



Identifying and assessing the potential for conflict between landscape values and development preferences on the Faroe Islands



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ABSTRACT

Small islands are characterised by geographic isolation, strong place attachment, and vulnerabilities to social, economic, and ecological changes. They are often subject to development activities that raise concerns about impacts on multiple land- and seascape values. This study elicits a range of land- and seascape values, development preferences, and land-use conflicts in a Northern Atlantic islands setting. We do so by linking participatory mapping with narrative analysis techniques to elicit landscape values and development preferences and to identify the potential for land-use conflicts. Four narratives were illustrative of human-nature relationships in the North Atlantic, revealing a great appreciation for wildlife and landforms, for peaceful and undisturbed ecosystems, for open access to land and sea, and for people being part of nature as major themes. The overlay of mapped landscape values and development preferences identified areas with a high potential for future land-use conflicts. Tourism development had a particularly high potential for conflicts. The local narratives on development activities – tourism, renewable energy, and fish farming/processing – confirmed diverging viewpoints. Respondents acknowledged the need for new economic opportunities that may create employment and wealth, but were concerned about negative effects for nature and society and the perceived inability to govern these developments. We argue that planning for multiple landscape values and preferences is crucial to manage the potential for trade-offs in land- and seascape development that is influenced by a range of pressures and drivers of change.

1. Introduction

Small islands in the North Atlantic (e.g., Faroe Islands, Shetland, Lofoten) (c.f. Baldacchino and Milne, 2000) are closely coupled social-ecological systems that have discrete boundaries (Martín-López et al., 2017) and display particular human-nature relationships (Flint et al., 2013). These relationships are formed by characteristics of geographic isolation, place attachment, and vulnerabilities (Ankre and Nilsson, 2016; Kaltenborn et al., 2017a). Given these particularities, small islands have often been considered as iconic sites, with lessons to be learnt for interactions between human society and the environment as a whole (Kelman, 2007; Renes, 2014).

Geographic isolation implies that small island societies have traditionally relied on local ecosystem services of the land and the sea. In the past and in part until today, many islands had very intensive forms of subsistence agriculture and extremely small-scale field patterns. Often, crop cultivation has been carried out on sites that would be considered too marginal for agriculture elsewhere. Marine and coastal ecosystem services (in particular, fish stocks) typically complemented agriculture and acted as a safety valve (Renes, 2014). At the same time, small islands are connected to the outer world by trade, although they often suffer from competitive disadvantage because of lesser economies of scale and longer transport times. Also, they are strongly dependent on relationships and support from mainland policies and economies

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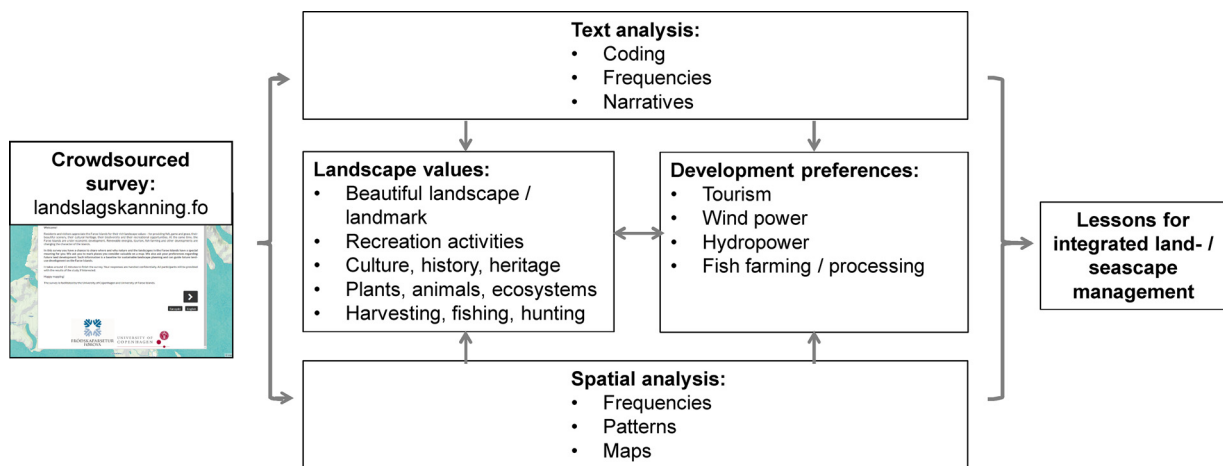


Fig. 1. Crowdsourced approach to assessing landscape values and development options established in this study.

(Kaltenborn et al., 2017a).

In small island communities, isolation and dependence on local ecosystem services typically create high levels of place attachment (Williams and Vaske, 2003) and sense of community (Vallega, 2007). The values derived from the relationship to and the responsibility for nature termed cultural (Bieling et al., 2014) or relational values (Chan et al., 2016) play an important role. Relational values are inclusive and responsive to known aspects of well-being, particularly when addressing how people make decisions and what they care about (Klain et al., 2017). In many situations, these values are stronger than purely utilitarian/economic motivations (Kaltenborn et al., 2017a; Plieninger et al., 2015). In the islands of the North Atlantic, cultural values result from intimate engagement with land and sea through practices and knowledge formed for example around animal husbandry, fishing, harvesting of edible wild plants, or hunting of seabirds, whales, and other wildlife (Vergunst, 2012). Complex rules regulating access to natural resources (including land divisions, usage rights, and land ownership) and comprehensive landscape modifications (e.g., development of infield/outfield systems, soil augmentation) yield evidence that relational values to the land and the sea have evolved over long time scales (Edwards, 2005; Thorsteinsson, 2008).

