



Wind farms in the Icelandic highlands: Attitudes of local residents and tourism service providers



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ABSTRACT

Over the last decades the harnessing of wind power has gained increasing popularity and is currently believed to be one of world's best environmental options in seeking to meet the international target of reducing greenhouse gas emissions by at least half by the year 2050. There is undeniably an abundance of wind resources in Iceland. But what impact would the harnessing of this power have on the country's growing tourism industry? This paper focuses on the dynamics existing between wind farming, residents and tourism. Its overall aim is to evaluate the attitudes of local residents and tourism service providers in Southern Iceland towards the country's first proposed wind farm, which is to be located at the edge of Iceland's Southern highlands, and to critically discuss the causal relationship between the landscape and these attitudes. An on-site questionnaire was distributed to residents in the municipalities adjacent to the proposed wind farm. Interviews were also conducted with residents and tourist service providers. The results indicate that the relationship between residents and the landscape of the proposed site is based on its use as highland pasture and the residents' romantic conception of the landscape, which for centuries has been characterized by wilderness and remoteness. This conception seems to linger on despite gradually increasing hydropower production in the area. The associations made by tourist service providers with the area differ since they are selling a certain image, that of unspoiled nature and wilderness. Wind turbines would be a new and prominent presence in the Icelandic landscape likely to transform the area from its previous perceived wild and natural state. As such, social acceptance of the location of wind farms in the Icelandic highlands is more critical than in the case of more traditional ways of harnessing renewable energy.

1. Introduction

In order to meet the international target of reducing greenhouse gas emissions by at least half by the year 2050 (e.g. OECD, 2011) there has been an emphasis on the development of renewable energy sources at a global level. As a result, the harnessing of wind power has increased rapidly over the past decade. Simultaneously, technical advances in the development of wind turbines have increased the possibilities for harnessing wind power in areas that previously were considered unsuitable, and moreover have resulted in wind turbines that are more efficient and have a greater capacity (e.g. Wolsink, 2007; Dai et al., 2015). Accordingly, the efficiency of wind as a feasible renewable energy option has multiplied in recent years.

Iceland possesses abundant renewable energy sources, such as hydropower and geothermal power, and the fact that 87% of the country's national energy consumption comes from such sources (Statistics Iceland, 2017) makes Iceland first among equals when it comes to the use of renewable energy per capita. Tourists who visit Iceland appear

intrigued by this fact, which presents opportunities for the development of tourism. So far the interplay between tourism and energy production is primarily reflected in an increased and improved access to areas where power production takes place. Improved access to Iceland's uninhabited interior highlands is, for example, greatly indebted to the construction of hydroelectric power plants, the first of which was built in the late 1970s. During the past few decades Icelandic power companies have embraced the country's expanding tourism industry by, for instance, opening visitor centres at particular power plants, and these are proving popular among many tourists visiting Iceland. Research (e.g. Tveit et al., 2006; Sæþórsdóttir, 2010; Sæþórsdóttir and Ólafsson, 2010; Sæþórsdóttir and Saarinen, 2016) however indicates that power plants can potentially bring about a reduction in the quality of nature-based tourist destinations. Moreover, opposition to the construction of power plants seems to be greater in primitive and pristine natural areas (Nadaï and van der Horst, 2010), compared with areas where power plants already exist (Devine-Wright and Batel, 2013; Sæþórsdóttir and Hall, 2018). Research into the interplay between tourism and wind

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farms (e.g. Heiberg et al., 2009; Riddington et al., 2008) further indicates that despite a generally positive perception of wind energy at a national level, negative effects, and accordingly a negative perception of wind farms, tends to persist in their vicinity. Where conflicts have arisen between wind farms and tourism, there has been an emphasis on compensatory action aimed at enhancing tourism, mainly by developing visitor centres and outdoor recreation (e.g. Heiberg et al., 2009; Riddington et al., 2008). Such measures can mean that the side effects of power plants can ultimately bring about a positive impact on local tourism. Nevertheless, an increasing body of research across the world (e.g. Hall et al., 2013; Enevoldsen and Sovacool, 2016; Motosu and Maruyama, 2016; Mostegl et al., 2017) now emphasizes the importance of public participation and the local populations' acceptance of the location of wind farms.

The National Power Company of Iceland (NPCI) (Icel. Landsvirkjun) is currently planning the construction of Iceland's first wind farm, which will entail placing up to 80 wind turbines on the edge of the Icelandic Southern highlands. The project has been given the name *Búrfell Wind Farm* (BWF). The area's significance as regards tourism is reflected, among other things, in the fact that 75% of all registered overnight stays in mountain huts in the Icelandic highlands in the year 2017 were in the Southern highlands (Statistics Iceland, 2018). The proposed wind farm will undeniably transform the appearance of the landscape, and thereby the experience of those travelling through it, both tourists and others. As a result, the BWF will impact tourism, not just in its immediate vicinity, but over a much wider area. According to a survey conducted on behalf of the NPCI (2013), over 80% of Icelanders are in favour of the development of wind power in Iceland. This attitude accords with the positive attitude to renewable energy in general across Europe (Smardon and Pasqualetti, 2016). However, throughout the world the organization and development of wind farms has proven to be a complicated matter, and in many countries it is characterized by conflicts between different stakeholders (Bidwell, 2013; Wolsink, 2007). The attitude of all stakeholders and their consent regarding the positioning and organization of wind farms is likely to be vital to a successful process. This is especially important in open and barren landscapes of the kind that characterizes Iceland, and particularly for the Icelandic tourism industry, whose income is highly reliant on such landscapes.

