clear need for local-level research in Finland. Our aim in this paper is to shed more light on this research area by comparing two Finnish dwelling groups, local people and owners of second homes, and their attitudes.
towards a proposed rural wind-farm project in a small municipality located in South East Finland. The next section describes our research design in detail.

3. Materials and methods

We used both survey research and semi-structured interviews to analyse differences and similarities in attitudes to wind power among local residents and owners of second homes. Quantitative analysis made it possible to statistically compare various aspects that influenced attitudes, whereas qualitative methods allowed a deeper understanding of the underlying factors.

3.1. Research context

Many Finns divide their time between two places, with a home in the city and a second home in the countryside. The rural to urban migration has been shown to influence attitudes. Therefore, it is assumed that many people have been influenced by other people’s experiences. A questionnaire was used to study this phenomenon. In June 2011 the municipality decided to start the municipal planning process for wind power in Ruokolahti. The questionnaire was pre-tested three times: a link to the Webropol survey was sent to a varying group of five or ten colleagues, the Ruokolahti municipal manager and the technical manager. Some details were revised following this final phase of the questionnaire development.

In 2006 the environmental authorities did not require Environmental Impact Assessment (EIA) of the Ruokolahti wind-farm project because of the small number of turbines. Instead, the municipal planning process was followed and the survey research was carried out during the consultation procedure. The survey comprised three sections: Section 1 covered the socio-demographic background of the respondents, Section 2 concerned attitudes to wind power in general, and Section 3 questioned attitudes towards the Ruokolahti project plans. The questionnaire was pre-tested three times: a link to the Webropol survey was sent to a varying group of five or ten colleagues, the Ruokolahti municipal manager and the technical manager. Some details were revised following this final phase of the questionnaire development.

The municipal population register was used to obtain mailing information. A total of 241 survey questionnaires with cover letters (one per landowner) were mailed together with a hearing notification concerning the municipal zoning process in June 2012. The survey also freely available at the municipal centre and library. The survey was advertised on the Ruokolahti web pages, the web pages of Lappeenranta University of Technology, and in the local newspaper at the beginning of August 2012. It was open from June 20 to August 10, over seven weeks altogether. Sixty-seven completed questionnaires were returned and 45 responses were received via the Internet survey. Thus, the total number of respondents was 112. Consequently, the response rate from the mailed questionnaires was 27%. The respondents received information about the survey from the letter (61.6%, 69), the local newspaper and/or the Ruokolahti web pages (29.5%, 33), or some other source (8.9%, 10). Twelve respondents were excluded from the analysis because they were not local residents or owners of a second home in Ruokolahti. Table 2 gives the demographics of the valid respondents (n=100).

As Table 2 shows, 35% of the respondents were locals, and 65% owned a second home. This is well in line with the information provided in Fig. 1. The majority of the buildings near the proposed wind farm are second homes, thus, the higher number of owners of second homes among the respondents was to be expected. Of the local respondents, 62.8% (22) were male, 34.3% (12) were female and 2.9% (1) did not give their gender. The respective figures among owners of second homes were 55.4% (36), 43.1% (28) and 1.5% (1). The differences in gender distribution between the two groups are not statistically significant (Pearson chi-square
According to Statistics Finland, 49.7% of residents in Ruokolahti are male. Thus, males are somewhat over-represented in our survey. One possible explanation for this is that the questionnaires were mailed to property owners, the majority of whom are male, thus the gender distribution in the responses may reflect this disparity. Moreover, gender bias is common in surveys concerning energy issues, as well as in survey research in rural areas (Jacobson et al., 2007). However, gender did not appear to affect the results significantly.

The median age group of both locals and owners of second homes was 56–65 years, slightly older than the median age group of residents in Ruokolahti reported by Statistics Finland (45–56 years). Unfortunately, there are no official data available about the age distribution among owners of second homes in Ruokolahti. The differences in age-group distribution between the two groups were not statistically significant (Fisher’s exact test p-value 0.653).

As Table 2 shows, the majority of the respondents owning properties near the proposed wind farm used them as second homes: among the owners of second homes, 81.5% (53) estimated the distance between their property and the proposed wind farm at less than 2 km, 16.9% (11) at over 2 km, and 1.5% (1) did not identify the distance. The respective figures among the local residents were 54.3% (19), 42.9% and 2.9% (1). The differences in distance distribution between locals and owners of second homes were statistically significant at the one-per-cent level (Pearson’s chi-square 6.938, p-value 0.008). As discussed in Section 2, Wolsink (2007), for example, suggests, NIMBYism is too simplistic an explanation of opposition to wind farms. However, given the possibility that distance had an impact on attitudes towards the proposed wind farm, its role is taken into account in the analyses.

Various non-parametric tests were used to identify possible differences between locals and owners of second homes. Cross-tabulation was used to analyze differences in background knowledge, attitudes towards different forms of energy production, and attitudes towards wind power in general and to the construction of the wind farm in Ruokolahti. Pearson’s chi-square test or Fisher’s exact test was used to assess the statistical significance of the observed differences between locals and owners of second homes: Fisher’s exact test was used if the proportion of cells with an expected cell frequency of less than five exceeded 20%. The Mann–Whitney U-test was used to analyze the differences in the potential effects of the proposed wind farm in Ruokolahti. The distance between the property (permanent residence or second home) and the location of the proposed wind farm was controlled, and “I don’t know” responses were filtered out before the analyses.

### 3.3. Interview data

The qualitative research material consists of semi-structured interviews as well as the open-ended responses in the questionnaire. Interviews were held with a total of 14 individuals representing locals (3), owners of second homes (7), corporate interests (2) and municipal politicians and officials (2). The interviewee selection was based on the demographics in the study area on the one hand, and the purpose of the interviews on the other. Because it was clear from the first part of the study that the majority of properties near the proposed wind farm were second homes, whose owners thus comprised the majority of the survey respondents, a higher number of these property owners received an invitation to be interviewed. The purpose of the interviews was to...
open the interpretation of the survey results. Nonetheless, the survey was the main instrument, and the interviews were intended to shed more light on the findings. Representatives of corporate and municipal interests enlarged the study context and helped in identifying the characteristics of the two dwelling groups under scrutiny. The interviews were conducted during the spring and summer of 2013. All the interviewees were asked questions related to the following six themes: (1) attitudes (impact on the landscape and environment); (2) ownership and fairness (property prices, and the use of knowledge); (3) everyday activism (personal actions and experiences of activism); (4) interaction (successfulness of interaction between different stakeholders); (5) knowledge (sufficiency and source of information, the use of knowledge); and (6) tolerance (fears, health effects, personal tolerance of nuisance). Future expectations of wind power were equally discussed.

The interviewees were able to talk about wind power in general and the Ruokolahti project in particular. The interviews lasted an average of one hour each, and they were recorded and transcribed verbatim. The texts were then coded by means of Atlas.ti software version 7.09.2. In creating the codes the researchers read the material and identified the points at which the interviewees talked about the environment and the landscape. Responses concerning the juxtaposition of local people and owners of second homes were also of great interest in terms of shedding light on the factors behind the different attitudes to wind power.

4. Results and discussion

As discussed above, the objective of our study was to compare and analyse attitudes and expectations among owners of second homes and local residents in connection with the proposed wind farm in Ruokolahti. In pursuance of this goal we asked several questions concerning (1) existing knowledge and level of interest when it comes to wind power and energy issues, (2) attitudes towards wind power and other forms of energy production, and (3) attitudes towards the proposed wind farm in Ruokolahti. The results emerging from the survey research and the interview data are analysed and discussed concurrently in the following subsections.

4.1. Existing knowledge and level of interest

Overall, the majority of the respondents reported being very interested in energy issues. As Table 3 shows, in response to the question, “To what extent are you interested in energy issues?” 61.1% of locals living near the proposed wind farm (distance < 2 km) responded “To a great extent”, compared to 38.5% among owners of second homes. Conversely, more owners of second homes (57.7%) than permanent residents (38.9%) responded “To some extent”. Among respondents living further from the proposed wind farm (distance > 2 km) the percentages were almost equal between the groups: 72.7% of owners of those with a second home responded “To a great extent” and 27.3% respondent “To some extent” compared to 66.7% and 33.3% among locals. Thus, the differences between the groups are not statistically significant.

Table 2
Demographics of the respondents (n = 100). Frequencies are in parentheses.

<table>
<thead>
<tr>
<th>Respondent group</th>
<th>Percent of all respondents</th>
<th>Percent of locals</th>
<th>Percent of second home owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>55% (55)</td>
<td>60% (35)</td>
<td>55% (65)</td>
</tr>
<tr>
<td>Second home owner</td>
<td>45% (45)</td>
<td>35% (35)</td>
<td>45% (65)</td>
</tr>
<tr>
<td>Total</td>
<td>100% (100)</td>
<td>100% (100)</td>
<td>100% (100)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>58% (34)</td>
<td>62.9% (22)</td>
<td>55.4% (36)</td>
</tr>
<tr>
<td>Female</td>
<td>42% (40)</td>
<td>37.1% (12)</td>
<td>43.1% (28)</td>
</tr>
<tr>
<td>No gender selected</td>
<td>25% (2)</td>
<td>2.9% (1)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>Total</td>
<td>100% (100)</td>
<td>100% (35)</td>
<td>100% (65)</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 18 years</td>
<td>15 (1)</td>
<td>2.9% (1)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>18–25 years</td>
<td>15 (1)</td>
<td>2.9% (1)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>26–35 years</td>
<td>25 (2)</td>
<td>2.9% (1)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>36–45 years</td>
<td>40 (4)</td>
<td>15.4% (5)</td>
<td>15.4% (10)</td>
</tr>
<tr>
<td>46–55 years</td>
<td>25 (2)</td>
<td>2.9% (1)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>56–65 years</td>
<td>25 (2)</td>
<td>2.9% (1)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>Over 65 years</td>
<td>35 (3)</td>
<td>2.9% (1)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>No age group selected</td>
<td>15 (1)</td>
<td>2.9% (1)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>Total</td>
<td>100% (100)</td>
<td>100% (35)</td>
<td>100% (65)</td>
</tr>
<tr>
<td>Distance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 2 km</td>
<td>72% (72)</td>
<td>54.3% (22)</td>
<td>81.5% (53)</td>
</tr>
<tr>
<td>&gt; 2 km</td>
<td>26% (26)</td>
<td>42.9% (15)</td>
<td>16.9% (11)</td>
</tr>
<tr>
<td>No distance selected</td>
<td>25 (2)</td>
<td>2.9% (1)</td>
<td>1.5% (1)</td>
</tr>
<tr>
<td>Total</td>
<td>100% (100)</td>
<td>100% (35)</td>
<td>100% (65)</td>
</tr>
</tbody>
</table>

* Distance between the property and the proposed wind farm.
translated the citations into English.

Differences between locals and owners of second homes in their existing knowledge and level of interest about energy issues.

<table>
<thead>
<tr>
<th>Level of interest (energy issues in general)</th>
<th>Distancea</th>
<th>Groupb</th>
<th>Not at all n (%)</th>
<th>Very little n (%)</th>
<th>To some extent n (%)</th>
<th>To a great extent n (%)</th>
<th>Pearson chi-squarec,d</th>
<th>df</th>
<th>Fisher's exact test, Table prob.</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent you are interested in energy issues?</td>
<td>&lt; 2 km L</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>7 (18.9%)</td>
<td>11 (31.5%)</td>
<td>0.0376</td>
<td>0.220</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 2 km L</td>
<td>0 (0.0%)</td>
<td>2 (3.8%)</td>
<td>30 (37.57%)</td>
<td>20 (24.4%)</td>
<td>8 (9.76%)</td>
<td>0.1372</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>5 (5.53%)</td>
<td>10 (11.75%)</td>
<td>8 (9.27%)</td>
<td>0.0376</td>
<td>0.220</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Background knowledge about the wind power</th>
<th>Distancea</th>
<th>Groupb</th>
<th>Yes n (%)</th>
<th>No n (%)</th>
<th>Pearson chi-squarec,d</th>
<th>df</th>
<th>Fisher's exact test, Table prob.</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you visited a wind farm or at the vicinity of about 100 m tall wind turbines?</td>
<td>&lt; 2 km L</td>
<td>5 (27.8%)</td>
<td>15 (72.2%)</td>
<td>0.572</td>
<td>1</td>
<td>0.468</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 2 km L</td>
<td>21 (41.3%)</td>
<td>30 (58.7%)</td>
<td>1.264</td>
<td>1</td>
<td>0.283</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>8 (7.3%)</td>
<td>3 (27.3%)</td>
<td>0.572</td>
<td>1</td>
<td>0.468</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you sought for information about wind power actively?</td>
<td>&lt; 2 km L</td>
<td>14 (77.8%)</td>
<td>4 (22.2%)</td>
<td>0.358</td>
<td>1</td>
<td>0.552</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 2 km L</td>
<td>31 (65.56%)</td>
<td>19 (38.54%)</td>
<td>1.577</td>
<td>1</td>
<td>0.209</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>8 (7.29%)</td>
<td>8 (72.7%)</td>
<td>0.358</td>
<td>1</td>
<td>0.552</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you participated in information sessions about the construction of wind power plants in Ruokolahti?</td>
<td>&lt; 2 km L</td>
<td>2 (18%)</td>
<td>15 (82.2%)</td>
<td>3.522</td>
<td>1</td>
<td>0.061</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 2 km L</td>
<td>21 (41.2%)</td>
<td>30 (58.8%)</td>
<td>1.577</td>
<td>1</td>
<td>0.209</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>4 (27.3%)</td>
<td>11 (72.7%)</td>
<td>0.283</td>
<td>1</td>
<td>0.661</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There were no statistically significant differences with regard to seeking information about wind power in general either (see Table 3): a majority of both locals (77.8%) and owners of second homes (82.2%) living less than 2 km from the proposed wind farm have actively sought for information. Among respondents living further from the proposed wind farm, more locals (65.56%) than owners of second homes (27.3%) have sought for information. However, the difference is not statistically significant (Pearson Chi-square p-value 0.061). The interviewees also reflected on the questions about knowledge. As one owner of a second home said:

'Yes, there is enough information available about wind power, facts like how it works and what it is. Certainly, a lot of information is available. This project is a case apart, how it's proceeding.'

Owners of second homes appear to be keener to attend information sessions about the construction of wind-power plants. In total, 39.7% (25 respondents) as opposed to 18.8% (6 respondents) of the locals had been to such meetings. Controlling for distance (see Table 3) emphasizes the difference: only 11.8% of locals living less than 2 km from the proposed wind farm responded 'Yes' to the question, 'Have you attended information sessions about the construction of wind-power plants in Ruokolahti?', as opposed to 40.4% of those with a second home. The difference between the two ownership groups is significant at the 10% significance level (Pearson chi-square p-value 0.061; see Table 3), but vanishes when the distance between the property and the proposed wind farm is over 2 km. All in all, it appears that locals and owners of second homes have quite similar levels of knowledge about wind power in general, although the latter have been more active in seeking information about the local wind farm project.

The interviewees in the two groups gave their views on the state of knowledge in the other group. Some locals criticized the understanding of rural matters among people with a second home, who speak about the wilderness when they mean the growing forest. As one of the locals said in an interview:

'This is not a wilderness, these forests are grown for economic purposes.

Owners of second homes, in turn, were sceptical about the locals’ knowledge of wind power and the possibility of opposing the plans. As one interviewee said:

'It's wrong that these locals get the disadvantages but not the benefits. This is the case in developing countries as well. This is colonialism. Locals are elderly, lonely people. They are not able to defend themselves. Just take our local neighbours: they can't protest as loudly as I can.'

4.2. Attitudes towards different forms of energy production

In order to gauge their attitudes towards the various alternatives, and wind power in particular, we asked the respondents two questions: (1) ‘What is the most favourable form of energy production in the future?’ and (2) ‘What is your attitude towards wind power (as general)?’

As Table 4 shows, solar power was by far the most attractive energy form among the respondents (41.4% of the locals and 31.6% of those owning a second home). The locals put wind power in second place (24.7%), bioenergy in third (20.7%) and hydropower in fourth (10.3%); only 3.4% of them chose the ‘Nuclear power’ or ‘Fossil fuels’ option. The corresponding percentages among the owners of second homes owners were 211 (hydropower), 17.5 (bioenergy), 15.8 (nuclear power or fossil fuels) and 14.0 (wind power). Thus, locals appear to favour wind energy more strongly than owners of second homes whereas the latter prefer hydro- and even nuclear power and fossil fuels to wind power. As regards to favourability of wind power, the difference between...
the locals and the owners of second homes is even larger if the distance is less than 2 km but vanishes when the distance between the property and the proposed wind farm is over 2 km (see Table 4). However, the differences in the attractiveness of energy forms are not statistically significant at the 5% significance level (o2 km: Fisher’s exact test p-value 0.3793; > 2 km: Fisher’s exact test p-value 0.3793).

The interviewees compared nuclear power and wind power, revealing polarized attitudes to nuclear power in their discourse. Some of them regarded wind power as a counter force to nuclear power. As one of the locals said:

I have thought that even if it [the wind farm] was close enough to disrupt my life badly, I would still accept it and prefer it to nuclear power. So, I’m dealing with this mentally.

Many of our interviewees shared the perception that nuclear power was necessary to ensure sufficient energy supply. Those owning second homes in particular considered both sides of argument, which confirms the survey results: they felt it was not unambiguous. As one of them said:

Energy is big business. The climate change in the background promotes renewables. Personally I support nuclear power rather than wind power.