Being exposed to a harsh and fragile environment, to economic dependence on fishing, and to often poor adaptive capacity, small island communities in the North Atlantic are vulnerable to social, economic, and ecological changes (Brewington, 2016; Guillotreau et al., 2012). Resource depletion (e.g., through overfishing) easily translates into unemployment and business failures, followed by outmigration and substantial changes in the size and composition of island populations (Hamilton et al., 2004). Today, many small islands are particularly impacted by pressures of global environmental change (such as changing climate, rising demand for natural resources, and growing dependence on public support), making them “frontiers of future change, conflict, and opportunity” (Kaltenborn et al., 2017b, p. 29).

Several public policies and private initiatives promote responses to these social-ecological challenges under the umbrellas of “marine spatial planning” (Domínguez-Tejo et al., 2016), “integrated coastal zone management” (Portman et al., 2012), and “integrated landscape management” (Sayer et al., 2013). Integrated management approaches support conservation and restoration of biodiversity, the sustainable extraction of natural resources, the protection of critical ecosystem functions, and improvement of livelihoods as joint objectives in land- and seascapes rather than dealing with them in isolation (García-Martín et al., 2016). Integration of management across sectors, levels of government, uses, stakeholders, and spatial and temporal scales is at their core (Portman et al., 2012). Implementing such approaches requires a profound spatial understanding of the cultural values and conflicts that

people perceive (Gee et al., 2017; Martin et al., 2016). Several qualitative and quantitative methods have been developed to reveal such values and conflicts at land-/seascape level, for example freelifting (Bieling et al., 2014), monetary valuation (Ruiz-Frau et al., 2013), or culturonomics (content analysis of large digital text bodies) (Ladle et al., 2016). Public Participation Geographic Information Systems (PPGIS) have been particularly widely used as they allow putting cultural values on a map (Brown and Fagerholm, 2015).

Here, we link participatory mapping with the use of narratives as a way to inform integrated management of land- and seascapes and to enable a more socially inclusive approach to landscape valuation (Raymond et al., 2014). We aim to identify the potential for conflict between a range of landscape values and development preferences at the scale of an island nation, the Faroe Islands in the North Atlantic. Our specific goals are: a) to reveal spatial patterns and underlying narratives of landscape values in a remote island setting; b) to elicit spatial patterns and underlying narratives of development preferences and the potential for land-use conflicts. Our approach combines quantitative PPGIS and qualitative narrative analysis to gain a both spatially explicit and thematically deep understanding. We expand current qualitative and quantitative analysis of landscape values and ecosystem services by using the same methods for eliciting development options and potential for land-use conflict. Also, we test a crowdsourced form of an online survey at the scale of a small nation, which has been rarely performed in landscape value or ecosystem services assessments (Brown and Fagerholm, 2015). We argue that such approach can inform both the advancement of PPGIS science and public policies toward integrated land-/seascape management on remote islands (Fig. 1). The Faroe Islands provide an understudied yet unique context for illustrating small islands as social-ecological systems with the properties of geographic isolation, place attachment, and vulnerability. Being one of the most fisheries-dependent national economies in the world (Hamilton et al., 2004), the Faroe islands have during the last decades undergone a period of rapid economic development and diversification (tourism, renewable energy, fish farming/processing) that challenges environmental integrity, cultural values, and spatial planning practices.

2. Land- and seascape development on the Faroe Islands

2.1. Study area

The Faroe Islands are located half-way between Scotland, Iceland and Norway, centred on 62°N and 7°W (Fig. 2). The archipelago consists of 18 islands that can be classified into six socially and ecologically distinct regions (see Appendix A for a characterisation). The total area is 1399 km² and the population is 49,864 (2017). The islands are