This paper aims to evaluate the attitudes of local residents and tourism service providers in Southern Iceland towards the proposed BWF, and more generally towards wind turbines in the Icelandic landscape. Furthermore, to critically discuss the causal relation between the landscape and the two stakeholder groups. The study is based on a larger study which evaluated the proposed wind farm's environmental impact assessment (cf. Ólafsdóttir et al., 2015).

2. Social and environmental effects of wind farms

Wind turbines are considered by many to be a positive renewable energy option (e.g. Krohn and Damborg, 1999; Wolsink, 2007; Landry et al., 2012; Smardon and Pasqualetti, 2016). This is especially true in areas where wind turbines replace coal, petroleum and nuclear energy and many perceive them therefore as a positive transformation to a clean energy future (Firestone et al., 2015). This attitude seems however to be gradually changing in step with the upsurge in wind farms over the past decade (e.g. Ladenburg and Dahlgaard, 2012; Molnarova et al., 2011; Wolsink, 2007). The environmental impact of wind turbines is primarily visual, still it encompasses various other effects, such as noise pollution, deforestation, the deterioration of ecosystems, soil erosion, impacts on radio waves and climate change, as well as impacting animal life, especially birds and bats, and marine life where wind farms are sited offshore (e.g. Dai et al., 2015; Lima et al., 2013; Leung and Yang, 2012). Of these environmental impacts of wind turbines, it is the visual impact that has proven the most difficult to assess (Leung and Yang, 2012). Nonetheless, the visual impact is the

environmental factor that affects tourism the most, since the tourist experience primarily consists in tourists' visual perception of the environment through which they travel (Urry, 2002).

Ladenburg (2008) points out that the environmental impact of wind turbines has given rise to extensive debate regarding the positioning of wind farms, and that increasing disputes have made it more difficult to find suitable locations for the development of permanent wind farms. In order to decrease conflicts of interest in relation to wind farm sites on land, placing them offshore has become an increasingly desirable option (Ladenburg, 2010; Haggett, 2011), thus as the harnessing of wind power has increased, more and more countries have decided to locate wind farms offshore. Attitude surveys (i.e. Ladenburg and Möller, 2011; Firestone et al., 2012) have shown that people are generally more positive towards the placing wind farms offshore than on land. According to Ladenburg and Möller (2011) people's attitudes towards a given site are primarily determined by their particular connection to the area in question. Localized, social and historical connections seem to be the principal factors in this respect. It has furthermore been shown (i.e. Knapp and Ladenburg, 2015) that the acceptance of wind power is largely related to the spatial location of wind turbines relative to places of residence. However, researchers do not agree on what factors predominate in the local people's attitudes towards wind farms. Krohn and Damborg (1999) point out that the size of the particular wind farm appears to have little to no effect on the attitude of locals, and as such is not a decisive factor. By contrast, who owns the wind farm seems to be a more significant factor for locals. Accordingly, more recent research (i.e. Haggett, 2008, 2011; Gross, 2007; Jobert et al., 2007; Wong, 2009) demonstrates that small wind farms under local ownership have a much higher level of support among local residents than larger wind farms, which are situated further away but owned by large international corporations. This concurs with Krohn and Damborg (1999) results, which indicate that the attitude of local residents towards wind farms is primarily based on their attitude towards the developer, the planning authorities, and the planning process, all of which emphasizes the importance of the participation of residents in the planning process. Furthermore, their results indicate that a lack of collaboration between the various stakeholders is the main cause of conflicts of interest and the negative attitude of residents towards wind turbines.

Most existing studies that focus on public attitudes towards wind energy projects onshore concentrate on their position in cultural landscapes. The proposed BWF in Iceland will be located at the border of the country's uninhabited interior highlands, one of Europe's largest wilderness areas (e.g. Ólafsdóttir and Runnström, 2011; Sæþórsdóttir, 2014), characterized by vast open landscapes. Wilderness has long been one of the major factors attracting tourists to Iceland (e.g. ITB, 2012; Sæþórsdóttir, 2010, 2013; 2014). It is therefore important to increase our understanding of the attitudes of different stakeholders towards wind farms in such landscapes, as well as the relationship between the landscape and stakeholders' preferences.

3. Material and methods

3.1. Study area

The proposed wind farm will be situated at the edge of Iceland's Southern highlands, an uninhabited area characterized by natural landscape and wilderness. The area surrounding the wind farm comprises rangeland belonging to three municipalities, Rangárþing ytra, Ásahreppur and Skeiða- and Gnúpsverjahreppur (Fig. 1). The edge of the Southern highlands has for a long time held economic significance for the residents of these three municipalities. For several centuries farmers have used the rangelands both for grazing and fishing, while local residents have travelled through the area for recreational purposes. As a result, these local residents have formed a connection with the area. In the vicinity of the proposed wind farm several hydroelectric power plants have been constructed in recent decades. These developments