In addition to eliciting comparisons with other forms of energy production, we also asked the respondents about their attitudes towards wind power in particular. As Fig. 2 shows, 88.9% of the locals, and about 66.0% of those owning a second home living in close proximity to the proposed wind farm felt “Positive”; the corresponding percentages at a distance of over 2 km were 66.7 and 90.9 (see Fig. 3). The differences between the two groups were not statistically significant in either case (o2 km: Fisher’s exact test p-value 0.241; > 2 km: Fisher’s exact test p-value 0.457). Thus locals and owners of second homes share positive attitudes when it comes to wind power in general.
4.3. Attitudes towards the proposed wind farm in Ruokolahti

Attitudes towards the proposed wind farm in Ruokolahti seemed to be more polarized than attitudes towards wind power in general. Almost all of the locals (94.4%) living in close proximity to the proposed wind farm were in favour of the project, whereas the owners of second homes were split in their opinions: 57.7% of them (distance < 2 km) responded “Negative” and 38.5% responded “Positive” to the question, “What is your attitude towards the construction of a wind farm in Ruokolahti?” (see Fig. 4). The difference between the two was highly significant in this case (Fisher’s exact test p-value 0.0001). Interestingly enough, this difference completely disappears at a distance of over 2 km (see Fig. 5).

The interview data confirmed the typical positive opinion among locals. One of them said:

“I’m neither a wind-power enthusiast nor an opponent because we need electricity and it (wind power) is a very natural alternative.

The interviewees with second homes, on the other hand, considered wind energy positively but only in principle: they all reacted negatively to the published plans concerning Ruokolahti. The energy perceptions of the latter group may reflect the NIMBY syndrome (Wolsink, 2007): the gap between general support for an energy source and support for a plant in one’s own community. Supporting nuclear power in this case meant that energy production would be geographically far away, not in their own backyard as would be the planned wind turbines. One owner of a second home we interviewed showed an awareness of NIMBY attitudes:

This is the hard core of the whole issue: the Not-In-My-Backyard syndrome. Wind power is OK if it is not generated in my backyard. I confess that this is how I think. Damned good as long as I don’t have to suffer in any way.

Some of them even blamed the EU and its unreasonable targets for wind-energy production. One of them did realize the complexity, however: Wind-energy production is new in Finland and there is a lack of experience and operational models. Despite its sustainable production of energy, wind power has problems, as this interviewee explained:

One is the aesthetics and therefore the conditions in the vicinity. The other is economics, since all energy production needs large investments that are defrayed by taxes. And for the taxpayer wind energy is the most expensive as the energy efficiency is so low. It is an expensive way to produce energy. And another thing is that wind power can never be the only energy source: it depends on the weather conditions.

The respondents were also asked six questions about their expectations concerning the impact of the proposed wind farm on Ruokolahti. As Table 5 indicates, at distances of less than 2 km there were clear differences between the two groups. To be more precise, the owners of second homes living in close proximity to the proposed site were significantly more negative in their expectations than the permanent residents of Ruokolahti. For example, 76.5% of the locals responded “No effect” and 65.2% of those with a second home responded “Negatively” to the question “how will the construction of wind-power plants affect property values in Ruokolahti?”. The corresponding percentages of positive responses concerning the expected economic effect of the wind farm were 66.7% (locals) and 32.5% (owners of second homes).

Local people had some expectations concerning the potential for new business, such as road maintenance. Private landowners could also benefit from tenancies. One of the locals was happy with the idea of obtaining electricity from nearby and was wondering if the price might even go down. Feed-in-tariffs did not concern the locals given that the taxes they pay benefit their own area. One of them also mentioned the possibility of forming partnerships with wind-energy companies.

On the subject of the landscape the differences of opinion between the two groups of respondents were striking. Only 13.3% of the locals living less than 2 km from the proposed wind farm but as many as 70.8% of those with a second home expected the
Ruokolahti landscape to deteriorate if the wind farm was constructed. The two interviewees representing corporate interests contrasted the situation as outsiders:

To some people it [wind power] is an irrelevant issue, a few others protest because the landscape will be ruined. I suppose there are not many people who would be happy to see wind turbines. You either oppose them strongly or you ignore them: very few are actually happy.

The other corporate representative said:

You can't own the landscape... as a starting point, the landscape is changing all the time, because of human influence or without it.

The trend continued with the last three questions: a significantly larger percentage of the locals living near the proposed wind farm expected Ruokolahti and its image to develop positively in tourism. A municipal politician summarized the situation thus:

I feel that people coming from a distance, from a metropolitan area for example, are the most concerned. They own second homes, and don't live here permanently. These people are the loudest critics. They have been very active in this. I'm not sure about the reasons. I suppose they, coming from their busy every-day-life, decided to buy a second home because of the peaceful and wild nature of the area. And now they feel that wind power and turbines conflict with these values.

As with the attitudes towards the proposed wind farm, the differences between the locals and the owners of second homes disappeared at distances of over 2 km. Quite interestingly, it also seems that locals living further away from the area are stronger in their opinions, i.e. they responded more often "strongly agree" or "strongly disagree" compared to locals living in close proximity.

Both the interviewees and the survey respondents described the mental image of Ruokolahti. This image discourse emerged especially when people were evaluating the future consequences of wind-power construction, and the costs and benefits of the proposed Ruokolahti wind farm. The survey respondents mentioned place image, which we define in this paper as people's perceptions and evaluations of Ruokolahti (see also Zimmerbauer, 2008) (Table 6).

The current image profile of the place was positive. A few of those with a second home spent a while in the interview talking about their roots and how they came to own a second home in Ruokolahti. They wanted to explain their relationship with the place. One of them said:

I was born in this village. Hence, mentally we are very strongly residents even though we are owners of a second home. And we stand for this place, always!
According to the survey respondents, the building of wind turbines would damage this good image, or create a totally new one. Local interviewees spoke about the rural-urban confrontation, suggesting that those with second homes envisioned an idyll that locals did not see: a pastoral rural place, where nothing is allowed to change. Wind-power plans offended these perceptions. One of them remarked in the interview:

Owners of second homes want to live in a cocoon. But they also have electricity? They are interested in their own wellbeing. Nowadays people don’t see the big picture. You care about your neighbours as well.

As outsiders, the municipal officer and the politician had similar perceptions of the perspective of those with second homes as the locals. As the municipal officer said in the interview:

The greatest conflict arises from their thinking that Ruokolahti is a place for holidays; a small place that cannot change. It’s the same when trees are felled. My forest has disappeared!

One of the interviewees with a second home described the meaning of free time as “untouched”, meaning that people are in their own natural place and environment. They want to do relaxing things, in their preferred environment and landscape. They may live in built-up areas because of their work or other responsibilities, but would prefer to spend their free time in rural areas. One of them described a personal relationship with Ruokolahti:

Here I’m only seeking a peaceful place in which to spend my free time. Hence, I have no interest in local politics. In my view, Ruokolahti is being short sighted in planning this wind power. There will be no benefits to the community, despite the property taxes over the years, and a lot trouble for owners of second homes.

5. Conclusions

The key objective in this paper was to compare and analyse attitudes and expectations among owners of second homes and local residents concerning the proposed wind farm in Ruokolahti. We also wanted to assess existing levels of knowledge of and interest in issues to do with wind power and energy, as well as attitudes towards wind power and other forms of energy production. The study drew from both survey research and semi-structured interviews.

Our results imply that locals and owners of second homes have quite similar levels of existing knowledge about wind power in general. Solar power was considered by far the most favourable energy form in both stakeholder groups. With regard to wind power, the locals ranked it second, whereas those with a second home considered it the least favourable option. However, when asked about wind power in general, members of both groups expressed positive views. The proposed wind-farm project in Ruokolahti, on the other hand, provoked more polarized responses. It seems that locals tend to fall into the YIMBY category whereas the majority of those with a second home appear to reflect NIMBY attitudes.

Distance from the proposed wind farm seemed to affect the respondents’ attitudes. In sum, those with a second home in close proximity to the proposed site seemed to have more negative expectations of the impact on Ruokolahti (for example on the Ruokolahti image, landscape, tourism, the economy and property values) than the locals. The most striking differences between the two groups concerned perceptions of the landscape: only slightly over 10% of the locals but the vast majority of those with a second home expected the Ruokolahti landscape to be ruined if the wind farm were to be constructed.

Our results are in line with those of Devine-Wright (2005), Jones and Eiser (2010), Ladenburg (2008, 2009, 2010) and Meyerhoff et al. (2010) for example, suggesting that distance affects how stakeholders accept wind-power plans. We also found that stakeholders have different views and expectations of the rural landscape, depending on whether they live there permanently or only in their free time: this is also congruent with Bergmann et al. (2006, 2008). Thus, these findings further support the idea of Aitken (2010) and Wüstenhagen et al. (2007) that people are not an integrated whole. All things considered, the findings reported in this paper have clear theoretical and practical implications. On the theoretical level, the study contributes to the literature on the acceptability of wind power in introducing a new, significant stakeholder group, owners of second homes, who have been neglected in previous research. By way of a methodological implication, the research setting proved to be fruitful in that the survey analysis revealed differences between the groups in question, which we were able to discuss in more detail in the interviews, and to suggest potential underlying reasons for the differing views. The results of this study are of potential use to managers of wind farms needing to recognize early on the factors that affect the wind-energy business in rural areas, and also to policy makers contemplating policy decisions and financial incentives.

As in any research, there are some limitations to be mentioned. First, the interviews were conducted almost one year later than the survey. People could have changed their perceptions somewhat during that period. For example, they may have sought more

<table>
<thead>
<tr>
<th>Image at the moment</th>
<th>Image after wind power building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>Positive image connected to clean and environmentally friendly energy</td>
</tr>
<tr>
<td>Naturally beautiful, peaceful</td>
<td>Better image brings other investments</td>
</tr>
<tr>
<td>Wilderness with prominent areas for birdlife, unique nature</td>
<td>Pioneer at the wind power building</td>
</tr>
<tr>
<td>Excellent possibilities to nature tourism</td>
<td>Turbines at tourist sights, more taxes, cheap electricity, employment during building and caring</td>
</tr>
<tr>
<td>Holders of second home</td>
<td>Benefits marketing and publicity</td>
</tr>
<tr>
<td>Negative</td>
<td>Negative migration</td>
</tr>
<tr>
<td>Negative migration</td>
<td>Ruined landscapes → decreased attractiveness → decreased number of second home owners → women economics → decreased employment</td>
</tr>
<tr>
<td>Negative migration</td>
<td>Accelerates negative migration</td>
</tr>
<tr>
<td>Negative migration</td>
<td>Reduced attractiveness as second home and tourist area</td>
</tr>
<tr>
<td>Negative migration</td>
<td>Falling prices of second home building sites</td>
</tr>
</tbody>
</table>

Table 6

The mental image of Ruokolahti, as people describe in interviews.
information about wind power. As mentioned above, acceptance is time-dependent (Wolsink, 2007), and this particular study represents a snapshot of one time period, having been conducted during the phase when the degree of acceptability was presumably at its lowest. Second, one could also question the generalizability of the results, which are from one country (Finland): the summer-cottage culture, where it exists, may differ from one country to another. Hence, those owning second homes in other countries may have different attitudes. Future research on wind power in particular should therefore take owners of second homes into account. It would also be interesting to repeat this study after a couple of years when the wind farm is in operation, and to find out whether attitudes still followed the recognized U-shape also in this case.

Acknowledgements

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References

Publication II

Korjonen-Kuusipuro, K. and Janhunen, S.
Tunteet osana tuulivoiman sosiaalista hyväksyttävyyttä

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Kristiina Korjonen-Kuusipuro ja Sari Janhunen

Tyyntä ja myrskyä
Tunteet osana tuulivoiman sosiaalista hyväksyttävyyttä

Calm and storm: Emotions as part of social acceptability of wind power

This article discusses the role of emotions in Finnish wind power debates. We draw on four case studies (Kotka, Ruokolahti, Lappeenranta and Merijärvi) and 47 semi-structured interviews. We argue that the role of emotions should be better understood and addressed in wind power projects, and it should be accepted that being human means that emotion and cognition are entwined and act together. However, in the Finnish wind power debate, emotions and cognition are still seen as opposite to each other. In our research, we found that there are plenty of emotional responses attached to different contexts of wind power. Feelings differ according to the state of the wind power project: expectations and experience shape the feelings attached to wind power. Furthermore, we suggest that compassion, in particular, could help to understand the complexity of wind power development projects.

Keywords: emotions, Finland, social acceptance, wind power

Johdanto


Mieliidekyseine antavat pääin vaastaisen kuvan: suomalaiset pitävät tuulivoimaa energiantuotantomuotona, jota toivoisivat lisää. Tämä niin sanottu tuulivoiman yleinen hyväksyttävyys näkyy vuositauksin yhteisöjen puheen suoraan (verkostojärjestelyjen tai liuvattujen tapahtumien auttaman kautta). Vuonna 2013 vastaajista jopa 85 % oli sitä mieltä,
että tuulivoiman käyttöä pitäisi lisätä. Paikallisissa hankkeissa esiin nousee kuitenkin myös vastustus, jota on tutkimuskirjallisuudessa pyritty selittämään laajemmin kuin pelkän Nimby-ilmion kautta (Wolsink 2007; Wüstenhagen ym. 2007), esimerkiksi tiedon tai osallistumismahdollisuuksien puuttumisella (Snow & Lurie 2010).


Figure 1. Social acceptance according to Wüstenhagen et al. (2007). Emotions are part of community acceptance where issues of justice and trust are considered significant.
Wüstenhagenin malli vaikuttaa mekanismitelä ja yksilöottoiselta jaottelulta eikä sen avulla päästä kovin syvälliseen ymmärtämiseen. Malli saattaa jopa aiheuttaa vääriäitsyksiä, mikäli enemmistööhyväksyntä tulkitaan myös paikallisten ihmisten asenteeksi tuulivoimateknologiaan koh-taan. Esimerkiksi Energiateollisuus ry:n seurantaututkimus kertoo korkeasta yhteiskunnallis-politiikasta hyväksyyvästä yleisellä tasolla, mutta hyväksyntävyyden muut puolue tai tuulivoiman vastustus jäävät kuvaamatta.

Artikkelimme syventää paikallista hyväksyntävyyttä ja lisää tietoa tuulivoimaan liittyvistä tunteista, joita on alettu tarkastella vasta aivan viime vuosina (Taukkanko 1). Tuulivoimasta keskusteltessa järki ja tunteet näyttävät usein toisilleen vastakkaisina, vaikka tunteet ovatkin merkittävä osa kokemukseroantaa ja tiedonmuodostusta (Korjonen-Kuusipuro & Parks, tulossa). Tästä syystä tämä aiheutuu pois suurella järjelmä ja tunteen dualismin ja yhteiskuntatieteissä on viime vuosina puhuttu ns. affective turn (et al. 2005). Teoreettisesti tunteiden älykkyyttä ja kontekstuaalisuutta (et al. 2007) tarkastelemassa liittyen tunteiden tarkastelu hyödyttää laajemmaksi myös ympäristökohtelun tutkimusta, sillä tunteet ovat konfliktittaneina merkitävä toiminnan motivaattori ja ne kärjistävät usein tilanteita (Buijs & Lawrence 2013).


**Sosio-kulttuurinen näkökulma tunteisiin**


Tunteilla on biologinen perusta, sillä ne ko-

sanoihin lisätään ”emotion”, tuloksena on nolla ar\(\text{tikkelä.}
\)

\begin{table}[h]
\centering
\caption{Previous studies on emotions attached to wind power.}
\begin{tabular}{l|l|l}
\hline
\textbf{Tutkimus} & \textbf{Tavoite} & \textbf{Tulokset} \\
\hline
\hline
\end{tabular}
\end{table}

\begin{flushright}
\textbf{Tutkimusaineisto ja menetelmät}
\end{flushright}

Artikkelinme perustuu neljällä eri paikkaamalla, Korkkassa (n=17), Ruokolahdella (n=14), Lappeen- rannassa (n=8) ja Merijärvellä (n=8), tehtyihin tuulivoiman sosiaalista hyväksytyyvyyttä käsittelevi- viin haastatteluhiin. Haastatteluvaihin otettiin yhteyt- tä puhelimitse ja vuokrattua lukuun ot- tumatta ihmiset suostuivat mukaan tutkimukseen. Aineisto on esitetty tarkemmin tauluossa 2. Seu- raavassa esitelmämme paikkaamalla, joissa haas- tatteluja tehtiin ja kuvaamme tuulivoimahankkeet hyvästi.


Lappeenrannassa oli vuoden 2013 lopussa lähes 73 000 asukasta, mutta se on toinen tuulivoimalan rakentamisen tapauksessa. Lappeenrannan tuulivoimalaiden rakentaminen on toteutunut.”