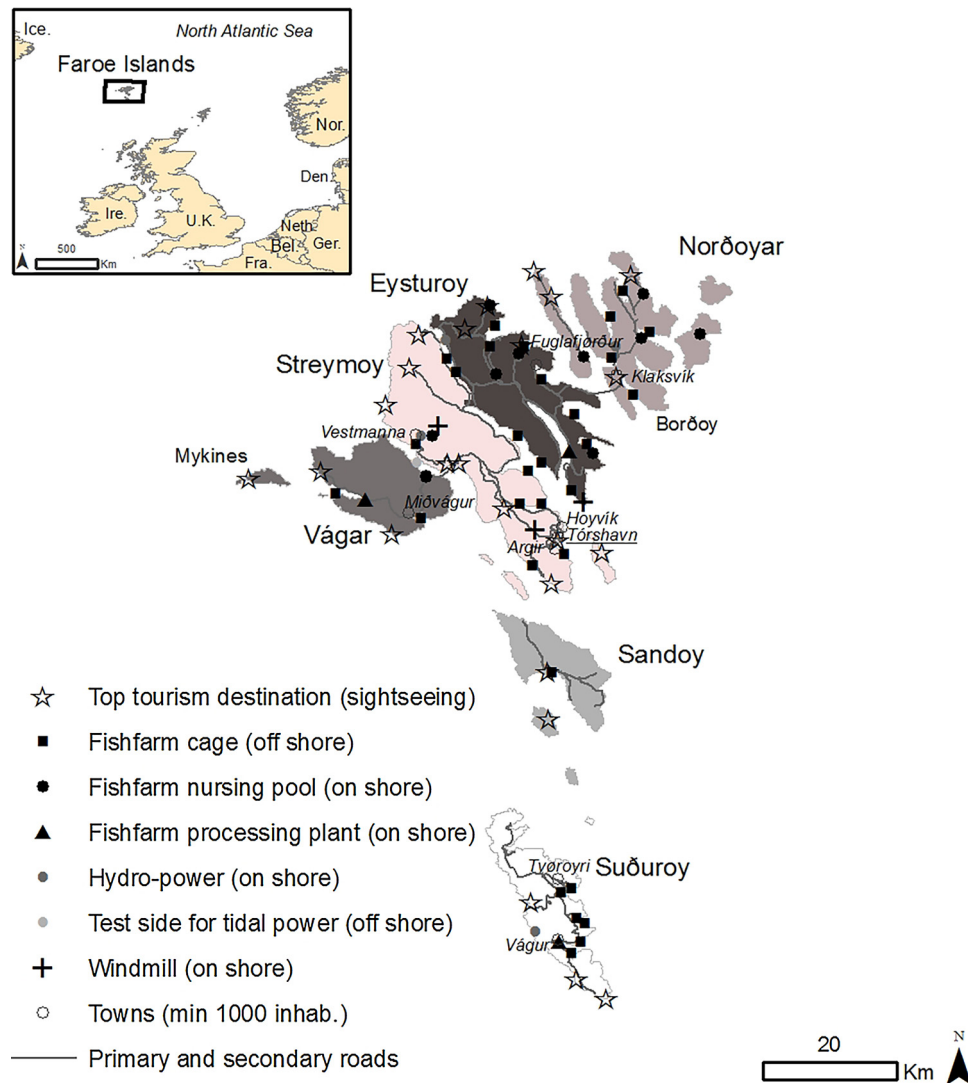


Fig. 2. Location of the Faroe Islands in the North Atlantic, specifying current hotspots of land- and seascape development. Sources: own data, kortal.fo, visitfaroeislands.com.

mainly comprised of basalt of volcanic origin. The western and northern shorelines of the islands are characterised by spectacular, precipitous cliffs. The inland terrain comprises valleys, mountain ridges, and upland hills. The climate is pronouncedly oceanic, with a mean temperature of 4 °C during the coldest months (January, February) and 11 °C during the warmest month (July). Mean annual precipitation varies locally (823–3261 mm), and fog or strong winds frequently prevail (Cappelen and Laursen, 1998). Villages typically consist of a small, densely built-up area with adjoining cultivated infields (mostly used for haymaking) that are separated from the surrounding outfields (mostly used as grazing land) by stonewalls or other kinds of fences.

2.2. Tourism

Tourists visit the Faroe Islands primarily for their remarkable nature and have been characterised as “globetrotters” (22%), “nature lovers” (14%), “sightseers” (11%), and “culture lovers” (9%) (Visit Faroe Islands, 2017). The tourist season begins in May and ends in September. To broaden the economic base, Faroes authorities have improved tourist facilities since 2013, and tourism has become an important and continuously growing industry. The number of overnight stays has increased by 21% from 2013 to 2016. Tourists purchased products and

services for 89 million € in 2015, which is a 60% increase compared to 2011 and corresponds to 1.4% of the gross domestic product (GDP) (Visit Faroe Islands, 2017). In 2016, 701 people (2.7% of all employees) worked in hotels and restaurants (Statistics Faroe Islands, 2017).

2.3. Renewable energy

Electricity on the Faroe Islands is supplied by the municipality-owned company SEV. In 2016, the total electricity production was 317 GWh, an increase by 16% compared to 2011. Fifty percent was generated from oil, 34% from water, and 16% from wind energy (the latter having increased by 11% since 2011) (SEV, 2017). SEV aims to produce 100% renewable electricity by 2030 (SEV, 2017). Currently, there are six hydropower plants and three windmill parks on the islands (Fig. 2). Additional windmills are planned for the near future.

2.4. Fish farming/processing

Faroese aquaculture industry, which started at the beginning of 1980s, is mainly based on Atlantic salmon (*Salmo salar*). Salmon farming takes place in three stages: a) Hatcheries and smolt (juvenile salmon) are produced in fresh water tanks on land (first 12–15 months); b) Smolt are transferred to and kept in floating sea cages located in the

fjords around in the Faroes Islands (months 12–28); and c) Afterwards they are harvested and processed on land-based factories. Salmon-farming is run by three companies that have a total of 10 hatcheries, sea cages in 32 fjord-sites, and 3 processing factories (Fig. 2). While the harvest of salmon was 14,484 t in 1996, it had increased to 68,271 t in 2016, comprising 47% of the total Faroese export value (Statistics Faroe Islands, 2017). In 2016, 1072 people (4.3% of all employees) were employed in aquaculture (Statistics Faroe Islands, 2017).

3. Methods

3.1. Categories of landscape values and development preferences

We developed a participatory mapping survey that included five categories of landscape values and four different development preferences. Respondents were asked about the spatial location of these landscape values and development preferences. After intensive discussion with local residents and experts, we considered 1) Beauty of landscapes/landmarks; 2) Recreation activities; 3) Culture, history, heritage; 4) Plants, animals, ecosystems; and 5) Harvesting of wild plants, fishing, hunting as the most meaningful place-based landscape values perceived by residents. The following development preferences were covered in the survey: 1) Tourism development; 2) Wind power development; 3) Hydropower development; and 4) Fish farming/processing development. The selection of the development preferences was based on a review of policy documents and media coverage on the Faroe Islands. For the assessment of landscape values, we formulated indicator statements such as “I value these places because they provide recreational opportunities (e.g., hiking, sailing, biking)” (for recreation activities). Typical indicator questions for development preferences were “Please mark areas/places where you believe that tourism development could occur” and “Please mark areas/places where you believe that tourism development should NOT occur” (for tourism development). In addition, the survey included open questions. Firstly, respondents were asked to share the values that they most enjoy from the Faroese landscapes. Secondly, they were requested to express two to three of their main visions and concerns about the future development of tourism, renewable energy, and fish farming/processing. The survey also covered socio-demographic characteristics. It was pretested among twelve local residents in May 2017.