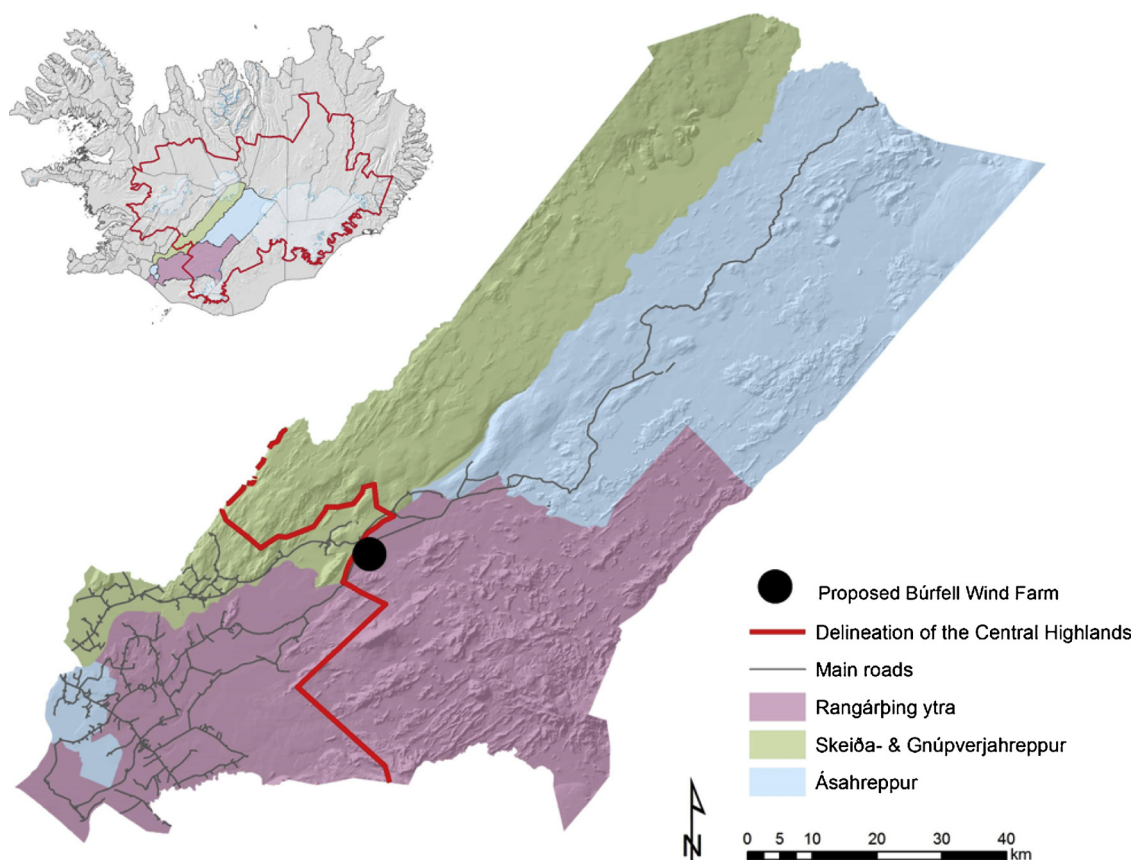


Fig. 1. The location of the Búrfell Wind Farm along with the three adjacent municipalities, and the border demarcating the central highlands of Iceland.

have established a certain tradition for energy production in the area. The first of these power plants, the Búrfell Power Station, was constructed in 1969 (Pálsdóttir, 2005), a development which created access for small and medium-sized vehicles into the Southern highlands. Since then vehicle access has gradually increased, alongside further power plant developments. There are currently six hydroelectric power plants in the area, with accompanying infrastructure including the power station building itself, reservoirs, canals, dams, improved roads, transmission towers and transmission lines. Thus, the construction of the power plants and associated infrastructure has gradually transformed the area's landscape into something far more anthropogenic.

In 2012 the NPCI erected two experimental wind turbines in the area in order to test wind energy utilisation and the turbines' durability in Icelandic conditions (NPCI, 2015). According to the NPCI (2015) the turbines' performance has surpassed all expectations, with an annual average capacity factor of over 40%, which tops the world average capacity factor, estimated to be 21% for the same year (Smil, 2012).

In recent decades the tourism sector in Iceland has been growing rapidly and is now an important industry, not the least in the three aforementioned municipalities. One of the distinguishing features of these three municipalities is their proximity to the edge of the uninhabited interior highlands, and many of the tourists who visit the area stay in local accommodation as a base from which to explore the Southern part of the highlands (e.g. Ólafsdóttir, 2011). More primitive accommodation options exist within the highlands and are used by the large number of tourists who seek out such conditions. Nearly 80% of all registered overnight stays in mountain huts in 2016, corresponding to over 70 thousand overnight stays, were in the Southern highlands (Statistics Iceland, 2018), a statistic which underpins the area's importance as a tourist destination. Two major routes into the Icelandic interior central highlands run through the proposed development area. Many of the most-visited tourist destinations in the Icelandic highlands

are located in their Southern part, such as the geothermal area Landmannalaugar, which has long been the most popular tourist destination in the entire Icelandic highlands (ITB, 2012). The starting or end point of Iceland's most popular long-distance hiking route is situated in Landmannalaugar. As such, many tourists would pass the proposed site of the wind farm on their way into or out of the highlands.

3.2. Questionnaire survey

In order to evaluate the local residents' attitudes towards the proposed BWF and wind turbines in general in the Icelandic landscape, an on-site questionnaire was distributed among the residents of each of the three municipalities. The questionnaire was semi-structured and comprised twenty-seven questions, which were divided into four parts. The first of these concentrated on the residents' use of, knowledge of and connection with the area surrounding the proposed wind farm. The second part focused on their awareness of the proposed plans for the BWF, along with their perception of wind turbines in general in the Icelandic landscape. To better evaluate the perception of the impact of wind turbines in the landscape, some of the questions in this part were supported by photographs. A total of twenty-one photographs taken from different angles in the area surrounding the proposed wind farm were used. Six of the photographs formed three image pairs with and without man-made constructions, such as transmission lines, roads, etc. Into fifteen of the photographs wind turbines had been photoshopped using a raster graphics editor, and these formed seven image pairs with a varying number and size of wind turbines (66 wind turbines at a height of 80 m, compared with 87 wind turbines at a height of 64 m) at two distances, 1.5 km and 4 km, and in differing landscapes. The same photograph series were used in a piece of research on tourists' perception of the proposed BWF, and are further described in Sæþórsdóttir et al. (2017). The third part of the questionnaire focused on energy

consumption in relation to climate change. In the fourth and final part the participants were asked about regional development and the employment situation in their municipality.