<table>
<thead>
<tr>
<th>Paikkakunta</th>
<th>Haastattelujen ajankohta</th>
<th>Ajallinen suhde tuulivoimaan</th>
<th>Naisia</th>
<th>Miehiä</th>
<th>Haasteltuja henkilöitä sidosryhmänä</th>
<th>Haastattelujen keski-ikä (sulussa ikänsä ilmoitaneiden lkm)</th>
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<td>Kotka</td>
<td>Talvi/kevä 2013 Odotukset</td>
<td>5</td>
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<td></td>
<td>17 vakituista asukasta, joista lukuamushenkilöitä 3, joista lukuamushenkilöitä 14, joista lukuamushenkilöitä 7 loma-asukasta</td>
<td>59 (17)</td>
</tr>
<tr>
<td>Ruokolahti</td>
<td>Kevät/kesä 2013 Odotukset</td>
<td>5</td>
<td>9</td>
<td></td>
<td>3 vakituista asukasta, lukuamushenkilöitä 7, yritysten edustajia</td>
<td>58 (13)</td>
</tr>
<tr>
<td>Lappeenranta</td>
<td>Talvi 2015 Kokemus</td>
<td>3</td>
<td>5</td>
<td></td>
<td>8 vakituista asukasta</td>
<td>51 (7)</td>
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<td>Merijärvi</td>
<td>Talvi 2015 Kokemus</td>
<td>4</td>
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<td>8 vakituista asukasta</td>
<td>48 (8)</td>
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</tbody>
</table>
Lappeenrannassa ja Merijärvelle haastattelempi lähellä tuulivoimalaitos asuvia vakuutuisia asukkaita talvella 2015. Tarkoituksena oli selvittää ihmisten kokemuksia tuulivoimalaitosten naapurustossa asumisesta, erityisesti äänen kokemisesta. Haastattelutoimio oli neljä: asukkaiden yleinen kanta tuulivoimaan; tunteet, järki ja toiminta; muutotukseen liittyvät kokemukset ja henkilökohtaiset arvot. Tunteisiin liittyy kysymys: ”Millaisia tunteita tuulivoimararkentaminen on herättänyt?”


Neljän erilaisen tapauksen aineistojen vertailu ja yhdistäminen ei ole ongelmatonta. Suunnitella olevissa ja toteutuneissa hakemisteissa tunteista kysytiin haastateltavissa eri tavoin. Odotuksiin liittyen kysyttiin suoraan pelaista, kokemuksista liittyen tunteista yläpäässään. Tutkimusasettelma ei sillä suorassa päätelystä saatu, miten tunteet ja asenteet muuttuvat tuulivoimahankkeessa.


koettiin ehkä vaikeaksi, sillä tunneksymysten yh- teyteen liittyi edelläkin mainittua nauhartelua, jon- ka tulkinnut häämillään ololki. Haastattelusta ei aina löytynyt tunteilleen sopivaa sanaa, jolloin hän saattoi esimerkiksi käyttää ilmaisua "mitä veljellinen tunte, että". Tässä korostuu se, että tunteet eivät il- mene pelkästään sanallisessa muodossa. 
Tutkimuksessa kuitenkin havaitsemme, että haastattelijat saattettiin kokea tuntemattomaksi, jonka kohtaan meni jännitteitä. Haastattelua oli mo- nelle ensimmäinen ja aiuntukertainen tilanne, jonka vaatimuksesta saattoi olla epätehosteutta, vaikka tutkimuksen tarkoitus ja osallistumisen kaikinpuolinen vapaaehtoisuus oli käyty läpi. Haastattelusta saattoi myös pohtia, kenen puolella haastattelijaa on tai hän saattaa pyrkää täyttämään haastattelijan toiveita.
Sitä tasa niima lääketieteellisessä näkökulmassa on tie- tyistä esim. meluvaikutuksesta, väheksyvästä ajattelusta niin heinän on huomattu tunteita ja se pelottaa. Tässä onkin yksi sanaa niin kuin niin kuin heinän huolestuttaa, se on pelon järkevämpä" (MiesA, 64).
Sitaati kuvastaa mielekäntoissella tavalla tunteen ja rationaalisuuden suhdetta – jotkut tunteet näyt- tävät olevan "järkevämpää" kuin toiset. Tunteita voidaan käyttää tarkoituksellisesti ja niiden avulla voidaan pyrkia vaikuttamaan toisten käsitely- siin tuulivoimasta.


Mieheen liittyy käsittelemän paine olla se suurin pelkiä, että tulevat tekniikat vaikuttavat paikalle ja että se vaikuttaa paikan ympäristöön. Mieheen liittyy myös käsittelemän paine olla se suurin pelkiä, että tulevat tekniikat vaikuttavat paikalle ja että se vaikuttaa paikan ympäristöön. Mieheen liittyy käsittelemän paine olla se suurin pelkiä, että tulevat tekniikat vaikuttavat paikalle ja että se vaikuttaa paikan ympäristöön. Mieheen liittyy käsittelemän paine olla se suurin pelkiä, että tulevat tekniikat vaikuttavat paikalle ja että se vaikuttaa paikan ympäristöön. Mieheen liittyy käsittelemän paine olla se suurin pelkiä, että tulevat tekniikat vaikuttavat paikalle ja että se vaikuttaa paikan ympäristöön.
den lujittajana ja tästä sosiaalista toimintaa toivot-
tiin:
 Sen mikä minua niinkun harmitti että yhteen sellasta
kohteen muuttuminen ei järjestet yllä Hauklapissa missä
ne lähialueen ihmiset on. […] Niin minusta on kiina
että mentää läheisimmäiset ihmiset sittemmatt
ne ihmiset yhtenä ne asio niinkun kaikkien
eniten huolte. Se on tekojen teken vaikutusta. Se pitää ihmisten muttaa
aina olla yhtä suurin
(ArneC, 52)
Aina vuorovaikutustilanteet eivät onnistuneet ja
seuraavassa haastateltana ollut pariskunta kuvaa,
mitä tunteita asukkaiden olivat.
H2: Sitä mä en tiiä koska tuota mulla oli semmonen
käsitys, me ollaan nimittäin oltu pari kertaa niissä tie-
dostilaisuuksissa mitä kunta on järjestänyt. Ne on
erittäin turhaa ja ahdistavia.
H1: No ei nyt ahdistavia, turhaa ja hyvin
organisoituja.
H2: Ja siellä puhutaan ihan vääristä asioista.
H1: Aivan turhaa sanahelinää
(ArneC, 66; MiesC, 70)
Vuorovaikutus näyttäytyy tutkimuksessamme
myös tilanteina, joissa ihmisten tunnereaktiot saat
vallitavat olla hyvinkin voimakkaita. Tulkintamme mu
kaan juuri tähän tulivuominen etenkin olisi hyvä
kiinnittää huomiota. Eräs haastateltava korosti
kuinka ajatus esittelijöiden ylenkatseesta synnyti
hänessä ärsyyntymistä. Samalla hän suorastaan
vaati, että ”toisenlaista asentetta pitää ruota esittele
ään, jos ontaa moinaa. Jos tunnottomaa esitteleä – niin
ei kyllä hyväksy seuraa” (MiesB, 88). Hänen puheestaan
tävä iki miin myös se, että alueellalla tulivoimaa on
yleisesti suhtauduttu myöhemmällä, mutta
värähsilaisen kohteen seurauksena paikallisten
asukkaiden asenne saattaa tulevaisuudessa muutt
uut.
Rakentamisen aikainen onnistuttua vuorovaiku-
tus koettiin myöhemmällä tahtovuotista vahvista-
vana. Näin olikin etenkin silloin, jos vuorovaikutus
edisti henkilökohtaiselle menevien kontaktien rakenn
mista. Haastateltavat kuvasivat huomattavasti tule-
misen tunnetta, joka lujitti luottamusta hankkeen

Se on aina kun tuliaan henkilökohtaisesti niin kuin
menneen se teken vaikutustaen. Se pitää ihmisten mainosta
aina ohttaa toinen huomioon. (MiesB, 49)
Haastateltavien suhtautumisessa omalle yliläille si-
joittuvan hankkeeseen näkyi myös kyläyhteisön
jäsenten välisten suhteiden merkitys: jos tuulivoi-
mala ei sojottu omalle maalle, ei koko asian haluta
puuttua.

Lawlerin ym. (2014) mukaan kollektiiviset tunteet
syntyvät yhteisön sisällä ja etuuksista kokemukse-
ta. Tunteet toimivat yhteisössä liikan tavoin – ne
sitovat ihmisiä laajempiin sosiaalisiin ja kulttuuri-
siin rakenteisiin (Turner and Stets 2005: 1). Var-
sinkin maaseudulla asukkaat totesivat usein, että
heillä on halu ylläpitää sosiaalista suhteita.

Kun siinä on enemmän niitä vastustajia kaun myö-
tälijoista, niin täällä ei oikein sillä lailla anta ”lähimm
erilöö” erilöö. Sitä ei aina tiedä, että ketä sitä tarttee.
(NainenD, 45)
Arjen kokemukset nousivat merkittäviksi niis-
sä hankkeissa, joissa tunteita tarkasteltiin tuuli-
vuorman rakentamisen jälkeen. Wolsink (2007) on
todennut ihmisten asennoittumisen tulivuomaa
kohtaan muuttuvan rakentamishankkeen edetessä.
Tulivoima koetaan yleensä hyväksi tavaksi tuot
uutta energiasta, mutta tämä niin. sylen hyväksyttävyys
kääntyy paikallisesti vastustamiseksi, kun tuulivoi-
matuostantoulleen rakentamissuunnitelma julkaisti
aan. Hyväksynnä on kuitenkin korostettu palau-
tuvan korkeammalle tasolle, mikäli ympäristövai
kutoaineprojektin aikana hallitsemaan. Aikaa vaaditaan yleensä vähenääntä ruoosi (Wolsink
2007). Vastakohtaisia esittelyitä on esitetty: Joh-
sekä Krohn ja Damborg (1999) eivät tutkimuk-
sissaan ole havainneet kokemuksen vaikutavan
asenteisiin. Vaikutusohjeet eivät myöskään ole yks
iselitötiset, vaan ne voivat kiertoutua monisymest
toisinsa.
Tällä tutkimuksessa tuulivoimalaiden naapu-
rissa asumiseen liittyvät tunnekokemukset näkyvät
Lappeenrannan ja Merijärven aikaisissa. Yleisin
tunteita herättävät sekä olivat tuulivoimalaiden
varoitusvalot. Ne aiheuttivat yksityischyrpyyttä
ja jopa järkyttymistä (MiesB, 9). Korjaat toimen
piteet, esimerkiksi häiritseviä, vilkkuvia ja liian
kirkkaiden varoitusvalojen vaihtaminen, lisäisivät
lyhyttäytyystä (esim. NainenC, 73).


Päätelmät

Tarkastelemalla tunteita olemme syventäneet ylei- sesti tuulivoimatarvikkeessa esitettyä mallia tuulivoimaa ja sen aiheuttamia haittoja. Haastattelut ovat valmistuttuaan aiheuttaneet arkeen ja tulevai- suuden suunnitteluun. Tuulivoimaloiden toiminta on härinnyt tietoliikenneyhteyksissä ja haastattelutapaa on huolissaan tilansa kehittämisestä:

Niin kuin ajatteluteknikun, että joi millään tuo nava- tu pantauu robustanttouon niin minä en saa mistään kuvau talla sellaista nettia, että se tuo mulle se rohottaa. Nyt- ken minä muille totes tähän tapaan kaks nettia kokoel- eri firmalain. Toinen toimii aina, silti kun siltiin yhden ylläsuassa niin se saattaa jätti tulevat sileimmistä takia. Sitten kun se menii se jrotvo niin siitä tuli haavaus- vainen sillä sillä. Sitten telkkarikin kun ei toiminut niin kyllä se vaan juoksva olla silti päihin. Sitten kun se pohjeliin päätie aikoin sopii as kun toimit johdokin minne jätää jättää ja saa jättää sinun neljä- kymmenestä viedettä kertoa samaa päätään – niin se kyllä kysyy, että eiksi tästä elämästä voi yksinkertaistaa?

(NainenD, 45)

Lähteet:


Publication III

Janhunen, S., Hujala, M. and Pätäri, S.  
The acceptability of wind farms: the impact of public participation

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The acceptability of wind farms: the impact of public participation
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1. Introduction
The Fifth Assessment Report of the Intergovernmental Panel on Climate Change asserted that the largest contributor to global greenhouse gas emissions is the energy supply sector (Bruckner et al., 2014). The relation between wind power and mitigation of climate change is obvious. Wind power as an alternative energy source can reduce greenhouse gas emissions. Thus, it is no wonder that, during the last few years, the wind has been an increasing source of renewable energy in the European Union (EU). In 2015, wind accounted for 44.2% of all power capacity installations; hence, it is the leading form of all power installations (World Wind Energy Association, 2014).

The concepts of acceptance and acceptability are used when discussing wind power development wherein planning proposals are presented from the top – meaning from companies and authorities – down to people and communities. However, focusing on social acceptance maintains a top-down perspective on the wind power planning process which easily simplifies the expected reactions to wind energy proposals into two categories: objection and support. This obviously means there is a risk of losing sight of other important individual or community responses like uncertainty, resistance or apathy (Batel, Devine-Wright, & Tangeland, 2013).

The general acceptability of wind power is very high, according to many surveys and public polls. For example, the Special Eurobarometer 2014 showed that European citizens would prefer national targets to increase renewable energy consumption by 2030 (European Commission, Directorate-General for Climate Action, 2014). In Finland, 74% of citizens perceive that the use of wind power in electricity production should be increased (Energiateollisuus ry, 2015). However, in addition to general acceptability, wind power projects are also influenced by local acceptability. According to Wolsink (2013), attitude objects that gain general...
acceptability and local acceptability are completely different and evaluated with different attributes. For example, when the attitude object is wind power (in general), one of the most obvious perceived attributes for this object is when wind power is perceived to mitigate climate change. When the attitude object is a particular wind farm, many of the attributes being evaluated are related to personally perceived effects, such as visual impact on the landscape (Wolsink, 2013). Thus, when local project plans are published, different kinds of fears and worries may emerge amongst members of the public. People may be concerned because of perceived local or personal impacts. The concept of a social gap is used in conflict situations where opinion polls show the high general acceptability of wind power but local developments meet resistance (Bell, Gray, & Haggett, 2005; Bell, Gray, Haggett, & Swaffield, 2013). According to Bell et al. (2005), this attitude–behavioural gap has been explained by a demographic deficit if most locals accept the project but minority opposition leads to cancellation or delay of the project. The other explanation is that the proponents are qualified supporters. Nimbyism (the word is derived from the acronym NIMBY [not in my backyard]) is the third reason for a social gap, and here it means support for wind power in general but not when in people’s own backyards (Bell et al., 2005). Bell et al. (2013) later expanded the framework with findings about heterogeneous types of attitudes that influence the social gap. One explanation for the social gap is that it is a consequence of the power of local people: opponents may be in the minority, but they can block the planning process for a wind power project (Bell et al., 2013).

In this paper, we define participation as the contribution by groups or individuals to the decision-making process (see also Jami & Walsh, 2014). The concept of participation is seen as representing a hierarchy of ways in which citizen power might be manifested following Arnstein’s (1969) ubiquitous ladder of public participation (see also Aitken, Haggett, & Rudolph, 2016) where the bottom rungs represent non-participation. The middle rungs mean tokenism where the public is informed and consulted. The upper rungs are called empowerment, indicating power redistribution from power holders to the public (Aitken et al., 2016; Arnstein, 1969; Jami & Walsh, 2014).

The growing body of participatory research in the context of wind power has covered practices related to community engagement (Toke, Breukers, & Wolsink, 2008), planning processes (Cowell, 2010; Wolsink, 2010), information and participation (Jobert, Laborgne, & Mimler, 2007; McLaren Loring, 2007), questions of ownership (Warren & McFadyen, 2010) and fairness (Gross, 2007; Möller, 2010; Van der Horst & Toke, 2010). Many studies have observed the power of communities; for example, members of the public may block or delay developments with their actions (Aitken, 2010; Bell et al., 2013; Eltham, Harrison, & Allen, 2008; Jones & Eiser, 2009; Waldo, 2012). However, the point when passivity turns to activity regarding wind power project differs between people (Waldo, 2012).

This study aims to examine the perceptions of the level of participation in the local wind farm planning process. Additionally, we will analyse the factors affecting the acceptability of the operating wind farm to answer the question: Does perceived participation also predict local wind farm acceptability? The study period occurred about six years after the decision-making when the wind turbines had been in the operational phase about 1.5 years.

The present study uses data from semi-structured interviews (N = 22) as the main method and a survey (N = 291) as an additional method to study the perceptions of participation and their effects on acceptability. During the interviews, we were especially interested in the perceived level of participation of community members in the participation process. The qualitative interview material was analysed using the International Association of Public Participation’s (IAP2) spectrum of public participation, which was developed based on Arnstein’s (1969) ladder of participation. The local acceptability of operating wind farms was measured quantitatively as the perceived impacts of wind turbines on the landscape and well-being.

The remainder of the paper is organized as follows. The next section reviews previous research on public participation during the wind farm planning process and the acceptability of wind power in terms of the landscape and human well-being. Section 3 describes the research design and the context of the study in detail. The results are presented and discussed in Section 4, and Section 5 concludes the paper.
2. Public participation in wind power projects

2.1. The spectrum of public participation

Almost all papers concerning the wind power planning process have recommended a high level of public participation (Coleby, Miller, & Aspinall, 2009; Devine-Wright, 2011; Devlin, 2005; Swofford & Slattery, 2010; Wolsink, 2007; Wright, 2012). Better public engagement can result in better decisions and greater legitimacy and trust, which may then have positive effects on a wind power project’s acceptance. Perceptions of procedural fairness (e.g. being heard, receiving adequate information, being treated with respect and perceiving unbiased decision-making) may affect outcome fairness (e.g. the development of the wind farm) and vice versa (Gross, 2007). In other words, increasing participation and procedural fairness might increase the local acceptability of the outcome or a sense of outcome fairness (Aitken, 2010). Neglecting local interests may turn conditional wind farm supporters into objectors (Wolsink, 2007). Community members desire public participation (Coleby et al., 2009) but also the continuity of involvement for there to be policy responsiveness and accountability (Hindmarsh & Matthews, 2008).