3.2. Sampling strategy

Our survey covered full- or part-time local residents who were recruited through crowdsourced sampling. This was done by setting up a website (landslagskanning.fo – in English: “landscape survey”) that was promoted through a Facebook site; by sending information to newspapers, other media sites, and numerous Facebook groups; and by participating twice in a live show of the National Faroese Radio. Data collection was carried out between June and September 2017 through a web-based PPGIS survey (<https://app.maptionnaire.com/en/2840>) in Faroese and English language. In total, 765 respondents participated in the survey (417 also providing socio-demographic information). The vast majority (89.5%) were full-time residents of the Faroe Islands. We performed a post-hoc analysis of the representativeness of our sample (see Appendix B and discussion).

3.3. Spatial analyses

We analysed the frequency and distribution of each mapped landscape value and development preference separately for the six island regions (and the surrounding ocean) through descriptive statistics and Chi-square tests for significant associations. With a statistically significant Chi-square finding, we used standardised residuals to identify the categorical source(s) of the significant association. A residual quantifies the difference in the observed frequency and expected

frequency, in this case of PPGIS points located within the regional polygons. The PPGIS point counts falling within each polygon were expressed as a percentage of the total points. Expected point counts generated from the percent of total area within the Faroe Islands occupied by each polygon were used to calculate the standardized residual scores. Residuals greater than 2.0 or less than -2.0 indicate that a given response category is significantly over- or under-represented. Standardized residuals falling in the range -2.0 to $+2.0$ may be suggestive of under- or over-representation, but are not statistically meaningful.

We produced density surfaces from the point layers by using quadratic Kernel function (Silverman, 1986) that formed the basis for visualizing our findings in maps. Kernel density heatmaps were created using the following parameter settings (the selection of which was based on the mapping scale used and on the nature of the mapped landscape values and development preferences): cell size = 300 m, search radius = 2000 m. The maps were classified according to geometrical intervals (5 classes). The spatial arrangement (i.e., clustering or random distribution of points) of the point layers within each landscape value type were then investigated through nearest neighbour statistics (NN). NN statistics express the Euclidian distance between each point and its nearest neighbours and divide this with the distance in a hypothetical randomly distributed point layer (Ebdon, 1985). A NN ratio below 1 indicates spatial clustering and one greater than 1 dispersion. z-scores are standard deviations. Small p-values combined with a very high or a very low z-score indicate that there is statistically significant spatial clustering or dispersion. Finally, mean distances to 1) the nearest coastline, 2) respondents homes, 3) main settlements (defined as all towns and villages with > 1000 inhabitants), 4) primary and secondary roads, and 5) development hotspots were calculated for each indicator. Data sources were: 1), 3) and 4): Open Street Map, 2): Homes as mapped by participants (n = 337), 5) see Fig. 2. ArcGIS 10.5 and R for Windows 2.14.2 were used for all spatial and statistical analyses.

We used weighted preference scores to examine the potential for conflict between supporting and opposing (no) development preference points relating to tourism development, wind power development, hydropower development, and fish farm development. A preference score was generated for each sampling grid cell. In each cell, the number of opposing development preferences was subtracted from acceptable preferences. We then represented this difference as a ratio between 0 and 1 whereby values of 1 represent the highest potential for preference disagreement (conflict) whereas values toward 0 represent the highest level of agreement. In the ratio, the smallest number of the supporting or opposing land use preferences becomes the numerator in the ratio while the largest number becomes the denominator. The numerator is set to a value of 0.1 to handle the case where the numerator preference may be 0. We then weighted this preference score by the number of total mapped preferences (both supporting and opposing) found within each sampling grid cell. To enable comparison between the distributions of conflict across development types, we translated these weighted preference scores into a standard deviation distribution, which shows how each conflict scores varies from one standard deviation from the mean. Class breaks were created with equal value ranges that are a proportion of the standard deviation. Land-use conflict is higher in cells where more preferences were expressed because the activity in that area is more frequently mapped by study participants (Brown and Raymond, 2014).

3.4. Analysis of narratives

Responses to open survey questions were translated from Faroese to English. They were then manually coded through inductive content analysis in a data table (Excel) to identify different landscape values and concerns or visions related to each of the mapped development preference. Landscape values were classified according to same five

categories that had also been used in the PPGIS survey. A sixth category “Other landscape values” was added. Development preferences were coded by listing all concerns and visions mentioned by respondents. Each response was classified into one (or more) subcategories that we developed inductively.

Alongside the content analysis (i.e., the coding process), an iterative process of in-depth reading through the responses was done to establish specific narratives (Fraser, 2004) that emerged from the responses. These narratives were identified separately for the landscape value responses and for each development preference (i.e., tourism, renewable energy, and fish farming). The narratives were constructed by identifying discrete segments in the textual responses (i.e., descriptions and argumentation of how events are experienced and the values and opinions attached to them) that link to a specific topic (Bontje and Slinger, 2017). During the iterative reading process, we coded each response that supported one (or more) of the identified narratives. We performed our analysis by immersing ourselves into the responses by reading and re-reading them and thus identifying “patterns, sequences, and themes” (Wilmer and Fernández-Giménez, 2016, p. 152). In the process of re-reading, these themes were broadened or condensed to four core narratives of landscape values and two core narratives for each development option. Details on the documentation of the responses are provided in Appendix C.