To obtain a representative subset of the population in the three municipalities, which consisted of 1773 registered inhabitants aged 18 and over on the 1st of January 2014 (Statistics Iceland, 2015), the questionnaire was distributed on-site. Over half (57%) of the residents live in rural areas, and 43% in urbanised areas (Statistics Iceland, 2015). In the rural areas the questionnaire was distributed to every third farm, where nobody was at home it was given to the next farm, and then the third one thereafter. It was collected a couple of hours later on the same day. In the small towns all major workplaces were visited during the day time and households in the evenings. A total of 178 questionnaires were collected. The collected sample represents well the spatial distribution of the population and has a fairly even gender distribution, with 51% male and 49% female respondents. The average age of respondents was 48 years, the youngest one being 16, and the oldest 85 years old. On average, respondents have lived 28 years in the area, about 15% have lived there for less than five years and equally many have lived there for over 50 years.

The results of the questionnaire were analysed using both descriptive and inferential statistics. For the inferential statistics a *t*-test was used to evaluate whether there is a significant difference between two groups, comprising a one-way analysis of variance (ANOVA) in instances where there were more than two groups. A 5% significance level was applied.

3.3. Interviews

In order to obtain a deeper understanding of local attitudes towards the proposed wind farm, and to assess its potential impact on tourism, semi-structured interviews were conducted with both residents and tourism service providers. In these interviews a map presenting the area of the proposed developments was used, which illustrated the boundaries of the BWF, as well as the six hydroelectric power stations already present in the area surrounding the proposed wind farm (Fig. 2). The interviews were also supported by the same photographs as in the questionnaire.

The total number of interviewees was 39, of which 16 were tourism service providers. The tourism service providers with a vested interest in the impact area of the BWF are both locals who provide services to tourists in the area and operators who bring tourists to the area but whose headquarters are based outside of the three municipalities. Accordingly the tourism service providers were further divided into two groups: local service providers, and service providers based in the capital region. Information regarding tourism service providers operating within the three municipalities was obtained from the municipalities' websites. There proved to be a total of 47 that cover most types of tourism services, i.e. accommodation, restaurants, bus tours, horse riding, adventure tours, and museums. Sixteen representatives who cover the full service spectrum were randomly selected. The interviews were all carried out anonymously and the interviewees were informed of this at the start of the interview. Most of the interviews were carried out in situ, i.e. at the interviewee's home or in the company's reception, which more often than not was the same location. The interviews lasted from 15 to 45 min. They were all recorded with the permission of the interviewee, then transcribed, analysed and categorized according to the aim of the research.

4. Results

4.1. Attitudes of local residents towards the búrfell wind farm

The results show that residents in the three municipalities are generally well acquainted with the area surrounding the proposed BWF. The majority of respondents consider the area to have a natural

appearance (63.2%), to be beautiful (65.9%), clean (76.3%) and quiet (75.0%). It is noteworthy that only 12% experience the area as anthropogenic. Most respondents (72.0%) are familiar with the two experimental wind turbines, and nearly one in every ten residents claim to be able to see them from their home (Table 1). The majority (71.2%) are positive towards them, while less than half (47.5%) are positive towards wind turbines in the Icelandic nature in general, male respondents being significantly ($p < 0.05$) more positive. A large majority (81.6%) furthermore consider wind turbines to be a positive addition to Iceland's energy production. The respondents are however less enthusiastic about the proposed BWF, with one third of the respondents negative towards it (Table 2). Male respondents are significantly ($p < 0.05$) less negative than female respondents. The wavering attitude of residents towards the BWF is highlighted in the interviews. The visual impact of the wind turbines seems to be the principal cause of uneasiness among residents, while the potential for noise pollution is also a cause for concern for many. Nonetheless, three out of every four respondents are of the opinion that the BWF will not have a decisive impact on their travel through the area. Still, most of the interviewees state that they would prefer the wind farm to be located closer to the site of the existing hydropower plants instead of the proposed area, which they regard as still being relatively unspoilt.

The results of the photographic survey demonstrate that there is a significant difference in the attitudes of residents towards the beauty of a given landscape with and without anthropogenic infrastructures, such as canals, transmission towers and roads, with landscapes without infrastructure being considered more beautiful than the same landscapes with infrastructure. Moreover, the results show that residents consider the most negative aspect of wind turbines to be if they were to block their view of the surrounding mountains, especially the view of the area's most scenic mountains, i.e. the Hekla volcano (Fig. 3) and Búrfell (Fig. 4). There is not a significant difference in the attitude of respondents to the different proposed heights of the wind turbines, i.e. between 64 m and 80 m. The same goes for the number of wind turbines on a wind farm, i.e. 66 versus 87 wind turbines. Instead the results indicate that it is the proximity to the wind turbines, both single wind turbines and wind farms, which is the most significant aspect for the residents. The interviewees have different opinions on how much a wind farm might affect their experience of the area. Consistent with the results of the questionnaire most interviewees consider it most negative if the wind farm were to obscure the view of the mountains, especially Hekla. One interviewee describes many people's views when saying:

My experience of this would be very negative. It disturbs me if I can't look at the mountains except through wind turbine fences. Others are more negative: I think this just does not fit into this landscape, this is Icelandic landscape and I can't picture this. While others are not at all concerned about wind turbines in the proposed area: I think this in itself is okay ... the area is kind of much disturbed.