However, despite the many reported advantages of public participation, there may be disadvantages. Participation processes are time-consuming and hence expensive. If the process is conducted negligently, the result could be a loss of credibility or low-quality decisions that contribute to increased costs during the implementation phase (Jami & Walsh, 2014). Also, participation as a negative experience may influence attitudes about wind power or future participation negatively (Jami & Walsh, 2014). It also seems that non-participation is a risk for future wind energy developments. If residents perceive opportunities to express their opinions during the participation process and the developer responds to their requests, then the acceptability rate is likely to be high. Negative perceptions of those two points of participation result in a decrease in acceptability and an increased likelihood of a negative attitude towards the new project (Motosu & Maruyama, 2016). Despite the attempt to adopt the current best practices, a conflict may develop in the community (Colvin, Witt, & Lacey, 2016). The drivers of the conflict are diverse, such as unsuccessful early-stage engagement, the lack of a neutral facilitator, or absence of space for local opposition in the formal process. In addition, a vote of support for a wind farm proposal may polarize the community (Colvin et al., 2016). An unsuccessful participation process causes long-lasting harm and prevents the wind power operator from achieving a social licence to operate (Langbroek & Vanclay, 2012). While diverse interests should be taken seriously, it takes time and energy to consider them, giving rise to the possibility of political conflicts. Participants’ limited capacities to fulfil the requirements for participation process may cause problems (Alberts, 2007; MacArthur, 2015). This leads to the conclusion that meaningful discourse can reasonably occur only among technical experts and there is no value in building consensus amongst all stakeholders (Alberts, 2007).

One of the most commonly used typologies to examine or further develop the process of community participation is Arnstein’s (1969) ladder of participation (Hurlbert & Gupta, 2015; Shier, 2001; Tritter & McCalum, 2006). Arnstein arranged her model in a ladder pattern where each rung represents progressive levels of citizen participation. Based on Arnstein’s ladder of participation, the IAP2 developed a spectrum which demonstrates the hierarchical process in which social power is redistributed from project developers to the public (see Figure 1). Next, the results from studies concerning public participation in wind power are discussed following the IAP2 spectrum of public participation.

2.2. Lower rungs, tokenism

Informing citizens about their rights, responsibilities and options is the most important step towards conducting participation legitimately (Arnstein, 1969). In the context of wind power, researchers have highlighted the role of knowledge as an important factor for improving social acceptability: information, dialogue and the opportunity to participate are essential (Krohn & Damborg, 1999; Swofford & Slattery, 2010). Increasing the environmental literacy of a population near wind turbines influences supportive and opposing attitudes towards planned or constructed wind farms (Swofford & Slattery, 2010). Researchers have highlighted the
need for educational programmes near areas of planned projects (Dimitropoulos & Kontoleon, 2009; Wolsink, 2000). The aim of these programmes is to inform residents about a planned or proposed project and about renewable technologies, climate change and energy policy (Swofford & Slattery, 2010). As Swofford and Slattery (2010, p. 2517) put it:

Without it [education], the full advantages and disadvantages of a renewable technology (in this case wind energy) are not communicated entirely. Wind energy must be shown to be more than a financial investment; it is at the forefront of environmentally benign sources of electricity production and a new form of carbon mitigation.

A successful consultation process includes a promise by the company to abide by all laws, the use of multiple information sessions, and the use of public meetings and online forums for feedback collection (Corscadden, Wile, & Yiridoe, 2012). A high level of consultation and early communication with communities will secure the possibility of social acceptability and reduce conflicts (Corscadden et al., 2012). It should also be borne in mind that the complex nature of participatory engagement starts from the renewable energy policy-making level where practices have been closed and historically dominated by industrial interests (Agterbosch, Meertens, & Vermeulen, 2009; MacArthur, 2015). However, this level of participation is a passive approach that has been criticized as inadequate (Colvin et al., 2016). Just being informed gives citizens no guarantee they will be included in decisions (Colvin et al., 2016; Hindmarsh, 2010).

2.3. Higher rungs, empowerment

In Arnstein’s ladder of participation, the assumption is that higher rungs should be preferred over lower rungs. At the highest level, the public is empowered to make choices. In decision-making, collaborative approaches with the public are more effective in developing public acceptability towards wind power projects than top-down approaches (Agterbosch et al., 2009; Jami & Walsh, 2014; Wolsink, 2007). For procedural justice, it is essential that the local stakeholder’s voice is heard and information is disseminated in a network.

Aitken et al. (2016) suggested that community engagement should involve multiple methods: raising awareness amongst community members, consulting them and empowering them. These methods should be complementary rather than alternatives to one another. Empowerment should ensure that consultation responses are
meaningful and add value for participants and the community (Aitken et al., 2016). The question regarding large-sized wind power projects is the form of a realistic outcome. For private developers or officials, the delegated power is presumably not really an opportunity (Bidwell, 2016). Instead, smaller community-led wind power projects would meet these criteria for more active power redistribution. The approaches of community empowerment are still few and different in each case. Empowerment may include variation in project outcomes and dependency relations. It seems that empowerment is easier for those individuals who have better material (income) and knowledge (education) resources (Schreuer, 2016; Slee, 2015).

3. Materials and methods

The empirical study was carried out in Finland near two onshore wind farms located close to residential areas during the winter and spring of 2014–2015. The wind farms were Tuulimuukko in Lappeenranta and Ristiveto in Merijärvi. Both wind farms became operational in mid-2013. The Tuulimuukko wind farm has seven 3 MW turbines, and the Merijärvi wind farm has six 2.3 MW wind turbines. Thus, the size of the installations was quite small in relation to many commercial wind energy facilities.

In Finland, the law ensures that the public has the opportunity to participate in environmental decision-making (Kuusiniemi, Ekroos, Kumpula, & Vihervuori, 2013). The Constitution of Finland guarantees the public rights to participate and appeal during decision-making processes involving their environment. Public participation is also an essential requirement for planning processes which include an environmental impact assessment (EIA). For example, wind farms with at least 10 wind turbines or 30 MW mandate an EIA. In practice, wind farm siting includes the official hearing process involving the display of planning documents for public inspection, public comment periods and public meetings to ensure informed, legitimate decision-making. The official public hearing process was held in Lappeenranta in 2009 and in Merijärvi in 2008.

Data were collected via semi-structured interviews and a large survey that were both part of the larger wind power study. Next, both the data collection methods are presented.

3.1. Interview data

The aim of the interviews was to explore the residents’ perceptions of participation in the local wind farm planning process. The interviewees were selected because they permanently lived close to the wind turbines and could make observations about the turbines (their average distance to the nearest wind turbine was 1400 m). Almost all the contacted persons were willing to participate in the study, and the final number of interviewed persons was 22. The interviewees were regular residents in the local community. Principally, they did not have any other specific role in relation to the local wind power development process except for one interviewee, who was a landowner and hence had some monetary benefit from the wind power company through tenancy. Four of the interviewees were retired, and the others were of working age (the age ranged from 22 to 67 years old). Fourteen of the interviewees were from Merijärvi and eight from Lappeenranta. The interviews were semi-structured, meaning that certain themes and questions were included but the interviewees could share their experiences and views freely inside the given frame. The interview questions included topics like opportunities to participate in the wind farm planning process, general attitudes towards wind power, intentions to support or oppose wind power developments and perceived changes in their perceptions of wind power after the local wind farm construction. Interviews were held during the spring and winter of 2015 in the respondents’ homes, except for one interview which was held by phone. The interviews lasted an average of 45 min. The interviews were recorded and transcribed verbatim.

The interviews were coded with Atlas.ti software, version 7.5.13. Data were categorized in terms of the International Association of Public Participation’s ‘IAP2 spectrum of public participation’ regarding tokenism and empowerment. The coding process included reading and interpretation, resulting in categorizing the findings. During the analysis, the interviewees’ descriptions about information distributions, consultations, attempts to hear residents’ concerns and meetings were categorized as tokenism. The interview data were coded as empowerment when interviewees described negotiations between residents and power holders (project developers or
authorities), sharing decision-making responsibilities or dominant decision-making authority and control. During the classification, the limitations of the typology were considered. It was noted that individual perceptions could be placed in more than one location in the spectrum of citizen participation. For example, one of the participation methods was meeting with project developers and environmental officials, which is consulting with a degree of tokenism, but the interviewees also described it as an expression of residents’ power. However, power redistribution is of the essence when moving from tokenism to empowerment, and this example would be coded as tokenism.

3.2. Survey data

The survey questionnaire was loosely based on Pawlaczyk-Łuszczyska, Zaborowski, Zamojska-Daniszewska, and Waszowska’s (2014) study, with additional questions concerning participation during the wind farm planning process. The aim of the survey was to study the perceived opportunities for participation in the local wind farm planning process to further analyse the factors affecting the acceptability of the operating wind farm. So far, few studies (e.g. Firestone, Kempton, Lilley, & Samoteskul, 2012; Johansson & Laike, 2007) have examined the relationship between perceived past participation and local project acceptability during the operation phase.

Wind power acceptability was examined through two measures: the impact of the wind farm on the landscape and on well-being (see Table 1). The perceived impacts on the landscape and human well-being guide evaluative judgements of wind power and hence shape acceptability (Huijts, Molin, & Steg, 2012). The landscape effects of wind power are often reported to be the most significant factor for perceptions of wind power implementation (Krohn & Damborg, 1999; Toke et al., 2008; Warren, Lumsden, O’Dowd, & Birnie, 2005; Wolsink, 2007). More precisely, the landscape impacts of wind power or scenic questions regarding wind power are found to be important for the formation of both general and local wind power acceptability (Bell et al., 2005; Kontogianni, Tourkolias, Skourtos, & Damigos, 2014).

When it comes to well-being, wind turbines represent a change in the environment related to perceived health effects and may cause annoyance for some residents. Furthermore, annoyance has associations to visual cues and attitudes (Knopper & Ollson, 2011). Botterill and Cockfield (2016) recently found that health impacts, rather than changes in the landscape, are the focus of the Australian wind power debate. Hence, it seems that the impacts of wind power on well-being are part of the complicated attitudinal structures regarding wind farms.

We used the Ordinary Least Squares regression (OLS) model to explore the predictors of local wind farm acceptability. The predictors were those which were found to be significant within the previous literature. We included site-specific variables, like perceived participation in the planning process and the study area as predictors (Coleby et al., 2009; Motosu & Maruyama, 2016). Also included were demographics like age, gender and education, together with the distance between respondents’ homes and the nearest wind turbine and general attitude towards wind power (Johansson & Laike, 2007; Swofford & Slattery, 2010). In one of the earliest studies of wind farm acceptability, Thayer and Freeman’s study (1987) found females, older and less educated respondents had more positive attitudes towards the studied wind farm. Also, people living closer to a wind turbine and those more familiar with the area were less positive than people living farther away (Swofford & Slattery, 2010; Thayer & Freeman, 1987). The ‘proximity hypothesis’ of wind farm attitudes supposes that the closer the resident is to the wind farm, the greater the opposition or negative attitude towards the wind farm (Swofford & Slattery, 2010, p. 2510). However, some results have revealed signs of a reverse proximity hypothesis, where those people living near the wind farm show the highest acceptability (Warren et al., 2005). The literature has also indicated that general attitudes towards wind power have a substantial positive influence on project-specific attitudes (Bidwell, 2016; Johansson & Laike, 2007; Jones & Eiser, 2009; Wolsink, 2000).

The population register was used to obtain postal information on the targeted sample: all residents aged over 18 in Merijärvi (N = 812) and approximately the same number of residents (N = 810) aged over 18 living in postcode areas near the Lappeenranta wind turbines. Survey questionnaires with cover letters were posted to
Table 1. Key variables used in the analysis.

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Description</th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local acceptability of WP Landscape</td>
<td>Perceived landscape effects How has wind power affected the landscape in your living area? Scale from 1 = very negatively to 5 = very positively, 3 = not any effect</td>
<td>2.88</td>
<td>3.00</td>
<td>0.877</td>
<td>1</td>
<td>5</td>
<td>279</td>
</tr>
<tr>
<td>Well-being</td>
<td>Perceived effects on own well-being. Mean value of two questions: How has wind power affected your own physical health in your residential area? and How has wind power affected your own well-being in your residential area? Scale from 1 = very negatively to 5 = very positively, 3 = not any effect</td>
<td>2.94</td>
<td>3.00</td>
<td>0.522</td>
<td>1</td>
<td>5</td>
<td>255</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived participation</th>
<th>Control</th>
<th>Agerables</th>
<th>General attitudes towards WP</th>
<th>Distance between home and the nearest WT</th>
<th>Gender</th>
<th>WF</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you have opportunities to participate in the planning process for the wind farm? No = 0 or yes = 1</td>
<td>Non-participating</td>
<td>Mean</td>
<td>81.8% (238)</td>
<td>60</td>
<td>2027.3</td>
<td>Male</td>
<td>Lappeenranta</td>
</tr>
<tr>
<td>Age in years</td>
<td>Man</td>
<td>60</td>
<td>2081.0</td>
<td>552.5</td>
<td>720</td>
<td>2986</td>
<td>291</td>
</tr>
<tr>
<td>'What is your attitude towards wind power in general?' Scale from 1 = very negative to 5 = very positive</td>
<td>Participating</td>
<td>Mean</td>
<td>7.6% (22)</td>
<td>60</td>
<td>3.82</td>
<td>Female</td>
<td>Lappeenranta</td>
</tr>
<tr>
<td>Measured by EUREF ETRS-TM35FIN coordinates</td>
<td>Median</td>
<td>14.3</td>
<td>4.00</td>
<td>0.949</td>
<td>18</td>
<td>87</td>
<td>291</td>
</tr>
<tr>
<td>'What is your attitude towards wind power in general?' Scale from 1 = very negative to 5 = very positive</td>
<td>Not answered</td>
<td>Mean</td>
<td>10.7% (31)</td>
<td>60</td>
<td>2027.3</td>
<td>Lappeenranta</td>
<td>Merijärvi</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>14.3</td>
<td>4.00</td>
<td>0.949</td>
<td>18</td>
<td>87</td>
<td>291</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Mean</td>
<td>100% (291)</td>
<td>60</td>
<td>2027.3</td>
<td>Lappeenranta</td>
<td>Merijärvi</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>14.3</td>
<td>4.00</td>
<td>0.949</td>
<td>18</td>
<td>87</td>
<td>291</td>
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<tr>
<td></td>
<td>Max</td>
<td>87</td>
<td>291</td>
<td>87</td>
<td>291</td>
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<td>291</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>291</td>
<td>291</td>
<td>291</td>
<td>291</td>
<td>291</td>
<td>291</td>
</tr>
</tbody>
</table>

Note: WP = wind power, WF = wind farm, WT = wind turbine.
the residents for the first time during December 2014 and for a second time in January 2015. The total number of responses was 582. Thus, the response rate achieved was 35.5% (see Table 1).

The length of residence was controlled with the following question: ‘How long have you lived in this residential area?’ In the following, only the answers from residents who had lived in the area for more than seven years (the participation processes had been implemented about seven years before the survey was conducted) are used for the analyses.

Because of the differences in the sampling processes between the study areas, we analysed the perceptions of residents living near wind turbines (≤ 3 km). This supports our aim to study the authentic experience of participation as, in practice, hearing processes reach residents living near the planned wind farm. The number of valid respondents was 291. The selection of this subset leads to a different distribution of cases, since the final data includes 250 cases from Lappeenranta and 41 cases from Merijärvi. The reason for the difference is that the population density is much higher in Lappeenranta than in Merijärvi.

Comparing the characteristics of survey respondents to the corresponding populations shows how the survey respondents in Lappeenranta corresponded quite well with the whole population. However, in Merijärvi, men outnumbered women, and the education level was a bit lower compared to the corresponding population. The mean age of survey respondents was 60 years old, which is almost 20 years more than the mean age of corresponding populations. The demographics of the respondents and characteristics of the corresponding populations are presented in Appendix 1.

The method of studying past events has been successfully used in wind power research (e.g. Walker & Baxter, 2017; Warren & McFadyen, 2010), but this study includes risks of associated recall error. Both for the survey and for the interviews, participants were asked to recall events that had occurred several years before. This means that the data are likely to contain some error due to recall error. In addition, although the response rate (35.5%) is acceptable, two-thirds of potential respondents chose not to participate in the study. Thus, the data may also contain some error due to non-response bias.

4. Results

The results emerging from the interview data and the survey research are analysed and discussed in the following subsections.

4.1. Interviews

The interviewees answered two general questions (What is your general attitude towards wind power? In general, would you support or oppose wind power development?) and two questions related to the local wind farm (Did you have an opportunity to participate in the wind power planning process, e.g. during the hearing process? Have your own attitudes changed after the wind farm was constructed in your area?).