4. Results

4.1. Mapping of landscape values

In our spatial analysis, beautiful landscapes / landmarks were by far the most frequently mapped landscape values (44.4% out of 6129 mapped sites in total), followed by recreation activities (19.6%); culture, history, heritage (16.7%); plants, animals, ecosystems (9.9%); and harvesting, fishing, hunting (9.4%) (Appendix D). These values were not assigned equally across regions of the Faroe Islands (Fig. 3). For example, high densities of points for beautiful landscape/landmark were found around the capital Tórshavn and in some of the well-known tourism hotspots such as Mykines, Western Vágar, and the Northern parts of Eysturoy and Streymoy – typically outer coastal areas with spectacular cliffs and high mountain scenery. Recreation activity hotspots were concentrated to areas of higher population density, such as Tórshavn and Klaksvík as well as to well-known hiking areas, e.g. the highest mountain of the islands, Slættaratindur, in Northern Eysturoy. Culture, history, heritage values were mapped mostly in old settlements (that are at the same time centres of current cultural activity), such as Tórshavn, Klaksvík, and Kvívík, and areas that are known for their historical and archaeological monuments and excavations and also the settings of sagas, such as Kirkjubøur, Sandur, and the island of Koltur. Hotspots of plants, animals, ecosystems were the Tórshavn area, Mykines (an island known for its large numbers of puffins and gannets), Nólsoy (home of one of the world's largest colonies of European storm petrels), and Sandur (an area famous for its lakes and its rich and diverse agriculture). Harvesting, fishing, hunting areas were rather disperse, but there was some concentration around Tórshavn and Miðvágur (where the island's largest lake offers fishing opportunities), as well as in the different fjord systems around the islands.

All mapped landscape values showed significant spatial clustering ($p < 0.001$, nearest neighbour ratios: 0.24–0.45, z-scores: –69.11 to –25.35) (Table 1). The mean distances from mapped landscape values to the coastline were below 1 km for all values (Table 1). Culture, history, heritage values were located most closely to the coast (mean distance of 566 m), while recreation activities and harvesting, fishing, hunting values were most distant to the coast (941 m and 889 m). Mapped values were generally relatively far from respondents homes, with mean distances ranging from 13.1 km (for harvesting, fishing, hunting) to 27.1 km (for beautiful landscape/landmark). Beautiful landscape/landmark as well as plants, animals, ecosystems were the

landscape values with the farthest distances to main settlements (population ≤ 1000) and to the main road network (Table 1).

4.2. Elicitation of landscape values

Responses to the open question on landscape values on the Faroe Islands were given by 269 persons (35.1% of the total number of survey respondents). The responses related to 30 different landscape value categories (Table 2). Items related to plants, animals, ecosystems were mentioned frequently, typically highlighting particular animal, vegetation, geological, and water features. Beautiful landscape/landmarks was the second most frequent category, followed by the recreation activities and culture, history, heritage values categories. Values related to the harvesting, fishing, hunting category were not explicitly mentioned. A large number of responses related to landscape values that were beyond the six value categories used in the PPGIS survey, e.g. related to peace and quietness, solitude, or accessibility of landscapes (Table 2).

4.3. Narratives of landscape values

Four different narratives were established from the landscape values elicited: 1) *Valuable wildlife, vegetation, and landscape features*; 2) *Untouched and clean nature*; 3) *Accessible nature*; and 4) *Cultural landscape*. Each narrative is described below with a quote highlighting the essence of it. (For more examples see Appendix C.)

4.3.1. Valuable wildlife, vegetation and landscape features

According to this narrative (40.1% of responses) the Faroe Islands host valuable and beautiful nature that should not be disturbed. This narrative emphasizes that one can experience peace in nature without noise pollution and crowding. It argues that there should be a stronger political mandate to regulate development and promote nature conservation and in particular appreciates the distinct wild and domestic animals (e.g., seabirds), vegetation elements (in particular flowers), and conspicuous landscape features (such as mountains, cliffs, streams, and lakes) of the Faroe Islands. This was expressed by respondents through quotes such as:

“To hear the birds in the outfield, see seal, gannet, European shag, eider in the fjord and the rock doves fly by gives purpose to my day. And the joys of seeing an arctic tern couple return to my home town.” (female, 55)

4.3.2. Untouched and clean nature

A second narrative (32.3% of responses) argues that nature and landscapes in the Faroe Islands are very beautiful and have remained untouched over time. Nature is also clean from waste or pollution. For example, a respondent stated:

“I think our islands are so beautiful, the mountains are a beauty for the eye. Yes, beauty so I have to catch my breath every time I see them. The Faroese landscape still seems to be untouched, unspoiled and therefore natural, and I think this is a strong and important value.” (female, 38)

4.3.3. Accessible nature and freedom

The fact that the outstanding nature at the Faroe Islands is easily accessible to everyone – and that this means freedom is at the heart of the third narrative (11.9% of responses). This narrative emphasizes that no permission is needed to walk or to do other activities in the nature, for example fishing in the lakes, rivers, and along the shoreline. One respondent highlighted:

“I value quite a lot that you are able to travel quite freely both on the paths between the villages, but also up on the mountain tops. You can do this without meeting anyone else than sheep.” (male, 43)