4.2. Attitudes of tourism service providers towards the proposed Búrfell Wind Farm

The uniqueness of the area to the north and east of the proposed wind farm, according to the tourism industry, consists primarily in: i) its location at the edge of the Icelandic uninhabited interior highlands, which makes it an entrance point into the highlands; ii) its location at the foot of Mt. Hekla, which in and of itself is a great attraction for tourists, and as such represents great value for the industry; and iii) its wild and wasteland appearance, which is regarded by tourism service providers as one of Iceland's defining features and a significant tourism resource. All of the tourism service providers who were interviewed emphasized that exposure to *unspoilt nature* is the experience sought by their clients. In their opinion the main attraction of the area is the magnificence of the Icelandic landscape and the surroundings provided by the pristine appearance of Icelandic wilderness. Or as one

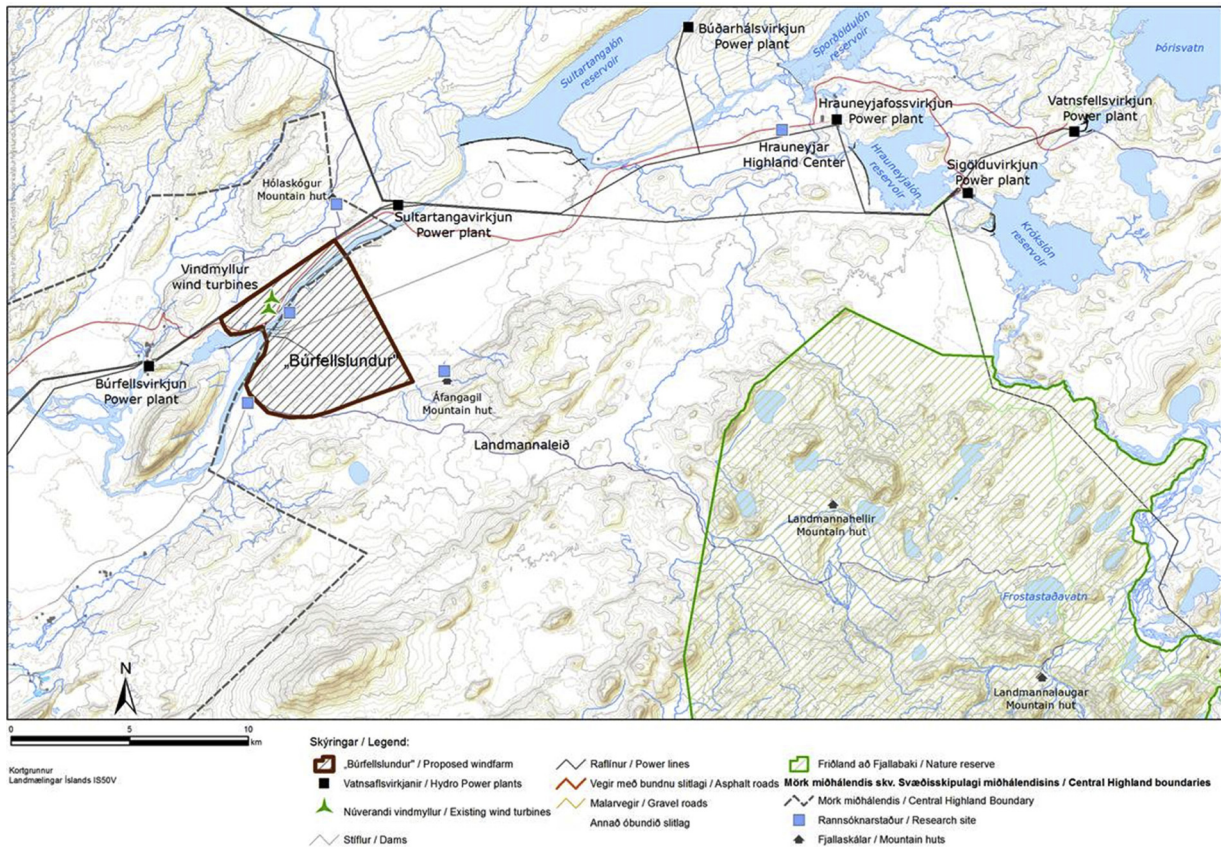


Fig. 2. Map of the proposed wind farm development used in the interviews, which also indicates (with black squares) the location of the six existing hydroelectric power stations (Obtained from: Ólafsdóttir et al., 2015).

interviewee stated:

This, of course is the entrance into the highlands, that is its speciality, this is the only way you can drive. [...] When you come where the wind turbines are [the two experimental ones] then you are suddenly watching over such a wasteland and you start to see such a typical Icelandic desert. Then when you continue to drive to Landmannalaugar you experience one of the many oasis in the desert.

Hence, in general, the tourism service providers, both locals and the others, are of the opinion that, since the area borders the Icelandic interior highlands, it forms a part of a larger total area, i.e. the Southern highlands.

The tourism service providers consider it unlikely that the BWF will have a decisive impact on the travel routes of the companies that currently utilize the area, and point out that the power plant developments that have already taken place in the highlands have, in their opinion, not drastically impacted the tourism industry. Conversely, they consider it likely that 80 wind turbines will impact the experience of tourists passing through the area. Much like the residents, they disapprove of the proposed location of the BWF, and particularly how far east the wind farm would extend. In the view of most tourism service providers the area east of the proposed wind farm is characterized by a wilderness appearance, and the majority feel that this would be lost if the wind farm becomes a reality in the proposed development area:

I feel that the area is far too big [...]. And I find this very negative if this is to be the case, as if the wind turbines were to be a landmark on the highlands; I don't like it, not if they are going to spread it here. Just because more and less all of our guests that come here in the summer are on their way to Landmannalaugar. This is such a large area, I did not realize it, I would be afraid of this [...]. This is

the highlands' most popular tourist route.