For the interviewed residents, it was obvious that wind power information was available. However, it seems that interviewed persons were not that interested in seeking information. During the planning process, the project developer and authorities provided information to the residents via e.g. websites and local newspapers. However, the distribution of information did not seem to have been a very effective method of raising community awareness as the interviewed residents did not remember this first stage of tokenism well. As an interviewed couple stated:

I don’t even remember. I was working when they [wind turbines] were planned. You (indicating Interview 3, person 2) checked the post. (Interview 3, person 1) I suppose some [information] came. I don’t remember at all. (Interview 3, person 2)

Another resident stated:

I suppose there was some kind of announcement on the municipal noticeboard, which is on the wall of the municipal office. You don’t necessarily visit there. [...] We heard just a rumour: ‘Hey, by the way, there are wind turbines coming somewhere.’ (Interview 7, person 1)
The interview data indicated that the official consultation sessions did not contribute much to the participation process. Conversely, the interviewed residents stated how they had been quite passive and had not participated in consultation meetings:

Yes, there were events, but we did not participate or our opinion was not asked. However, you could have participated. It was a public event. We did not consider it necessary because we do not own land, and hence, it does not affect us. (Interview 10, person 2)

Thus, quite interestingly, it seems that non-participation was a conscious choice. However, those who had participated felt that residents’ opinions had not been considered. Two examples of the unsuccessful interaction between the residents and the project developers follow:

Interviewee: Well, those presenters that visited [the public information session] gave themselves an image of being kings and knowing everything, and then the next [presenters] told a different story and didn’t take a stand on [residents’ opinions]. They considered us unimportant. […] Yes, there were two or three public hearings […] That’s the point where the negativeness comes in; they don’t tell the truth. (Interview 2)

Interviewer: Did you feel that you had an opportunity to participate in planning during the hearing anyway?

Interviewee: No, there was nothing like that. (Interview 2)

Hence, it seems that the opportunity for participation does not necessarily mean that people’s concerns and interests are taken into account. The second stage of tokenism (consultation) seems to have had two problems: it was developer-controlled and unable to provide two-way communication. Also, the impact of the consultation suffered from the lack of interest by residents, although the meetings were public and participation had not been limited. One reason for inactivity may have been the small size and number of wind turbines (total capacity of 21 MW and 13.8 MW), leading to less concern about visual impacts, impacts on personal well-being, concerns about or motivation to engage in participation, etc. For example, one interviewee described his indifference to the project:

Well, perhaps I’m that lazy and I do not actually care. I would just say that when they started planning and formed contacts and … so then there were my own evaluations, including the fact that they [wind turbines] don’t cause terrible harm. (Interview 1)

Instead of passiveness, some residents discussed personal contact rather than institutional procedures. Personal contact was an easy way for them to engage and get information. For some of the interviewed residents, personal contact on behalf of the project developers was highly valued:

It was just after the energy production began that [they] came and asked about our impressions; […] they asked how it appeared to us and if there is now anything [on the agenda] and if something interests us. (Interview 4, person 1)

Always, when you come personally, it makes an impression. You should always remember to take other people into account. (Interview 4, person 2)

Then whatever we wanted to ask, he gave us the information. For instance, I wanted to know how long this [wind turbine] was going to flicker. He answered immediately that, according to the data, it will be 18 minutes per year. They were well prepared. (Interview 4, person 1)

Some residents became activated, gathered information and asked community members to meetings to discuss the issue. This happened near the Merijärvi wind farm after the official planning process and the final decision made by public officials:

We had a meeting just because people were somewhat pessimistic towards the noise and visual impacts … . (Interview 7, person 1)

In that phase, all the permissions for construction of the wind farm were ready. (Interview 7, person 2)

The aim was to get some compensation for using the village for wind energy production. As a result, these community members managed to consult with the company and get some money for the development of the village.
The money is paid yearly to the community association, and the company wants a plan for the use of the money.

We were very satisfied with the amount of money of course [...] but we have been laughing that we were bought. 'Shut up! You get three thousand euros and shut your face!' (Interview 7, person 1)

An interesting issue in these cases was a late increase in awareness about the impacts of wind turbines. Some residents felt the installation process had been very tough and had caused much harm because of practical difficulties, such as closed roads during working days or interference with television reception:

And besides, during the installation, if you live along the same road, you need an even temper. They stretch your tolerance to the limit. Meaning that the neighbours would need helicopters during that time. You have no road, no life of your own, and unfortunately it takes a long time. [...] And one simple act to reduce these frictions would be to name a person in charge who could be contacted. And then to inform us about details like when the road will be closed. After blasting, it was totally closed. [...] No information was given about the closed road. (Interview 8)

Thus, it seems that the communication between residents and the developer was insufficient. Some of the residents contacted the project developers to take care of their everyday issues, such as being able to use the road when necessary. One of the interviewed residents described how they managed:

Finally, through the struggle, [the things were resolved]. Nothing was done as a favour or by asking. Then I just called a bigger boss. (Interview 7, person 1)

After the wind turbine had been installed, the residents felt annoyed by some issues, such as the visual and acoustic impacts. One resident stated:

And obviously, this view [of the turbines] strengthens the impacts. There they are, under our eyes and that rotation and sound – that is the irritation (Interview 15, person 1)

Another resident stated:

Yes, and probably you connect to that [visual effect] because your eye takes that high-speed rotation to indicate sound, even though you really don’t hear it. (Interview 15, person 2)

To sum up, it is not realistic to expect a fully public decision-making process for a wind power development when the project owners are private companies (see also Bidwell, 2016). The results of this study indicate only limited participation in the lower degrees of the IAP2 spectrum which are closer to tokenism than empowerment. In addition, it seems that the residents were aware of participation opportunities, but many of them chose not to participate. Additionally, those who participated did not feel the participation process was satisfactory. If activation after decision-making is seen as participation, our results reveal the continuous characteristics of participation in local projects, indicating that local participation does not always end with the siting decision and may continue as two-way communication between the residents and the wind power company during operation of a wind farm.

4.2 The survey

Table 1 summarizes the descriptive statistics of the dependent and independent variables, and Appendix 2 presents their distributions. Firstly, we asked the survey respondents whether they thought they had had opportunities to participate in the planning process for the wind farm. As Table 1 shows, most respondents living near wind turbines did not perceive that they had opportunities for participation in the planning processes. In fact, 82% of the respondents perceived no opportunities, and only around 8% perceived opportunities for participation.

The percentage of perceived non-participation is surprisingly high when considering that these respondents lived quite near the proposed site. However, one must bear in mind that the survey considers non-participation resulting from lack of opportunities to participate, whereas the interviews showed that residents were aware of participation opportunities but non-participation was rather a choice (see also section 4.1). Thus, it may be that
the high percentage of those who did not perceive that they had opportunities for participation arose from the survey wording or recall error.

Local acceptability in this context is measured as the perceived impact of wind turbines on the landscape and well-being. As shown in Table 1 and Appendix 2, the measures of acceptability are strongly centred on the middle of the scale, indicating that residents do not perceive strong effects on the landscape (mean: 2.88) or well-being (mean: 2.94). Especially, the vast majority of the respondents perceived the impact of local wind farms on personal well-being as neutral (not positive or negative). It is also possible that they were uncertain about impacts on personal well-being. The lack of variation in the well-being variable may result in lack of explanatory power of the OLS regression analysis. The general attitude towards wind power was quite positive (mean: 3.82).

We used OLS regression to analyse the impact of perceived participation on current local wind farm acceptability, measured by perceived landscape and well-being. The results of the regression analysis are shown in Table 2. As shown, the perceived participation or study area had no significant effect on the perceived landscape impacts. From controlled demographics (age, gender and education), only the coefficient of age was statistically significant ($p = .018$) and positive, showing that older people had more positive attitudes towards the local wind farms in terms of landscape impacts. The highest value of the standardized coefficients was that of the general attitude towards wind power (0.525, $p < .001$), indicating that it was the single most significant predictor of local wind farm acceptability measured as perceived impacts on the landscape. This model explained 35.7% of the variance in landscape impacts.

Concerning well-being, the model explained 32.6% of the variance. Perceived participation had a statistically significant impact on well-being ($-0.250$, $p < .001$). Surprisingly, the estimated coefficient is negative, indicating that people who felt they had been able to participate in the planning process perceived the impact on well-being more negatively. This result could be better understood if we analyse the responses about how the residents felt after their participation. Right after the question related to opportunities for participation, we asked whether their opinions were considered in the planning process. Of the respondents, 42.9% felt that their opinion was not taken into account, almost the same percentage (38.1%) were not able to say, and 19% felt that their opinion had been taken into account in the planning. Thus, the negative coefficient of people’s perceived participation may result from the feeling that their opinions or worries were ignored.

It seems that the general attitude towards wind power was the single most significant predictor for well-being as a measure of local wind farm acceptability as the estimated standardized coefficient was 0.465 ($p < .001$).

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Landscape</th>
<th></th>
<th></th>
<th>Well-being</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.726</td>
<td>1.737</td>
<td>1.576</td>
<td>5.792**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predictors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived participation</td>
<td>-0.289</td>
<td>-0.092</td>
<td>-1.625</td>
<td>-0.469</td>
<td>-0.250</td>
<td>-4.189***</td>
</tr>
<tr>
<td>Study area: Merijärvi</td>
<td>-0.181</td>
<td>-0.071</td>
<td>-1.197</td>
<td>0.043</td>
<td>0.028</td>
<td>0.452</td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.009</td>
<td>0.140</td>
<td>2.375*</td>
<td>0.005</td>
<td>0.132</td>
<td>2.150*</td>
</tr>
<tr>
<td>Male</td>
<td>-0.153</td>
<td>-0.086</td>
<td>-1.604</td>
<td>0.036</td>
<td>0.033</td>
<td>0.576</td>
</tr>
<tr>
<td>Education</td>
<td>-0.065</td>
<td>-0.081</td>
<td>-1.410</td>
<td>-0.036</td>
<td>-0.072</td>
<td>-1.204</td>
</tr>
<tr>
<td>Other predictors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance between home and nearest WT*</td>
<td>2.22E-5</td>
<td>0.014</td>
<td>0.254</td>
<td>7.676E-5</td>
<td>0.078</td>
<td>1.348</td>
</tr>
<tr>
<td>General attitude towards WPb</td>
<td>0.492</td>
<td>0.525</td>
<td>9.290***</td>
<td>0.267</td>
<td>0.465</td>
<td>7.722***</td>
</tr>
<tr>
<td>F (df)</td>
<td>19.717 (7;236)**</td>
<td></td>
<td></td>
<td>16.209 (7;220)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.376</td>
<td>0.348</td>
<td></td>
<td>0.357</td>
<td>0.326</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001.

*WT = wind turbine.

*WP = wind power.
study area had no impact on acceptability, but the respondents’ age was positive and statistically significant \((p = .033)\). The older people had more positive attitudes towards the local wind farms in terms of well-being as well. However, the distance between respondents’ homes and the nearest wind turbine did not predict acceptability in terms of well-being. One explanation may be that the mean distance from survey respondents to the nearest wind turbine was as much as 2027 m. By contrast, the interviewed residents lived much closer to wind turbines (mean distance: 1400 m), and they perceived the distance between wind turbines and residential areas as critical:

And surely, when these [wind turbines] were installed here, they [the project developers] had sessions and you cannot say that we were not informed. But you just felt that it is just nice to have them [wind turbines]. But they [the wind turbines] should not have been this close. (Interview 12)

I have generally got quite a positive attitude towards the installation of wind turbines. You should just keep the distance to residential areas long enough, and the placing should be planned rigorously. (Interview 22, person 1)

… not closer than one and half kilometres to the closest windmill [from someone’s home]. The one [wind turbine] that we have there that is one kilometre and 410 metres [away] is just … (Interview 3, person 1)

They are possibly too close to residential areas. They should be farther away. Then the disturbance would be less. I think that at least two – or as we have this two and half kilometres – up to three kilometres [is the distance required between wind turbines and residential areas]: not less than two kilometres distance to residential areas (Interview 10, person 2)

Thus, it may be that the distance plays an important role in acceptability only for those who live in relatively close proximity to wind turbines.

5. Discussion

The key objective of this paper was to examine perceptions of the level of participation in the local wind farm planning process. As an additional analysis, factors affecting the acceptability of the operating wind farm were analysed. The study was conducted in two Finnish study areas for residents who lived within the vicinity of the operating wind turbines during both the study and the planning and implementation processes. According to Finnish legislation, local authorities are responsible for decision-making in these cases, but they are also expected to consult and hear the opinions of people in the immediate surroundings of the planning area. Therefore, the residents in our study should have had an opportunity to participate in the formal decision-making process. The research questions were studied with semi-structured interviews supported by a survey.

As to the level of participation, our results reveal that most of the survey respondents did not perceive that they had opportunities for participation; however, the interviews showed that non-participation was out of choice grounded in a passiveness as people were aware of participation opportunities. In other words, the residents who perceived an opportunity to participate in the planning process did so rather passively. Our results also revealed that only a small number of people showed signs of activeness when they started to negotiate for some compensation after the official decisions by local authorities. Corresponding findings about limited public participation were also identified in the wind energy decision-making processes in Ontario, Canada (Jami & Walsh, 2017). There, practices seemed heterogeneous, and public participation was at varying degrees of the IAP2 participation ladder: inform, consult and (rarely) involve (Jami & Walsh, 2017).

All in all, the residents had quite positive attitudes towards wind power in general, which is a very typical result (Wolsink, 2007). The local acceptability was also measured and indicated lower acceptability in terms of perceived landscape and well-being impacts. This result – a high general attitude of acceptability and lower local acceptability – is consistent with previous research findings relating to the presence of a social gap (Bell et al., 2005; Van der Horst, 2007). These results may indicate possible problems in relations between the community and developers or between the community and decision-makers. Regardless of the difference between general attitudes about wind power and attitudes about local wind power development, the general
attitude was the most significant predictor for local wind farm acceptability: the more positive the general attitude towards wind power, the higher the acceptability of wind farms. This result is in line with many previous studies (Bidwell, 2016; Johansson & Laike, 2007; Jones & Eiser, 2009; Wolsink, 2000).

The results of the survey revealed that those who perceived they had opportunities for participation perceived landscape effects and especially effects on their own well-being negatively, meaning there was low acceptability for the local wind farm within this group. This seems to contradict results which emphasize the central role of perceived participation in the planning process as something contributing towards local acceptability (McLaren Loring, 2007; Swofford & Slattery, 2010). This result might indicate some misunderstandings, difficulties or other problems in the hearing protocols or in the interactions between different stakeholders. As participation may be a question of power, these results may also reflect an empty experience: an outcome after formal participation without power redistribution (Arnstein, 1969). In the studied cases, empowerment did not finally occur, and the participation remained at tokenism, which is at the lower rungs of Arnstein’s ladder (1969). Both the interviews and the survey results support this finding. Only a few residents were active, and activation happened after the decision-making process.

In addition, the regression analysis of survey data did not confirm the proximity hypothesis (Swofford & Slattery, 2010) as the distance between residents and wind turbines was not a significant predictor for the acceptability of the wind farm. However, this result contradicted findings from the interviews, where the residents perceived the distance between home and wind turbines as important. One explanation may be that the mean distance from survey respondents to the nearest wind turbine was longer than the corresponding distance between the interviewed residents and wind turbines.

As with any study, this empirical research includes some limitations. As the wind turbines had been operating for 1.5 years, it was reasonable to suppose that the residents had experience of local effects concerning landscape and well-being. However, one problem is that the survey respondents and the interviewed residents did not remember the details of the past planning process very well. This recall bias is difficult to systematically evaluate, but it must be acknowledged. The results of this study indicate that interaction was seen as either an institutional procedure or as personal contact, which could both be experienced in various ways on a subjective level. In addition, there might be different interpretations of the main concepts (such as participation, landscape, physical health or personal well-being) of this study. Hence, it would be important to conduct this study for other wind farms and give respondents some guidance about the meanings of the study variables.

This research aims to increase the understanding of the continuous nature of the participation process and thus reaffirms the complex nature of local social acceptability (see e.g. Fournis & Fortin, 2016; Jami & Walsh, 2017). Firstly, it seems that the right to participate does not substantially promote socially and culturally sustainable development in Finland. If the aim is to increase the acceptability of renewable energies as a technology for mitigating climate change, then the participation process should be further developed. According to this study’s results, residents perceive successful participation to be something more than contributing to processes at lower levels of tokenism. The current process seems to reach only the minority of residents while the majority stay rather passive. Special attention should be paid to an increase in awareness and advanced planning for projects that look far ahead towards installation and wind energy development while investing in continuous public participation. Secondly, this study reveals that the need for participation does not expire after wind farm siting decisions. This finding is in line with previous findings about citizens’ desire for active participation and continuity of involvement (Hindmarsh & Matthews, 2008; Jami & Walsh, 2017). Project developers should be prepared to continue communication with residents after the planning phase. There is a need for future research to identify ways and practices with which to establish how and when the formal wind power participation process could give more power to residents.

Notes
1. In this paper, we follow Huijts, Molin, and Steg (2012) and define acceptability of wind power as public attitudes towards wind power and acceptance as behavioural intention.
2. In both the Lappeenranta and Merijärvi wind farms, the number of wind turbines was under 10, and the total power amounted to less than 30 MW in each case. This means that the EIA was not required. In these cases, the wind turbine siting process included zoning and planning permissions with participatory and appeal rights.

3. The question was: “Did you have an opportunity to participate in the planning and siting process of the wind farm?” The question did not include any examples of opportunities for participation.