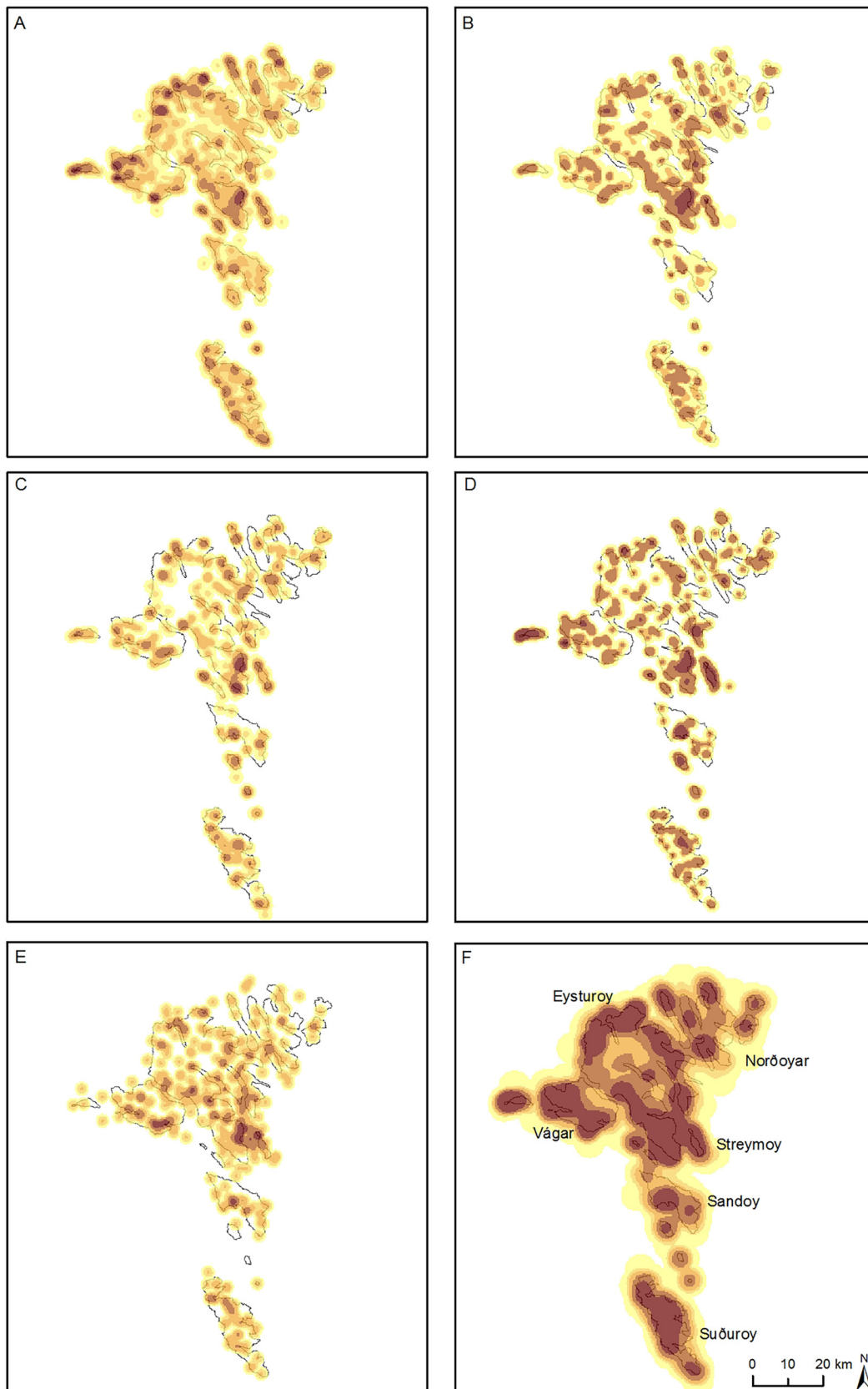


Fig. 3. Kernel density heatmaps of A) Beautiful landscape/landmark; B) Recreation activities; C) Culture, history, heritage; D) Plants, animals, ecosystems; E) Harvesting, fishing, hunting; and F) all landscape values. High density of points is visualized in brown and low density in yellow. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 1
Spatial clustering and mean distances to coastline, urban centres, roads, and development hotspots. Distances are given in means ± standard deviations.

Landscape values	Nearest neighbour		Distance to coast (m)	Distance to home (m)	Distance to main settlement (m)	Distance to road (m)	Distance to development hotspot (m)
	NN	Z					
Beautiful landscape/ landmark	0.31	−69.11	9761 ± 5889	27,103 ± 20,384	9761 ± 5889	2219 ± 2829	2451 ± 2330
Recreation activities	0.34	−43.58	6773 ± 5562	17,049 ± 17,790	6773 ± 5562	1669 ± 2375	2344 ± 1991
Culture, history, heritage	0.24	−46.81	7090 ± 6313	18,447 ± 18,553	7090 ± 6313	1616 ± 2669	1922 ± 2223
Plants, animals, ecosystems	0.34	−31.20	10,493 ± 7648	21,064 ± 18,884	10,493 ± 7,648	3273 ± 3923	2380 ± 2095
Harvesting, fishing, hunting	0.45	−25.35	7361 ± 5414	13,348 ± 15,465	7361 ± 5414	1627 ± 2149	2518 ± 2052

Table 2
Number of informants mentioning specific landscape values.

Landscape values	n
Beautiful landscape/landmark	77
Beauty	38
Scenery	28
Greenness, colours	11
Recreation activities	35
Walking, running, doing sports, bicycling	34
Relaxation	1
Culture, history, heritage	23
Cultural landscape/cultural heritage features	15
Cultural traditions (farming, grazing)	7
Memories	1
Plants, animals, ecosystems	185
Animals (birds, sheep, cows, horses, sealife)	51
Geology (mountains, cliffs, steep terrain, sea caves)	44
Water (Waterfalls, streams, lakes, sea)	29
Vegetation	26
Nature/biodiversity conservation	18
Biodiversity	17
Harvesting, fishing, hunting	0
	–
Other landscape values	284
Raw/unspoilt/untouched nature	56
Peace, quietness	52
Cleanness/no pollution, clean nature	42
Nature	32
Accessibility to landscape	31
Fresh air	13
Solitude	11
Areas free of built structures	9
Nature/landscape as a whole	8
Freedom	7
Areas without sheep grazing	6
Changing weather, wind	6
Areas without tourists	5
Intrinsic value of nature	3
Sound of waterfalls	2
Areas without traffic	1
Total	604