This location on these 80 wind turbines, we are talking about the highlands of Iceland on the one hand, and on the other hand this pristine nature and the feeling one can experience when one comes up into the highlands, then one will be facing this, welcome to the highlands here are 80 wind turbines. I don't want to see them in this area. We are not opposed to wind turbines in general and the utilization of our natural resources and wind turbines have many very positive sides, positive uses of this resource and produce a lot of energy, but it must be possible to find them another location here in this country.

Thus, the tourism sector considers that it should be taken into account, which would mean finding a more convenient location for the wind farm where the wind turbines would not be located on a major tourist route. Moreover, many tourism service providers are concerned that the light pollution from the wind turbines will have a detrimental effect on the experience of tourists, particularly on northern light tours, which have proven to be one of the most important extensions of winter tourism in the area.

The results from the photographic survey furthermore reveal that the number and size of wind turbines on a wind farm are not decisive factors in shaping the attitude of tourism service providers. Conversely, the proximity to the wind turbines, and that the wind farm blends into the landscape as much as possible, appear to be pivotal factors. This concurs with the tourism sector's emphasis on the importance of unspoiled nature and wilderness appearance for the industry.

Table 1
Residents' perception and knowledge of the proposed area.

Variable	Percent	N
Knowledge of the proposed area		178
• Very good	27,5	
• Good	33,7	
• Neutral	18,5	
• Little	13,5	
• Very little	6,7	
Cleaness		156
• Very clean	40,4	
• Clean	35,9	
• Neutral	22,4	
• Messy	1,3	
• Very messy	0,0	
Quietude		152
• Very quiet	40,1	
• Quiet	34,9	
• Neutral	25,0	
• Noisy	0,0	
• Very noisy	0,0	
Beauty		158
• Very beautiful	41,8	
• Beautiful	24,1	
• Neutral	30,4	
• Ugly	3,2	
• Very ugly	0,6	
Natural appearance		163
• Very natural	36,2	
• Natural	27,0	
• Neutral	24,5	
• Anthropogenic	9,2	
• Very anthropogenic	3,1	
Familiar with the two experimental turbines in the proposed area (Yes/No)	72,0 / 28,0	175
Able to see them from their home (Yes/No)	8,6 / 90,9	175



Fig. 3. Mt. Hekla, seen from the mountain road towards Landmannalaugar (Photograph Rannveig Ólafsdóttir).



Fig. 4. Mt. Búrfell, seen from the north (Photograph Rannveig Ólafsdóttir).

5. Discussion and conclusions

5.1. Causal relation between landscape, residents and tourism

It has been pointed out that tourism and energy production are by nature dissimilar industries that are both founded on the utilisation of nature, yet each brings about a different connection between people and their environment (Ólafsdóttir, 2009; Sæþórsdóttir and Saarinen, 2016). This difference of connection is partly reflected in the results of this research.

The connection between residents and the area is especially apparent in its use as highland pasture and the residents' romantic image of highland pasture lands that historically have been characterized by

wilderness, barrenness and tranquillity. This image seems to persist despite the arrival of the infrastructure that has accompanied the increasing energy production in the area. The connection of the tourism industry with the area is distinct, since the industry is selling a certain image, namely the image of unspoilt nature and wilderness. This is reflected in the attitude of all the tourism service providers who were interviewed. Hence, the tourism service providers benefit from the area managing to retain these qualities, and for the time being tourism service providers consider that the area east of the proposed BWF continues to do so (Fig. 5). However, considering the number of constructions already present in the area it may only be a matter of time before the appearance of the area deviates so far from what is considered 'natural' that tourists, tourism service providers, and locals start to experience it as primarily anthropogenic. It is clear that the area is situated at a point of transition not only between the highlands and the lowlands, but also between visibly anthropogenic and natural landscape. If this point is passed, tourism in the area is likely to change and different target groups will start visiting the area – groups that will have a different connection to the landscape, and likewise different planning and management requirements. This is supported by recent research (i.e. Ólafsdóttir and Haraldsson, 2019; Haraldsson and Ólafsdóttir, 2018), which demonstrate the dynamic of sustainable thresholds in nature tourism destinations. Such transition will bring with it

Table 2
Residents' perception towards Búrfell Wind Farm and wind turbines in general in the Icelandic landscape.

Residents' perception towards:	Very positive	Positive	Neutral	Negative	Very negative	Mean*	Stdev.
The two existing experimental turbines	42,4	28,8	16,5	8,8	3,5	3,98	1,13
Wind turbines in the Icelandic central highlands	27,6	27,6	16,6	14,1	14,1	3,40	1,39
Wind turbines in Icelandic nature	21,0	26,5	24,1	17,9	10,5	3,30	1,29
Búrfell Wind Farm	25,9	18,8	20,0	11,8	23,5	3,12	1,51
Residents' opinion on following statements:	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean*	Stdev.
Wind turbines are positive addition to Iceland's energy production	27,8	53,8	11,8	3,0	3,6	3,99	0,92
Wind turbines should be prohibited in national parks and areas under nature protection	46,2	27,5	11,1	7,6	7,6	3,97	1,25
I prefer to see wind turbines in the lowlands rather than in the uninhabited highlands	12,0	24,0	32,3	18,6	13,2	3,03	1,20
Ten wind farms with 10 wind turbines are more preferable than one wind farm with 100 wind turbines	6,3	24,1	41,8	19,0	8,9	3,00	1,02
I prefer to see wind turbines in agricultural areas rather than in the wilderness areas	7,8	19,9	27,1	26,5	18,7	2,72	1,21
Wind turbines are undesirable in the Icelandic landscapes	13,2	8,6	24,1	33,9	20,1	2,61	1,27
Wind turbines increase the attraction of an area for tourism	5,4	12,0	28,9	25,9	27,7	2,42	1,17

* Means based on a five-point Likert scale where 1 = Very negative/Strongly disagree → 5 = Very positive/Strongly agree.