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References


Appendices

Appendix 1

Table A1. Demographics of the respondents (N = 291) and characteristics of the corresponding whole population of Lappeenranta and Merijärvi.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percentage of respondents</th>
<th>Lappeenranta</th>
<th>Merijärvi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>48.5% (141)</td>
<td>49.4% (35,977)</td>
<td>54.5% (627)</td>
</tr>
<tr>
<td>Female</td>
<td>51.5% (150)</td>
<td>50.6% (36,817)</td>
<td>45.5% (523)</td>
</tr>
<tr>
<td>Total</td>
<td>100% (291)</td>
<td>100% (72,794)</td>
<td>100% (1150)</td>
</tr>
</tbody>
</table>

Age, years mean (S.D.)

<table>
<thead>
<tr>
<th>Age</th>
<th>Respondents (N = 291)</th>
<th>Population over 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>43.1</td>
<td>40.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>Percentage of respondents</th>
<th>Lappeenranta</th>
<th>Merijärvi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic education</td>
<td>28% (81)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>3% (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocational education</td>
<td>50% (146)</td>
<td>52% (32,562)</td>
<td>52% (465)</td>
</tr>
<tr>
<td>University of applied sciences</td>
<td>9% (26)</td>
<td>10% (6158)</td>
<td>5% (46)</td>
</tr>
<tr>
<td>University degree</td>
<td>4% (12)</td>
<td>7% (4563)</td>
<td>1% (11)</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>0%</td>
<td>0.8% (503)</td>
<td>0.3% (3)</td>
</tr>
<tr>
<td>Total</td>
<td>94% (273)</td>
<td>69% (62,083)</td>
<td>58% (890)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wind farm area</th>
<th>Percentage of respondents</th>
<th>Lappeenranta</th>
<th>Merijärvi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lappeenranta</td>
<td>85.9% (250)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Merijärvi</td>
<td>14.1% (41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100% (291)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *Frequencies or standard deviations are in parentheses. **High school and/or vocational education.

Figure A1. Acceptability of the local wind farm in terms of perceived landscape impacts. (Scale: How do you perceive the impacts of wind power in your residential area? 1 = very negatively ..., 5 = very positively).
Appendix 2. Distributions of key variables

Figure A2. Acceptability of the local wind farm in terms of perceived well-being effects. (Scale: How do you perceive the impacts of wind power in your residential area? 1 = very negatively … 5 = very positively).
Figure A3. Perceived opportunities for participation during wind farm planning process.
Figure A4. The frequencies of the respondents from two study areas.

Figure A5. Age of the respondents.
Figure A6. The frequencies of men and women.

Figure A7. Educational level of the respondents. (Scale: 1 = Basic education, 2 = High school, 3 = Vocational education, 4 = University of applied sciences, 5 = University degree).
Figure A8. Distance to the nearest wind turbine (metres).

Figure A9. General attitude towards wind power. (Scale 1 = very negative … 5 = very positive).
Publication IV

Janhunen, S., Hujala, M., Tarkiainen, A., Pääätä, S., Korjone-Kuusipuro, K., and Upham, P.

*Exploring behavioral intentions related to wind power landscapes with a particular focus on the role of emotions.*

Paper presented at the NESS2017 conference, 6-8th June 2017, Tampere, Finland. Revised and further submitted.
Exploring behavioral intentions related to wind power developments with focus on the role of aesthetic considerations via emotions

Abstract

The role of emotions, other than place attachment, in acceptance of wind power is almost neglected in current literature; additionally, immediate emotions may incorporate factors such as aesthetic values that are difficult to articulate (Loewenstein & Lerner, 2003). As the landscape can be defined as an aesthetically satisfying view and the visual impacts of wind turbines on the landscape are evidently large, taking into consideration both cognitions and emotions could aid understanding of perceptions about landscape changes caused by wind power developments and, further, their relevance in acceptance of wind power.

This study advances the wind power research by analyzing how emotions caused by wind turbines sited in various landscapes affect peoples’ intentions to support and oppose proposed wind turbines. The research models are tested with empirical data collected from customers of an electricity company ($N = 503$). The use of manipulated photographs makes it possible to study emotions raised by proposed wind turbines and follow behavioral intentions without place-related bias.

Results of the analyses show significant differences in perceived aesthetics between the landscapes. Furthermore, findings indicate the significant role of perceived aesthetics in emotions raised by the wind turbines added to the landscape in question, and that in turn has an impact on intentions to support and oppose wind power development.
1. Introduction

In general, public acceptability of wind power is high. Opinion surveys in many European countries have shown very positive attitudes towards wind power (European Commission, 2014). For example, in 2016, 71% of the respondents of a Finnish energy survey (Finnish Energy, 2016) considered that the usage of wind energy should be increased. However, previous studies have shown that, despite positive attitudes in general, local wind farm projects tend to raise strong emotional responses such as feelings of unfairness during siting process (Haggett, 2008; Kempton, Firestone, Lilley, Rouleau, & Whitaker, 2005) and disruption in place-related emotions such as in place attachment (Devine-Wright & Howes, 2010). The host communities face the downsides of the wind turbines including landscape changes and noise, and the opposition of residents may delay or even prevent the construction of a wind farm.

In the previous research regarding wind power acceptability (i.e., attitudes towards wind power) and/or acceptance (i.e., behavior or behavioral intention towards wind power), the focus has been on cognitive explanations. Researchers have found economic costs and benefits (e.g., Baxter, Morzaria, & Hirsch, 2013; Guo, Ru, Su, & Anadon, 2015; Jones & Eiser, 2009, 2010) and landscape type (e.g., Johansson & Laike, 2007; Wolsink, 2007a, 2007b) to be important determinants of attitudes towards a particular wind farm as well as intentions to oppose or support local wind farm projects. Conversely, the role of emotions in wind power acceptability and/or acceptance has attracted almost zero attention with the exception of place attachment (for
place attachment studies in the context of wind power, see, e.g., Devine-Wright, 2009; Devine-Wright & Howes, 2010; Hagget, 2011; Read, Brown, Thorsteinsson, Morgan, & Price, 2013).

However, in addition to place-related emotions, Korjonen-Kuusipuro and Janhunen (2015) distinguished landscape-related, economic-related, interaction-related, and everyday routine-related emotions with respect to wind power projects.

Emotions are part of every human experience and social relation (Turner & Stets, 2005). They provide useful information about the desirability of an action (Loewenstein & Lerner, 2003) and form a link between moral standards and moral behavior (Tangney, Stuewig, & Mashek, 2007). Especially immediate emotions may include factors such as aesthetic values that are difficult to articulate (Loewenstein & Lerner, 2003). For example, landscape amenity arguments are subjective and can be seen as a personal prerogative (Woods, 2003), but the subjective argumentation in landscape issues may be inconsistent with the prevailing argumentation policy. This means that individuals may have the right to give opinions on landscape change, but they may avoid using arguments based on aesthetics if prevailing views on the landscape are based on productive and active use of the place (Botterill & Cockfield, 2016).

In this paper, we argue that aesthetic considerations related to proposed wind power development have an impact on the acceptance of a wind farm via emotions. As a result, including measures of immediate emotions on models predicting acceptance increases their predictive validity. We used three of the basic emotions suitable for exploratory work: happiness, sadness, and surprise. These are intended to equate to emotions that are simply positive and negative, with a third
option reflecting perception of notable change but without positive or negative evaluation. These simple distinctions allow us to analytically separate emotional response from aesthetic response and to set these within a simplified version of one of the most widely used models of behavioral intention in environmental psychology and sustainable consumption, namely the theory of planned behavior (Ajzen, 1991). We tested our research model with a large survey of Finnish electricity company customers and asked respondents about their opposition or support for hypothetical wind turbine proposals.

We begin by shortly reviewing previous research on perceptions of landscapes with specific attention to wind power landscapes. Next, we present our research model and hypotheses for the aesthetic perceptions of proposed wind power developments, emotions raised by those perceptions, and intentions to support or oppose wind power projects. We will then present data collection and measures of the key variables, results of the empirical analyses, and a discussion of the implications of the findings.

2. Perceptions of (wind power) landscape

A sizeable number of environmental psychology studies have investigated environmental preferences and aesthetics (Swanick et al., 2007a, 2007b). This literature has indicated that particular features of environments and landscapes tend to be preferred, including water, vegetation, varied terrain, ruggedness, refuge, (half-) open views, and environments of moderate complexity, novelty, incongruity, and surprisingness (Heerwagen & Orians, 1993; Kaplan &
Studies have also explored public attitudes towards change in types of landscapes (e.g., New Map Consortium, 1993, as cited in Swanwick et al., 2007a). For example, research has shown that rural UK populations view new housing and removal of hedges as unwelcome types of change (New Map Consortium, as cited in Swanwick et al., 2007a). When offered a choice of future scenarios for different landscapes, those questioned have tended to prefer conservation, restoration, and enhancement of current landscapes, though rural development can also be favored (New Map Consortium, as cited in Swanwick et al., 2007a). More recently, renewable energy developments have added to the types of change that some find unwelcome with, for example, place attachment being proposed as one of the underlying reasons (Devine-Wright, 2005).

Many studies on public attitudes towards landscapes have investigated the role of personal or individual factors (Swanwick et al., 2007b). In general, these have suggested that perceptions of landscape and the value attached to landscape can be influenced by age and socioeconomic status; gender, although this has been relatively little explored; cultural background and ethnic origin; and relationship with the landscape in terms of status as residents or visitors and urban or rural dwellers, with degree of familiarity an important factor. Other factors include use of the landscape (e.g., with differences between farmers, tourists, and landscape managers), levels of educational attainment, and environmental value orientations which may or may not be
correlated with another key factor, namely membership of environmental organizations (Swanwick et al., 2007b; Upham et al., 2009). However, except for place attachment, the landscape perceptions literature has paid rather little attention to the development and testing of empirical models intended to identify the psychological factors, such as emotions, involved and the relationships between these.

As to change in landscape caused by wind power developments, previous empirical studies concerning onshore wind turbines are presented in Table 1. As shown, many have found that perceptions of the landscape impacts of wind turbines are affected by the perceived quality of the landscape or landscape type. For example, Betakova, Vojar, and Sklenicka (2015), De Vries, de Groot, and Boers. (2012), and Molnarova et al. (2012) found that the negative visual impact of wind turbines is greater in landscapes that are evaluated as beautiful whereas Lothian (2008) found that wind turbines have a positive visual impact on landscapes with lower scenic quality. Filova, Vojar, Svoabodova, and Sklenicka (2015) found that the type of landscape is the most important determinant of the aesthetic perception of wind turbines and other man-made elements in certain landscapes. According to Wolsink (2007a), the landscape type is a dominant factor in the acceptability of proposed wind turbines. However, if there is a pressing need for electricity (e.g., in the case of a developing country), the visual intrusion of wind turbines is not considered a relevant issue (Lombard, 2015).

Quite interestingly, most of the studies presented in Table 1 have concerned visual or aesthetic perceptions of wind turbines, while only a few of them have taken it one step further and dealt
with respondents’ attitudes (Kontogianni, Tourkolas, Skourtos, & Damigos, 2014; Palmer, 2015; Thayer & Freeman, 1987; Wolsink, 2007a) or behavioral intentions (Johansson & Laike 2007) related to wind power developments. In addition, only one of the studies has considered the role of emotions; specifically, Maehr, Watts, Hanratty, and Talmi (2015) investigated the emotional responses to the visual impact of wind turbines. They concluded that the psychophysiological response to wind turbines does not differ from that of other industrial constructions, but wind turbines are rated as more calming and less aversive than some other industrial constructions.
Table 1. Selected empirical studies concerning visual or aesthetic impacts of onshore and inland wind turbines.

<table>
<thead>
<tr>
<th>Study</th>
<th>Main research objectives*</th>
<th>Key results</th>
<th>Research design</th>
<th>N</th>
<th>Landscape types</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betakova et al. (2015)</td>
<td>To analyze the impact of number of WTs, distance of WTs, and landscape type on landscape perceptions</td>
<td>WTs in an aesthetically valuable landscape cause the worst evaluations.</td>
<td>H E</td>
<td>169</td>
<td>Landscapes with high, average, and low aesthetic value</td>
<td>PM</td>
</tr>
<tr>
<td>de Vries et al. (2012)</td>
<td>To investigate the visual impact of WTs and other man-made elements on scenic beauty</td>
<td>WTs negatively affect scenic beauty. Impact decreases with distance and is greater in landscapes that are more beautiful.</td>
<td>H S</td>
<td>2,008</td>
<td>Flat valuable landscapes worthy of conservation</td>
<td>PM</td>
</tr>
<tr>
<td>Fast, Mabee, &amp; Blair (2015)</td>
<td>To identify how WTs affect residents’ valuation of rural landscapes</td>
<td>Two opposing impressions of landscape change: (a) WTs ruin the rural landscape; (b) visual concerns are negligible.</td>
<td>EP M M</td>
<td>35</td>
<td>Rural landscapes</td>
<td>RP</td>
</tr>
<tr>
<td>Filova et al. (2015)</td>
<td>To determine how WTs and other elements are perceived in various landscape types</td>
<td>The perception of an element is most affected by the landscape type.</td>
<td>H S</td>
<td>470</td>
<td>Arable land, forested land, and pastures and mosaics</td>
<td>RP, PM</td>
</tr>
<tr>
<td>Johansson &amp; Laike (2007)</td>
<td>To study the importance of visual perceptions and attitudes in intention to oppose local WTs</td>
<td>Intention to oppose WTs is related to perceived unity of the environment, the attitude towards the effects of WT on landscape, and the general attitude towards wind power.</td>
<td>EP S</td>
<td>80</td>
<td>Rural landscape</td>
<td>AL</td>
</tr>
<tr>
<td>Kontogianni et al. (2014)</td>
<td>To analyze local attitudes towards existing and proposed WE installations</td>
<td>Impact of visibility on public acceptance is linked to physical landscape and socio-economic factors.</td>
<td>EP, EA S</td>
<td>110</td>
<td>Regions of Southern Evia in Greece</td>
<td>AL</td>
</tr>
<tr>
<td>Lombard (2015)</td>
<td>To study the landscape aesthetics and land use interference of proposed WFs in South Africa</td>
<td>Visual intrusion of WTs is the effect that concerns respondents the least when there is dire need for electricity.</td>
<td>EA S</td>
<td>148</td>
<td>Coastlines, vineyards, and wheat farms</td>
<td>AL</td>
</tr>
<tr>
<td>Lothian (2008)</td>
<td>To measure the effect of WFs on perceived scenic quality of the landscape</td>
<td>WFs decrease ratings of high-quality landscapes and increase ratings of low-quality landscapes. Neither number of turbines nor distance affects perceived scenic quality.</td>
<td>EA S</td>
<td>311</td>
<td>Costal scenes and inland agricultural land</td>
<td>PM</td>
</tr>
<tr>
<td>Maehr et al. (2015)</td>
<td>To investigate emotional responses to the visual impact of WTs on the landscape</td>
<td>Psychophysiological response to WTs does not differ from that of other industrial constructions. WTs are rated more calming and less aversive than other industrial constructions.</td>
<td>H Q, L</td>
<td>21</td>
<td>Rural scenes</td>
<td>PM</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Objective</td>
<td>Methodology</td>
<td>Sample Size</td>
<td>Landscape Characteristics</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>---------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Molnarova et al. (2012)</td>
<td>To study the effect of the landscape type, WT characteristics, and demographics on visual preferences. Attributes of landscapes and WTs affect visual preference more than demographic factors. Attitude to wind power is found to be the most important demographic variable.</td>
<td>H</td>
<td>S</td>
<td>Landscapes with high, average, and low aesthetic value</td>
<td>PM</td>
<td></td>
</tr>
<tr>
<td>Palmer (2015)</td>
<td>To show how effect size can be used to determine the scenic impact and acceptability of WT projects</td>
<td>EA</td>
<td>S</td>
<td>604</td>
<td>15 recreational locations (viewpoints)</td>
<td>PM</td>
</tr>
<tr>
<td>Thayer &amp; Freeman (1987)</td>
<td>To identify critical visual attributes, meanings, attitudes, and beliefs regarding actual WE development</td>
<td>EP</td>
<td>S</td>
<td>200</td>
<td>Treeless grassland</td>
<td>RP</td>
</tr>
<tr>
<td>Wolsink (2007a)</td>
<td>To identify conditions that could help to transform positive general attitudes towards WP into local acceptability</td>
<td>H</td>
<td>S</td>
<td>505</td>
<td>Societal landscapes, nature, residential areas, offshore</td>
<td>AL</td>
</tr>
</tbody>
</table>

*WE = wind energy; WP = wind power; WT = wind turbine

EA = ex-ante study; EP = ex-post study; H = hypothetical study

E = experiment; I = interviews; L = laboratory study; MM = mixed methods; Q = questionnaire; S = survey

AL = actual landscape; PM = photomontages; RP = real photographs
In summary, based on this short review of previous research, we believe that there is a need for a comprehensive study to analyze the role of landscape type and aesthetic considerations in behavioral intentions related to wind power development. We focus particularly on the role of emotions to examine this role in relation to but separate from aesthetic perceptions.

3. Research model and hypotheses

Our study loosely follows Ajzen’s (1991) theory of planned behavior (TBP) where beliefs, attitudes, and intentions are succeeded by people’s behavior. The key concept in TPB is behavioral intention that is an immediate antecedent of actual behavior. Intention is the most important predictor for behavior, and it is determined by attitudes, subjective norms, and perceived behavioral control. Based on TBP, Huijts, Molin, and Steg (2012) built a comprehensive acceptance framework for sustainable energy technology. They proposed that positive and negative affects (i.e., emotions and feelings) together with, for example, perceived cost, risks, and benefits predict attitudes (i.e., acceptability) towards renewable energy technologies and, therefore, indirectly influence intention to accept that technology.