4.3.4. Cultural landscape

This narrative (7.1% of responses) outlines that the Faroe Islands are a cultural landscape where people and nature live together. People are part of nature, and are entitled to its sustainable use. Past and current anthropogenic development is visible in the nature of the islands. Conservation of the landscapes and nature is important while development such as tourism and use of resources should be allowed, but carefully considered. For example, a respondent stated:

“The Faroese landscape is special and the values are complex, so that for example tradition, history, the physical landscape, and the cultural landscape act together.” (male, 39)

4.4. Mapping of development preferences

Survey participants mapped both areas of supporting (1223 sites) and opposing (800 sites) development preferences (Fig. 4). The most frequently mapped supporting development preferences were tourism (49.8%) and wind power (26.7%, Appendix D). Similar proportions of supporting tourism development preferences were assigned across all regions, whereas proportionately fewer supporting wind power preferences were assigned to the Northern Islands (16.1%) and Vágur/Mykines region (16.5%) than to the other regions (> 30.2%). Supporting hydropower and fish farming/processing points were less frequently mapped (9.6% and 13.9%) and shared similar proportions across administrative regions. However, there was predominance in the ocean (12.2% all mapped development preferences for hydropower and 61.5% for fish farming/processing).

Opposing tourism and wind power development points were most frequently mapped by participants (33.1% and 20.0%, Appendix C), although the overall numbers of sites mapped were lower than for supporting tourism and wind power. Fewer opposing tourism development preferences were mapped in Eysturoy (21.8%) than the other regions (mean of 37.9%). Eysturoy and Vágur/Mykines were identified as highly inappropriate for hydropower development (44.6% and 31.6%). Generally low proportions of mapped places opposing fish farming/processing were assigned to all island regions (mean: 10.2%). Rather, places for no fish farming/processing development were overwhelmingly mapped in the different fjords (90.7%).

The weighted differences between supporting and opposing development are presented in Fig. 5. Tourism development has the most sites of high potential conflict, followed by wind power, fish farming/processing, and hydropower. The potential for tourism development conflicts is highest in areas like Vágur/Mykines and Nólsoy regions, and in the towns of Tórshavn and Saksun. Multiple areas in the Northern and Southern small Islands are also subject to high tourism development conflict potential. The potential for wind power conflict is highest in areas like Klaksvík on the Northern Islands, Runavík in the region of Eysturoy, the area South of Tórshavn, the Southern region of Vágur, the island of Nólsoy, and central parts of the region of Sandoy. Potential for hydropower conflicts is concentrated in small areas like the Northern tip of Eysturoy (including Eiði), eight locations in Streymoy, including Nólsoy, and the Northern and Southern tips of Vágur. Potential for fish farming / processing conflicts is dispersed across fjords and inland areas of the Faroe Islands.

4.5. Elicitation of development preferences

The open questions on concerns and visions in regard to the three currently dominating types of developments were answered by 255 survey respondents (33.3%) for tourism, 177 respondents (23.1%) for renewable energy, and 163 respondents (21.3%) for fish farming/processing. Among all responses, those expressing concerns about tourism were by far most numerous (41.3% of responses) than those expressing positive visions (9.7%). For renewable energy and fish farming /processing, the number of answers expressing visions was slightly higher