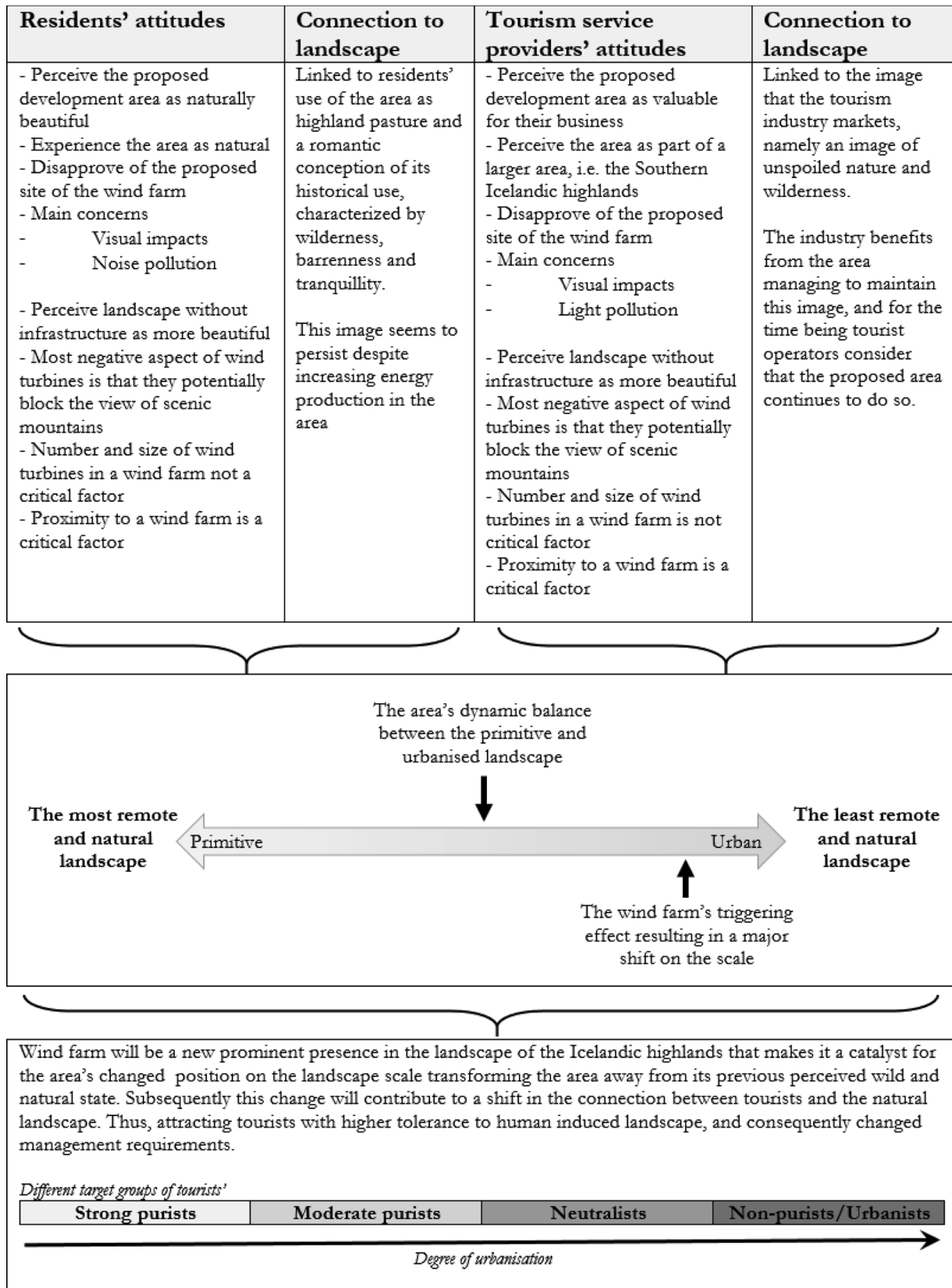


Fig. 5. The causal relation between attitudes towards and experiences of landscape, and the proposed area dynamic position in the primitive – urbanised landscape scale.

opportunities for developing a form of tourism that is distinct from that presently operated in the area. The tourism currently operated in the area, which is founded on tourists' experience of the wilderness, will not thrive in an area which contains a wind farm.

5.2. Wind farms and tourism at the edge of the Icelandic highlands

Both residents and tourism service providers are generally positive towards wind power, as they consider that such an alternative source of energy is keeping with contemporary environmental demands for green energy. This is in line with research on the attitude of the public towards wind turbines in areas where only a small number of wind turbines currently exist (e.g. Wolsink, 2007; Krohn and Damborg, 1999; Landry et al., 2012; Firestone et al., 2015). In step with the proliferation of wind farms, however, the attitude of the public towards wind turbines is becoming more negative (e.g. Ladenburg and Dahlgaard, 2012; Molnarova et al., 2011; Wolsink, 2007). Leung and Yang (2012) point out that the environmental aspect which the various stakeholders find most difficult to agree upon is the visual impact of wind turbines. This assertion is supported by the present study.