Additionally, Truelove (2012) based the dual-process model of energy support on TPB. Truelove’s (2012) model proposed that emotions and cognitive components jointly influence support for energy sources.

We take TPB and Huijts et al.’s (2012) framework as a starting point and build a simple research model to explore behavioral intentions related to wind power developments. We expect the landscape type to affect aesthetic considerations related to proposed wind power development,
and, thereafter, the aesthetic considerations to impact support and opposition of the wind power development in question via emotions raised. Figure 1 presents the suggested research model. Then, we set our three hypotheses.

![Figure 1. Research model to explore the effects of landscape type and perceived aesthetics on intention to support or oppose proposed wind power development via emotions.](image)

3.1. Aesthetic perceptions of wind power development in certain landscapes

The first hypothesis arises from the findings of previous literature concerning perceptions of landscapes. As described in the previous section, some features of the landscape are preferable to others, and evidence has suggested that landscape type has an impact on the visual perception of an element, such as a wind turbine, located in that landscape (Filova et al., 2015). Thus, we hypothesize that the landscape type affects the perceived aesthetics of proposed wind turbines:

**H1. Landscape type has an impact on the perceived aesthetics of wind turbines located in the landscape.**

Note that, in this study, we adopt the subjectivist view of landscape aesthetics where landscape quality lies in the eyes of the beholder (for further information, see the review by Lothian, 1999).
3.2. Emotions raised by aesthetic perceptions

Emotions are short-term psychological and physiological states that are experienced through the appraisal of a situation, physiological changes, gestures that express these emotions to other people, linguistic names, and compensation states for cognitions to resolve or continue the emotional state (Sharp & Kidder, 2005). Emotions arise when the brain makes body systems active, showing how biological processes are involved in the production of emotions (Turner & Stets, 2005). In addition, emotions are understood as being culturally constructed; hence, cultural differences shape expressions and interpretations of emotions (Hochschild, 2009; Turner & Stets, 2005).

Different theories of emotions differ in how they determine and categorize emotional stimuli and how emotions are perceived. Basic emotion theories assume that some emotions are universal to all humans (Brosch, Pourtois, & Sander, 2010). Happiness, fear, anger, and sadness, and often also surprise and disgust, are included in the list of basic emotions (Turner & Stets, 2005). Turner and Stets (2005) listed the characteristics of basic emotions. They are present in other primates, have a distinctive physiological response, have distinctive universal antecedent events, show coherence in autonomic and expressive responses, are quick in their onset, are brief, generate an automatic appraisal of the stimulus, and are experienced as events happening to oneself, beyond one’s full control (Turner & Stets, 2005). In turn, dimensional theories of emotion focus on a few dimensions, usually valence and arousal. This approach distinguishes
between negative and positive emotions at different intensities that reflect motivational systems (Brosch et al., 2010).

As the definition of emotion as a concept shows, emotions involve both biological and cultural processes. Emotions are formed because of judgements (Turner & Stets, 2005). An early cognitive appraisal theory of emotion (Schachter & Singer, 1962) stated that, for experiences that do not have an immediate explanation, people will label this state and describe their emotions in terms of the cognitions available to them at the time. However, when a person has an explanation for the experience, then the emotions are unlikely to be labeled in terms of alternative cognitions. Moreover, when a person is experiencing a situation that could have already raised an emotion in the past, they will react emotionally only if they are in a state of physiological arousal (Schachter & Singer, 1962). Siemer, Mauss, and Gross (2007) encapsulated the heart of appraisal theories: “It is the way a person interprets a situation – rather than the situation itself – that gives rise to one emotion rather than another emotion” (p. 599).

Loewenstein and Lerner (2003) distinguished two different categories for how emotions affect decision-making. The first are “expected emotions” or the predictions of the emotional consequences of decisions. The second are the “immediate emotions” which are experienced at the time of decision-making. Emotions cannot include all considerations, but immediate emotions may incorporate factors like moral or aesthetic values that would be difficult to articulate otherwise (Loewenstein & Lerner, 2003). Thus, we hypothesize that immediate
emotions caused by the inclusion of wind turbines in a landscape are determined by aesthetic perceptions:

**H2.** Perceived aesthetics of wind turbines located in the landscape affect the emotions raised.

### 3.3. The role of emotions in acceptance of wind power developments

As stated earlier in this study, apart from place attachment, the landscape perceptions literature has given hardly any attention to the testing of empirical models intended to identify the emotions involved. The same goes for literature concerning wind power acceptance, although researchers have often found that emotions are part of opposing behavior related to wind farms (Cass & Walker, 2009). Truelove (2012) is one of the few who has studied emotions and wind power acceptance. She found that emotional reactions measured via image evaluation of wind power are positively related to intention to support wind power; specifically, a more positive image evaluation leads to higher support for the proposed wind power plant. We hypothesize that emotions raised by aesthetic considerations related to proposed wind power development have a significant impact on behavioral intentions:

**H3.** Emotions raised have an impact on intentions to support and oppose proposed wind turbines.
4. Methods

4.1. Data collection

We tested our hypotheses with a convenience sample of customers of a Finnish electricity company. The survey was compiled in Finnish and pre-tested with a sample of Finnish higher education students ($N = 92$) during spring 2014. We attached a cover letter containing the link to the Qualtrics Survey Software to access the online survey to the monthly email newsletter of the electricity company at the beginning of September 2014. The number of newsletters sent was approximately 25 000. The link was also available on the front page of the company’s website.

The flow of the survey was as follows. First, demographics of the participants were assessed. Second, participants answered questions assessing their attitudes toward wind power and other forms of renewable energy at the general level. Third, one of four landscape photographs was randomly assigned to each participant. Below the assigned photograph, the participants were asked to assess emotions raised by the landscape photograph. Fourth, the same landscape photograph with two digitally added wind turbines was assigned to each participant. Respondents’ perceptions about the proposed wind turbine development, the emotions raised by the photograph, and their intentions to support or oppose the development were then assessed.

As the electricity company is in the eastern part of Finland, in a geographical area called Lake Finland, the four landscape photographs were from its sphere of operations. Photographs were taken in locations that represent typical Lake Finland landscapes (see, e.g., Käyhkö, Granö, & Häyrynen, 2004; Raivo, 2002) but are not famous or well-known to reduce the influence of place.
attachment on results as much as possible. The landscape photographs used were: (a) a summer cottage scene with lake in the foreground and forest in the background, (b) a forest scene, (c) a street view of a small town with some cars and trees, and (d) a countryside scene with a small road in the foreground and buildings and some forest in the background. All the photographs were taken and manipulated by the authors. Photographs are presented in Appendix A.

A total of 622 electricity company customers completed the questionnaire by the end of the September 2014. After the exclusion of respondents with substantial missing data or identical ratings for all items, the final sample \((N = 503)\) was obtained. Table 2 shows the demographic profiles of the valid respondents.

**Table 2.** Demographic profile of the respondents.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender ((n = 503))</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>385</td>
<td>76.5</td>
</tr>
<tr>
<td>Female</td>
<td>118</td>
<td>23.5</td>
</tr>
<tr>
<td><strong>Education ((n = 484))</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary school or equivalent</td>
<td>14</td>
<td>2.9</td>
</tr>
<tr>
<td>High school or vocational school</td>
<td>125</td>
<td>25.8</td>
</tr>
<tr>
<td>Institute-level training</td>
<td>145</td>
<td>30.0</td>
</tr>
<tr>
<td>Polytechnic degree</td>
<td>70</td>
<td>14.5</td>
</tr>
<tr>
<td>University degree</td>
<td>130</td>
<td>26.9</td>
</tr>
<tr>
<td><strong>Annual household income ((n = 501))</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\leq 20\ 000\ €)</td>
<td>22</td>
<td>4.4</td>
</tr>
<tr>
<td>20 001 - 40 000 €</td>
<td>103</td>
<td>20.6</td>
</tr>
<tr>
<td>41 000 - 60 000 €</td>
<td>126</td>
<td>25.1</td>
</tr>
<tr>
<td>60 001 - 80 000 €</td>
<td>106</td>
<td>21.2</td>
</tr>
<tr>
<td>80 000 - 100 000 €</td>
<td>49</td>
<td>9.8</td>
</tr>
<tr>
<td>(&gt; 100\ 000\ €)</td>
<td>50</td>
<td>10.0</td>
</tr>
<tr>
<td>I don’t want to answer</td>
<td>45</td>
<td>9.0</td>
</tr>
<tr>
<td><strong>Region of origin ((n = 494))</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City or town</td>
<td>268</td>
<td>54.3</td>
</tr>
<tr>
<td>Smaller population center</td>
<td>95</td>
<td>19.2</td>
</tr>
<tr>
<td>Countryside</td>
<td>131</td>
<td>26.5</td>
</tr>
<tr>
<td><strong>Age ((n = 415))</strong></td>
<td>60.4</td>
<td>63.0</td>
</tr>
<tr>
<td>M</td>
<td>60.4</td>
<td>63.0</td>
</tr>
<tr>
<td>SD</td>
<td>11.3</td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>89</td>
<td></td>
</tr>
</tbody>
</table>
As shown in Table 2, males were somewhat over-represented. One possible explanation for the gender disparity is that the survey links were mailed to the electricity customers, the majority of whom were male. Moreover, gender bias is common in surveys concerning energy issues, as well as in survey research in rural areas (Jacobsen, Brown, & Scheufele, 2007). The differences in sample sizes between males and females introduced the possibility of some bias. Therefore, we randomly selected 118 male respondents to get the same number of females and males and then repeated the analyses presented in the results section with this smaller sample. There were no significant differences in the results between samples (the results are available upon request). Thus, our results are not biased by the overrepresentation of male respondents.

The respondents were relatively highly educated as almost three-quarters of them had institute or higher level of education (see Table 2). In addition, the annual household income was relatively high (MD = 41 000 € – 60 000 €) compared to the Finnish population in 2014 (MD = 31 699 €; Statistics Finland, 2017). Regarding region of origin, slightly more than half of the respondents came from a city or a town, about one-fifth of them came from smaller population centers, and the rest were from the countryside. This was in line with the general distribution in Finland at the time as about 70% of the population lived in urban regions.

4.2. Measures
Respondents’ aesthetics perceptions of wind turbines added to the landscape were assessed using two items: (a) “This kind of wind power production looks ugly,” and (b) “This kind of wind power production fits well into the landscape.” The response scale was from 0 = “disagree
totally” to 100 = “agree totally” to measure variables at on an interval scale. The coding of the first item was reversed, and the items were averaged together. They exhibited acceptable reliability (Cronbach’s $\alpha = 0.777$).

Emotions before and after adding the wind turbines into the landscape photograph were assigned using a single item measure: “What kind of emotions are raised by this photograph?” Three basic motions (i.e., happiness, sadness, and surprise) were assessed. The response scale was from 0 = “not at all” to 100 = “very much.”

The intention to support the proposed kind of wind power production as in the assigned photograph was assessed with two items: (a) “I would vote for a party candidate that would push through this kind of wind power production,” and (b) “I would invest in this kind of wind power production.” The response scale was from 0 = “It is impossible for me even to think about doing this” to 100 = “I would definitely do it.” The two items were averaged together. They formed a measure with good internal consistency (Cronbach’s $\alpha = 0.892$).

The intention to oppose wind power production was assessed using a single item measure: “I would strongly oppose this kind of wind power project,” with the same response scale as with intention to support.
Attitudes towards wind power as an energy source, age, male, and level of education served as control variables. Three items were constructed to measure the attitudes towards wind power as an energy source: (a) “I have a positive attitude towards wind power in general”; (b) “In Finland, a larger amount of energy should be produced by renewable energy sources (e.g., solar energy, wind energy)”); and (c) “Electricity should be produced by wind as much as possible.” The response scale was from 0 = “disagree totally” to 100 = “agree totally.” These three items exhibited good reliability (Cronbach’s $\alpha = 0.884$), and they were averaged together. Male was a dummy variable for this characteristic, and the level of education categories were treated as ordinal-scale from 1 to 5.

No statistically significant differences were observed between the assigned landscapes in demographic variables or attitudes towards wind power as an energy source.

5. Results

Table 3 displays the means and standard deviations of the perceived aesthetics of proposed wind turbines by landscape type.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summer cottage</th>
<th>Forest</th>
<th>Town</th>
<th>Countryside</th>
<th>Kruskal-Wallis test’s $H$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived aesthetics</td>
<td>M (SD)</td>
<td>34.8 (31.8)</td>
<td>44.4 (33.9)</td>
<td>33.5 (31.3)</td>
<td>38.7 (31.7)</td>
</tr>
</tbody>
</table>

*p < .05

As shown, on average, the perceived aesthetics ranged from 44.4 (forest) to 33.5 (town), and the differences between landscapes were statistically significant (Kruskal-Wallis test’s $H = 8.169$, $p$
The scale was from 0 to 100, meaning that the mean value of the perceived aesthetics of the proposed kind of wind power production was quite low in all of the landscape types used.

Hypothesis H1 was tested by using analysis of covariance (ANCOVA). The perceived aesthetics of the proposed wind turbines served as a dependent variable, and the landscape type was the predictor. In addition, attitudes towards wind power as an energy source and demographic variables were used as control variables. The ANCOVA results are shown in Table 4.

Table 4. ANCOVA p-values for the association of predictor (left) and dependent variable (top). Values in bold-italic are significant at $p < .01$. Values in italic are borderline significant ($p < .05$).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Perceived aesthetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape type</td>
<td>0.022</td>
</tr>
<tr>
<td>Age</td>
<td>0.701</td>
</tr>
<tr>
<td>Male</td>
<td>0.854</td>
</tr>
<tr>
<td>Education level</td>
<td>0.335</td>
</tr>
<tr>
<td>Wind power as energy source</td>
<td>0.000</td>
</tr>
</tbody>
</table>

As shown in Table 4, the $p$-value of the landscape type was significant at the 5% significance level. Thus, it seems that the landscape type had a significant impact on the perceived aesthetics of wind turbines. This finding supports hypothesis H1. Also, it seems that one of the covariates, attitude towards wind power as an energy source, was significantly related to perceived aesthetics ($p < .01$).

Table 5 presents the means and standard deviations of the emotions raised by the landscape photographs with wind turbines by landscape type.
Table 5. Means and standard deviations of raised emotions in different landscapes.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summer cottage</th>
<th>Forest</th>
<th>Town</th>
<th>Countryside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>M (SD)</td>
<td>40.41 (36.92)</td>
<td>45.01 (36.89)</td>
<td>30.65 (32.35)</td>
</tr>
<tr>
<td>Sadness</td>
<td>M (SD)</td>
<td>49.12 (37.06)</td>
<td>43.55 (38.41)</td>
<td>46.57 (40.06)</td>
</tr>
<tr>
<td>Surprise</td>
<td>M (SD)</td>
<td>48.59 (35.68)</td>
<td>39.73 (36.67)</td>
<td>52.79 (35.86)</td>
</tr>
</tbody>
</table>

As shown in Table 5, the average scores for happiness and surprise had a wider range than the scores for sadness. It seems that the respondents scored the highest in happiness (46.56) if the wind turbines were located in the countryside. Conversely, the town landscape received much lower scores for happiness (30.65). The average surprise ratings ranged from 52.79 (town) to 39.73 (forest). Thus, it seems that the respondents were more surprised if the wind turbines were located in a town compared to in a forest. On average, the highest sadness scores were given for the summer cottage landscape (49.12) and the lowest for the forest landscape (43.55).

Hypothesis H2 was tested by using three ANCOVA models. Happiness, sadness, and surprise served as dependent variables, and perceived aesthetics was the predictor. Landscape type, attitude towards wind power as an energy source, demographic variables, and emotions raised by landscape photographs without wind turbines were used as control variables. Results of the ANCOVA are shown in Table 6.
Table 6. ANCOVA p-values for the association of predictor (left) and dependent variables (top).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Happiness</th>
<th>Sadness</th>
<th>Surprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived aesthetics</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Landscape type</td>
<td>0.011</td>
<td>0.884</td>
<td>0.507</td>
</tr>
<tr>
<td>Age</td>
<td>0.010</td>
<td>0.659</td>
<td>0.743</td>
</tr>
<tr>
<td>Male</td>
<td>0.740</td>
<td>0.920</td>
<td>0.419</td>
</tr>
<tr>
<td>Education level</td>
<td>0.551</td>
<td>0.443</td>
<td>0.355</td>
</tr>
<tr>
<td>Wind power as energy source</td>
<td>0.000</td>
<td>0.000</td>
<td>0.193</td>
</tr>
<tr>
<td>Happiness without wind turbines</td>
<td>0.000</td>
<td>0.000</td>
<td>0.055</td>
</tr>
<tr>
<td>Sadness without wind turbines</td>
<td>0.186</td>
<td>0.003</td>
<td>0.608</td>
</tr>
<tr>
<td>Surprise without wind turbines</td>
<td>0.754</td>
<td>0.038</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: Values in bold-italic are significant at $p < .01$. Values in italic only are borderline significant ($p < .05$).

When it came to perceived aesthetics of wind turbines in a landscape, the results showed that they had a significant impact on emotions raised ($p < .01$ for all the emotions). These results support H2. In addition, it seems that landscape type had a direct impact on happiness at the 5% significance level as well.