The results of this research demonstrate that there is not a substantial difference between attitudes of residents and tourism service providers to different numbers and heights of wind turbines on wind farms. This is in accordance with the results presented by Krohn and Damborg (1999), which demonstrate that the size of a wind farm has little impact on the attitude of locals. On the contrary, the results underline that it is the proximity to wind turbines, both single wind turbines and wind farms, which is the most significant aspect for residents as well as tourism service providers. This indicates that distance is a controlling variable for visibility of wind turbines, and especially wind farms. Nevertheless, the factor of most considerable significance to both residents and tourism service providers is the visual impact of wind turbines. The most negative aspect of wind turbines, in the opinion of these stakeholders, is that they have the potential to obstruct the view of the area's most scenic mountains. This highlights the significance of vast, open landscapes for Icelanders (e.g. Árnason, 2005), and likewise the importance of the country's wild appearance for the tourism industry's marketing efforts (cf. Sæþórsdóttir and Karlsdóttir, 2009; Sæþórsdóttir and Stefánsson, 2017; Sæþórsdóttir and Hall, 2019). Locating a wind farm on the edge of the uninhabited central highlands does not fit in with such marketing. The tourism service providers therefore consider it incompatible with the experience sought by tourists who travel through the Icelandic highlands. This view is supported by the results of a questionnaire conducted among tourists in the area, which indicates that over 80% of tourists consider wilderness to form a part of the appeal of the area surrounding the proposed wind farm (Sæþórsdóttir et al., 2015). The Icelandic wilderness has, for a long time, been employed in the marketing of Iceland as a tourist destination, and a large body of research demonstrates that wilderness plays a vital role for Icelandic tourism (e.g. Sæþórsdóttir, 2014; Sæþórsdóttir and Saarinen, 2016; Sæþórsdóttir and Hall, 2019). An assessment of the Icelandic wilderness indicates that these resources have been diminishing over the past decades (Ólafsdóttir et al., 2015; Ólafsdóttir and Runnström, 2011). It is thus imperative for Icelandic tourism to preserve the wilderness appearance of the country's highlands, and the border areas of its central highlands play an important part in this respect. It has been demonstrated (i.e. Cságyoly et al., 2017; Hendee et al., 1990; Lesslie et al., 1991) that the development of anthropogenic features in areas bordering wilderness areas impact the wilderness experience of tourists, since the quality of wilderness diminishes when the total area of wilderness is reduced in one way or another. Notwithstanding the fact that the area surrounding the proposed BWF is in many ways already artificial, the results of this research, as well as research into the attitudes of tourists in the area (i.e. Sæþórsdóttir and Hall, 2018; Sæþórsdóttir et al., 2015), demonstrate that most tourists still experience the area primarily as wilderness.

Nonetheless, it is difficult to estimate how many constructions can be added to the area without altering this experience.

Research into the impact of wind farms on tourism outside of Iceland has shown that wind farms have not resulted in a reduction in numbers of tourists on a national level (i.e. Heiberg et al., 2009; Riddington et al., 2008). However, recent research (i.e. Sæþórsdóttir, 2013; Haraldsson and Ólafsdóttir, 2018; Tverijonaite et al., 2018; Ólafsdóttir and Sæþórsdóttir, 2018) stresses that the tourist demographic changes in step with the abundance of artificial elements, from purist tourists, who seek pristine experiences, to mass tourists. Additionally, the connection between tourists and the landscape changes (cf. Fig. 5).

5.3. Conclusions

The landscape of the proposed development area has been gradually changing for the past five decades. Alongside the construction of an increasing number of hydroelectric power plants, the landscape of the area has become more anthropogenic. As such, the plans for the construction of Iceland's first wind farm comprising up to 80 wind turbines are a concern in an area that is already artificial. Nevertheless, wind turbines are a new and prominent presence in the Icelandic landscape that will make the landscape surrounding the proposed development area more artificial, and artificial in a different respect, than is presently the case. The proposed wind farm will thus transform the appearance of the area from natural to man-made, and thereby also transform both the residents and visitors' experience of it.

The following concluding remarks may be drawn from this study:

- Both residents and tourism service providers are positive towards wind energy and wind turbines in general, but less enthusiastic about a wind farm.
- Pivotal factors for both stakeholder groups attitude towards the proposed Búrfell Wind Farm is its location. Visual impact of wind turbines as well as the proximity to the wind turbines is the most significant aspect for both groups.
- The connection between residents and the area of the proposed Búrfell Wind Farm is evident through its usage as highland pasture and their image of highland pasture lands, which have been characterized throughout the years by wilderness and wasteland quietness. This image seems to remain despite the infrastructure that has accompanied the ever increasing energy production in the area.
- The connection of the tourism industry with the area is shaped by the fact that the industry is selling an image, that of unspoiled nature and wilderness, which is reflected in the attitude of tourism service providers. They benefit from the area managing to uphold these standards.
- The comparative advantage of Iceland as a tourist destination is founded on its diverse, unique and relatively unspoiled nature, which is seen as a desirable natural resource according to the international standards of nature tourism. Wind turbines would be a new form in the Icelandic landscape, especially the country's uninhabited central highlands. A wind farm might thus be a triggering factor transforming the still wild appearance of the Icelandic Southern highlands from natural to anthropogenic. Consequently, the area will attract different types of tourist groups – groups that will have a dissimilar connection to the landscape, and thus different planning as well as management requirements.
- Therefore the choice of a site of development resulting in such great landscape change as a wind farm in a wilderness area, has to be based on social acceptance. It is likewise critical that community planners and decision-makers listen to the locals and decisively activate their participation in land use planning which is the core element necessary to ensure sustainable management of natural resources.

Declaration of Competing Interest

No conflicts of interest were reported.

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