Table 7 presents the means and standard deviations of the intentions to support and oppose the proposed kind of wind turbines by landscape type.

Table 7. Means and standard deviations of intentions to support and oppose wind power production in different landscapes.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summer cottage M (SD)</th>
<th>Forest M (SD)</th>
<th>Town M (SD)</th>
<th>Countryside M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to support</td>
<td>29.66 (30.65)</td>
<td>38.35 (35.21)</td>
<td>28.78 (31.21)</td>
<td>35.25 (33.99)</td>
</tr>
<tr>
<td>Intention to oppose</td>
<td>48.72 (39.24)</td>
<td>37.81 (37.47)</td>
<td>51.99 (40.08)</td>
<td>41.13 (39.19)</td>
</tr>
</tbody>
</table>

As shown in Table 7, the average scores of intentions to oppose had a wider range than the intentions to support the proposed kind of wind power production. The intention to oppose a
similar kind of wind power production as in the assigned photograph was scored lowest in the forest landscape (37.81) and highest in the town (51.99). Quite surprisingly, the intention to support wind power production scored low in all four landscape types. The forest landscape had the highest scores (38.35), and the summer cottage landscape the lowest (29.66).

Hypothesis 3 was tested by using two ANCOVA models. Intentions to support and oppose served as dependent variables, and raised emotions were the predictors. The aesthetics of wind turbines in the landscape, landscape type, attitude towards wind power as an energy source, and demographic variables were used as control variables. ANCOVA results are shown in Table 8.

**Table 8. ANCOVA p-values for the association of predictor (left) and dependent variables (top).**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intention to support</th>
<th>Intention to oppose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>0.000</td>
<td>0.405</td>
</tr>
<tr>
<td>Sadness</td>
<td>0.575</td>
<td>0.000</td>
</tr>
<tr>
<td>Surprise</td>
<td>0.890</td>
<td>0.420</td>
</tr>
<tr>
<td>Perceived aesthetics</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Landscape type</td>
<td>0.115</td>
<td>0.182</td>
</tr>
<tr>
<td>Age</td>
<td>0.054</td>
<td>0.141</td>
</tr>
<tr>
<td>Male</td>
<td>0.002</td>
<td>0.588</td>
</tr>
<tr>
<td>Education level</td>
<td>0.004</td>
<td>0.153</td>
</tr>
<tr>
<td>Wind power as energy source</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: Values in bold-italic are significant at $p < .01$. Values in italic only are borderline significant ($p < .05$).

ANCOVA results revealed that the raised emotions affect behavioral intentions differently. Surprise was not a significant predictor of intention to support or oppose. Instead, the level of happiness experienced based on the landscape with the proposed wind turbines significantly predicted the intention to support, while sadness significantly predicted opposition. Also, it seems that the perceived aesthetics of wind turbines had a direct impact on behavioral intentions as well. Thus, it seems that hypothesis H3 is supported.
6. Discussion
This study explored support and opposition of proposed wind turbines in different inland landscapes in Finland. The focus was on the aesthetic perceptions caused by wind turbines located in different kinds of landscapes (summer cottage, forest, town, countryside) and the impact of the emotional response related to aesthetic considerations on the intention to support or oppose the development. The research models were tested with data collected via a large online survey from customers of an electricity company (N = 503).

Especially, our aim was to isolate and identify the emotions raised by the inclusion of wind turbines on landscape, and to understand the structure of the response to landscape change in more detail than has yet been done. Understanding the structure is the main value of theory of planned behavior (TPB) based models, used in this study. TBP-models are arguably reductionist as they reduce complex experience to statistically-manipulable factors, but the value gained in return is an insight into the structural relationships between the posited components of the response.

According to our results, the landscape type significantly predicts the perceived aesthetics of proposed wind turbines. Aesthetic perceptions are highest if wind turbines are located in forest landscapes and lowest if they are located in towns. This confirms the findings of Wolsink (2007a) and Filova et al. (2015) who asserted that landscape type affects wind power developments. Furthermore, this result may also reflect the importance of the proximity of wind turbines to residential areas or even NIMBYism (Not-In-My-Backyard) as forest landscapes seemed to be preferred over populated landscapes (i.e., town, summer cottage, and countryside).
In addition, we showed that aesthetic perceptions affect emotions raised as the perceived aesthetics of the proposed wind turbines significantly affected the happiness, sadness, and surprise felt after wind turbines were added to the landscape. Thus, it seems that, in the context of wind power developments, the aesthetic values may be shown via immediate emotions. Following Siemer et al.’s (2007) view about the appraisal process, it seems that it is not the landscape type that raises the emotion but rather the way a person interprets the landscape with wind turbines. Furthermore, our results suggest that emotions related to aesthetic considerations predict intentions to behave in wind-power-related issues. This finding is in line with Loewenstein and Lerner’s (2003) classification of how immediate emotions affect decision-making. According to our results, happiness increased the intention to support the proposed wind power development whereas sadness predicted opposing behavior. Conversely, surprise did not seem to impact behavioral intentions.

7. Conclusions
We close by emphasizing the main finding of this study: it is possible to isolate and identify emotional response related to the landscape change from the aesthetic response. Thus, we were able to increase understanding about the structure of the public response to landscape change. This finding underlines the importance of aesthetic considerations and emotions in acceptance of wind power.

Practical implications of this study could be, for example, in developing the public participation process of the wind power project. The aesthetic impacts of wind turbines are considerable, they cause emotional responses and affect intentions to support or oppose wind power projects. Thus, aesthetic perceptions presumably have at least some power to promote or slow down a proposed
wind power project. Careful assessment of emotions could give valuable information on public views about the landscape change for policy-makers and wind energy companies, and thus help the diffusion of wind power.

As with any study, our study has some limitations. Despite careful manipulation of photographs, it is possible that the experience of the wind turbines in a landscape is a bit different compared to situations in the real world. Additionally, the ability of respondents to evaluate their emotions differs between people. The respondents of this study were older people, so it would be important to conduct this study for a different population. In addition, in the future, different kind on landscape types and emotional descriptors beyond basic emotions could be studies to add more nuance.
References


Appendix A

Landscape photographs without and with wind turbines

Summer cottage:

Forest:

Town:

Countryside:
Publication V

Janhunen, S., Grönman, A., Hynynen, K., Hujala, M., Kuisma, M., and Härkönen, P.

Audibility of wind turbine noise indoors—Evidence from mixed method data

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Audibility of Wind Turbine Noise Indoors: Evidence from Mixed-Method Data

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Lappeenranta University of Technology
Lappeenranta, Finland

Keywords—wind turbine noise indoors; sound diary, audibility, sound pressure level, wind characteristics, amplitude modulation

I. INTRODUCTION

Wind energy (WE) is regarded as an important renewable energy source to mitigate climate change. Although public attitudes toward WE are relatively positive in general, local developments often raise considerable concerns and thus resistance within communities [1, 2, 3]. Furthermore, strong local resistance may delay or even prevent the planning process for a wind farm (WF) [3, 4]. This paper focuses on one of the most important issues causing public resistance to WFs—the audibility of wind turbine (WT) noise. This study has a twofold aim. The primary aim is to develop reliable methods for analyzing the factors affecting the audibility of WT noise indoors. The secondary aim is to analyze and compare the impacts of sound pressure levels, as well as wind characteristics and amplitude modulation (AM) on the audibility of WT noise indoors.

In this study, we used sound diaries to gather information about the audibility of WT noise indoors. We also measured the sound pressure levels near the homes of diary keepers and gathered wind speed and direction data. To our best knowledge, this study is the first attempt to combine self-reported audibility data, sound pressure levels, and wind measurements to analyze the audibility of WT noise.

II. MATERIALS AND METHODS

A. Study areas

The impacts of the sound pressure level, wind characteristics, and AM on the audibility of WT noise was investigated by collecting and analyzing the data from two residential areas near operating WFs in Finland. The neighboring areas of Tuulimuukko WF in Lappeenranta and Ristiveto WF in Merijärvi were selected as study areas. By using two study areas that were quite different in soundscape, among other factors, we increased the generalizability of our findings.

Both of the WFs are located onshore but on different sides of the country. Both WFs became operational in mid-2013. Tuulimuukko WF has seven 3-MW Alstom ECO1100 WTs, with a hub height of about 95 m. In Ristiveto WF, there are six 2.3-MW Siemens SWT 2.3-108 WTs, with a hub height of 115 m.

The environment and thus the background noise in the immediate surroundings of the study areas are very different. A four-lane highway, a railway, a motocross track, a shooting range, and an industrial area are close to the residential area near Tuulimuukko WF. In turn, a small downhill skiing center and cross-country skiing tracks are close to the residential area near Ristiveto WF. The area near Ristiveto WF is agricultural land with low-traffic intensity. Thus, the background noise is much louder in the residential area near Tuulimuukko WF compared with that of Ristiveto WF.

B. Data collection

The data were collected during the winter/spring of 2015. A sound diary was designed to assess the audibility of WT noise in the homes of local residents. The sound diaries were used to record information about the audibility of WT noise indoors on a scale from 0 (no sound) to 3 (very loud). The diary keepers...
assessed the audibility every hour during their waking hours. The diaries were kept for two- or three-week periods, following the sound measurement arrangements.

Out of the 21 diary keepers, seven were from Lappeenranta, and fourteen were from Merijärvi. Their mean age was 51.4 years, and 12 of them (57%) were males. The distance between each diary keeper’s home and the nearest WT varied between 706 and 2392 m, with a mean distance of 1402 m (standard deviation 508 m).

The sound diaries were synchronized with the five sound measurement locations; one or two diaries were kept in a house where Nor 140 sound analyzer equipped with Nor 1217 rain and weather shield was installed outside. The other sound diaries were kept in houses in the vicinity of the ongoing sound measurement (see Fig. 1).

Wind measurements were performed using WindCube v2 ground-based Lidar. The Lidar was situated in the direction of the predominant upwind from the WF so that the turbines disturbed the measurements as little as possible. Horizontal wind speed, direction, speed dispersion, and vertical wind speed were measured simultaneously at 12 different heights (40–200 m) by using 10-min averages. Fig. 1 summarizes the data collection.

### III. RESULTS

Eventually, two of the diary keepers from Lappeenranta failed to keep their diaries, decreasing the sample size to 19 diaries (90.5% participation rate). Table 1 presents the total number of diary entries, as well as those indicating audible WT noise indoors (levels 1–3). As shown, the share of those hours when WT noise was audible ranged from 0% to 14.61%. The WT noise seemed only rarely audible indoors as 14 diary keepers out of the total of 19 did not hear the WT sound at all. Additionally, only one of the diary keepers living close to Tuulimuukko WF in Lappeenranta (L1_1) had diary entries that indicated the audibility of WT noise, whereas four diary keepers living close to Ristiveto WF in Merijärvi reported audible WT noise indoors. These results may indicate the importance of background noise in the audibility of WT noise since (as described above) in the Lappeenranta area, there are considerable noise sources near the diary keepers’ homes.
TABLE I.  NUMBER OF DIARY ENTRIES INDOORS BY DIARY KEEPER

<table>
<thead>
<tr>
<th>Sound Analyzer Location</th>
<th>Diary Keeper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>_1 _2 _3 _4 _5</td>
</tr>
<tr>
<td>L1</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>(10, 4.81%)</td>
</tr>
<tr>
<td></td>
<td>Failed in diary keeping</td>
</tr>
<tr>
<td></td>
<td>206</td>
</tr>
<tr>
<td></td>
<td>(0, 0.00%)</td>
</tr>
<tr>
<td></td>
<td>Failed in diary keeping</td>
</tr>
<tr>
<td>L2</td>
<td>206</td>
</tr>
<tr>
<td></td>
<td>(0, 0.00%)</td>
</tr>
<tr>
<td></td>
<td>234</td>
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<tr>
<td></td>
<td>(0, 0.00%)</td>
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<tr>
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<tr>
<td></td>
<td>129</td>
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<td>(0, 0.00%)</td>
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<tr>
<td>M3</td>
<td>142</td>
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<tr>
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<td>293</td>
</tr>
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<tr>
<td>M4</td>
<td>188</td>
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<tr>
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<td>203</td>
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<tr>
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<td>M5</td>
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<td>(45, 14.61%)</td>
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<td></td>
<td>340</td>
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<td></td>
<td>(43, 2.63%)</td>
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<td></td>
<td>178</td>
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<tr>
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<td>(0, 0.00%)</td>
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<tr>
<td></td>
<td>356</td>
</tr>
<tr>
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<td>(28, 7.67%)</td>
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</table>

Note: Enclosed in parentheses are the numbers of diary entries indicating audible WT noise indoors and their percentages. L denotes Lappeenranta, and M denotes Merijärvi.

A. Effects of daytime and sound pressure level on audibility
The WT audibility varies during the day. The reported level-2 or level-3 audibility of WT noise peaks in the evening or late evening, and at the nighttime, it is more often reported at the two higher levels (see Fig. 2). These results slightly differ from those of Kuwano et al. [5], who reported that the people who were most annoyed by the WT noise experienced it especially at midnight and at night. However, van den Berg [6] reported that the residents who lived close to a WF complained about the noise especially in the late evening and at nighttime, which is qualitatively similar to our findings.

Fig. 3 presents the correlation between WT sound pressure levels and diary entries. It shows the average values for the total sound pressure level and the filtered maximum WT sound, including the standard deviations for each audibility level, and the number of diary entries indicating audibility. Although the average values increase with audibility, the values at each level overlap within one standard deviation. This overlap clearly indicates that the sound pressure level is not a sufficient method of evaluating the audibility of WT noise indoors when performed by a single person.

However, a general trend is noticeable and comparable with those of the previous studies. The most severe annoyances were reported mostly at sound pressure levels above 40 dBA. Bakker et al. [7] reported a clear increase in sleep disturbance due to WT noise at sound pressure levels above 45 dBA. Kuwano et al. [5] also noted that WT noise caused sleep disturbance, particularly when the equivalent sound pressure level was 40 dBA or higher. Pedersen and Waye [8] also found a definite increase in the percentage of annoyed persons when the sound pressure level rose above 40 dBA. Their study additionally showed a growing trend of annoyance when the sound pressure level increased from 32.5 dBA, supporting our findings.

B. Effects of wind characteristics on audibility
The influence of wind characteristics on WT noise and audibility was analyzed. The considered wind characteristics were wind speed and direction at hub height, wind shear, and turbulence intensity. The analysis indicates that the direction of the turbine with respect to the observer may be one of the key factors influencing the audibility of WT noise and the annoyance it causes.
Fig. 4 shows the sound pressure level as a function of relative turbine direction (measured from the closest turbine to the observer) during one measurement period.

The relative wind direction with respect to the observer is measured from a 0° angle, which means that an observer directly downstream from the turbine is located at 180°. The angles vary roughly between 180° and 230°. One possible explanation why the observed locations are not directly behind the turbine is the turbine rotation, which shifts in the direction of the blade’s downward movement.

In comparison, Bockstael et al. [9] reported that the risk of annoyance would depend on the angular blade velocity and the wind direction. Their analysis predicted that the risk of annoyance would be highest when the wind blew from the north, and the survey respondents lived roughly between northwest and southwest from the turbines. However, the wind blowing from the east (corresponding to 180° in Fig. 4) lacked data and could explain the difference between the findings of these two studies.

Regarding the influence of wind shear and turbulence intensity, weak indications were found that a combination of shear exponent between 0.3 and 0.5 and turbulence intensity between 0.1 and 0.2 could be connected to sound pressure levels above 40 dBA and thus to audibility. However, more data should be available to be able to draw conclusions.

C. Effects of amplitude modulation on audibility

An automated algorithm was developed and implemented to detect the WT’s AM and measure the modulation depth. A detailed operation of the algorithm will be presented in a currently unpublished paper [10]. The data were analyzed in samples, each with a 16-s duration. A sample was considered amplitude modulated if the modulation depth of $L_{A,eq,F}$ levels exceeded 5 dB six times. The 5-dB limit was based on the standard guidelines published in New Zealand [11], and instead of calculating the mean modulation depth on the sample interval, the above definition was used because of the observation that the modulation depth could change significantly on a 5-s time scale. The number of approved samples with AM per hour was calculated, and the results were compared with the reported audibility of the noise. Table 2 presents the relation between AM and audibility of WT noise. As shown, the AM does not seem related to the audibility of WT sound indoors. However, further analysis is required due to the relatively small sample size used in this study, as well as the relatively long distance between the diary keepers’ homes and the nearest WT.
TABLE II. PRESENCE OF AMPLITUDE MODULATION AND AUDIBILITY OF WT NOISE, NUMBER OF OBSERVATIONS

<table>
<thead>
<tr>
<th>Presence of Amplitude Modulation</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>No</td>
<td>1202</td>
</tr>
<tr>
<td>Yes</td>
<td>126</td>
</tr>
<tr>
<td>Total</td>
<td>1328</td>
</tr>
</tbody>
</table>

IV. CONCLUSIONS

Combining self-reported sound diaries with measurements of sound and wind characteristics seems to be a useful method of studying audibility and annoyance caused by WT sound indoors. Using this mixed-method approach, we gathered versatile information about the audibility of WT sound indoors and the annoyance it caused. We also found some evidence that in addition to the sound pressure level, the wind characteristics, especially the direction of the turbine with respect to the observer, played a role in the audibility of WT noise. However, further analyses with a much larger sample of residents living close to WTs are needed to be able to draw conclusions.

ACKNOWLEDGMENT

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