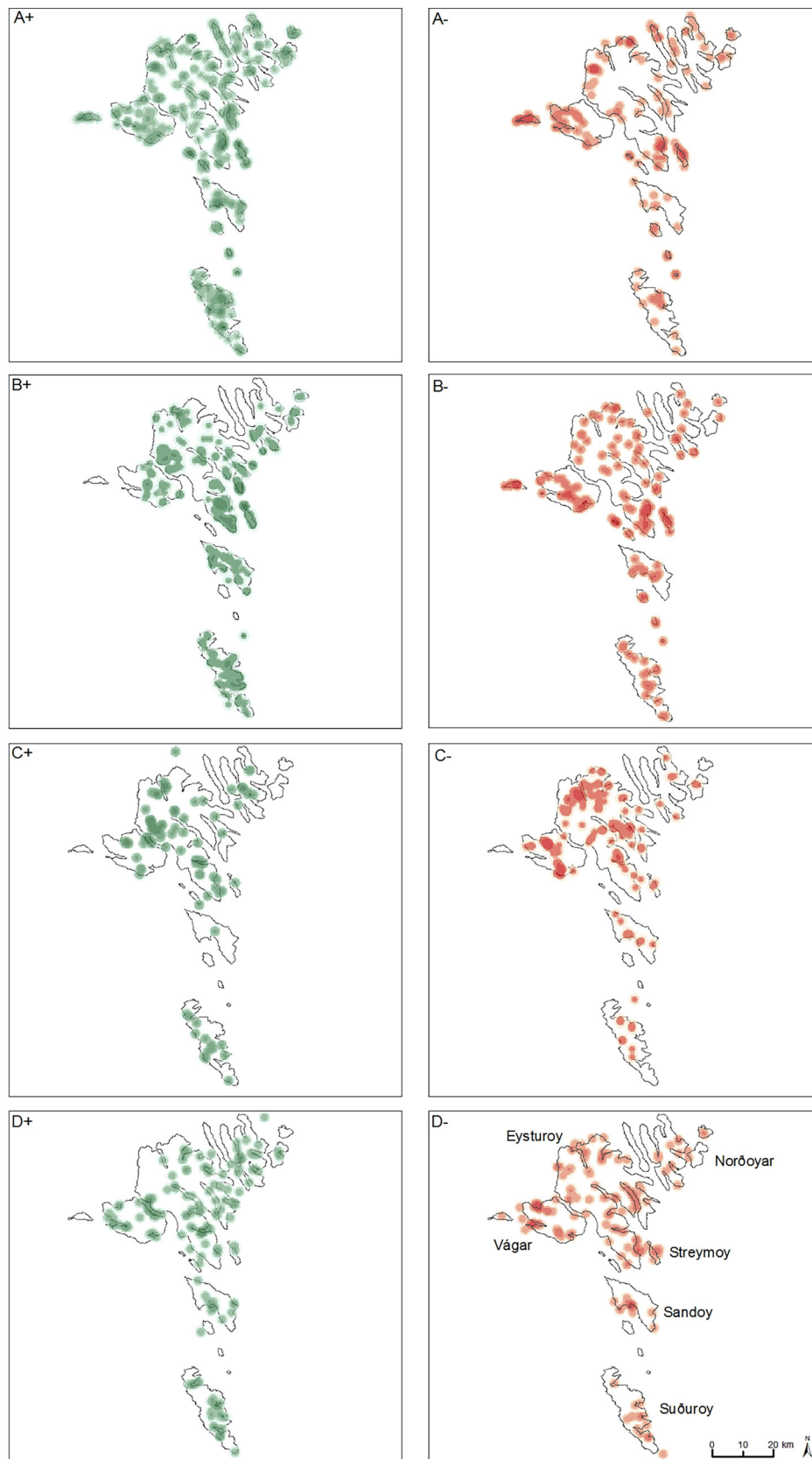


Fig. 4. Kernel density heatmaps of: A) Tourism development; B) Wind power development; C) Hydropower development; and D) Fish farming/processing development. Green colors indicate positive and red colors negative views. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.).

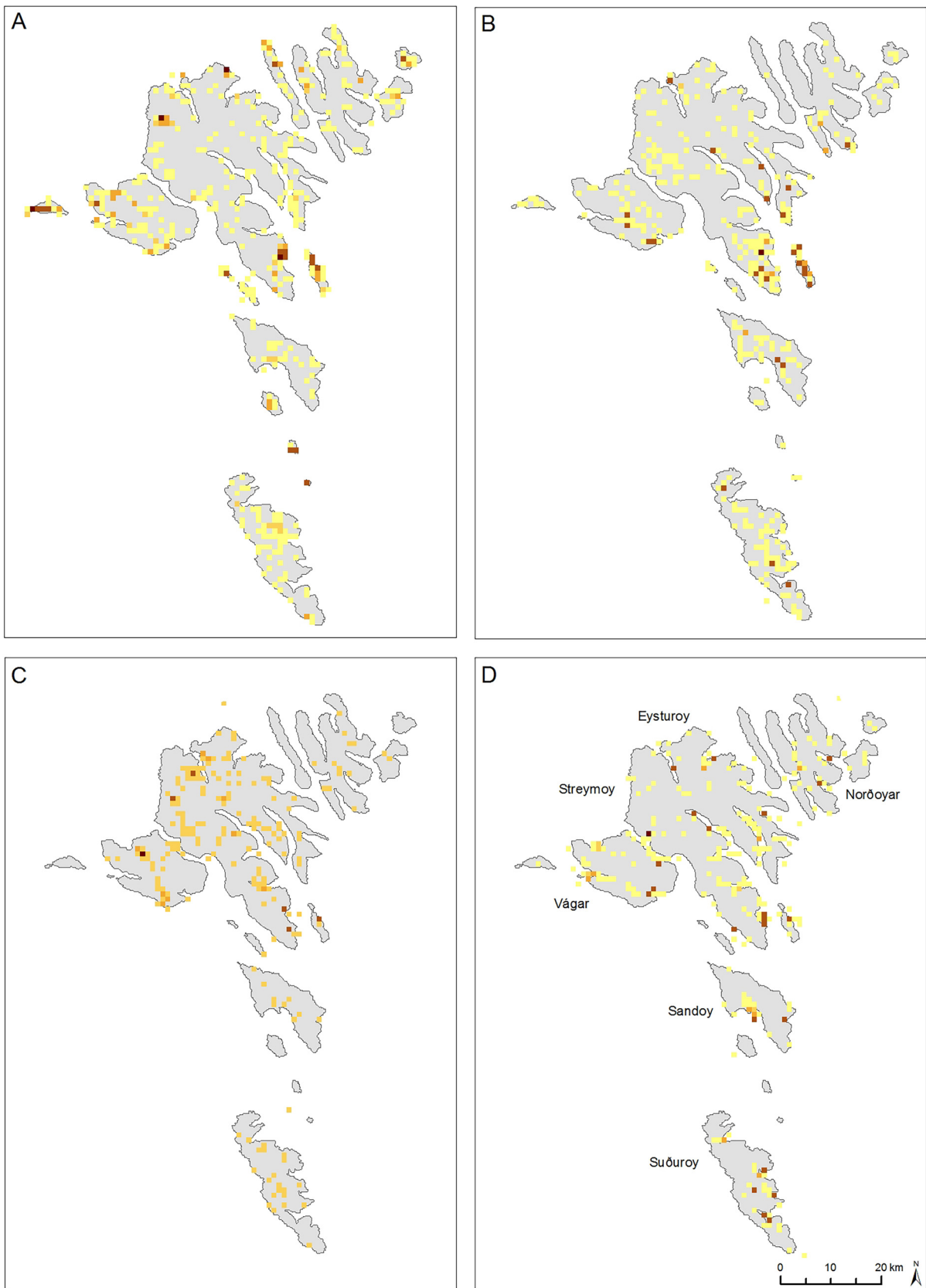


Fig. 5. Areas with potential for land-use conflicts regarding A) Tourism development; B) Wind power development; C) Hydropower development; and D) Fish farming/processing development. Yellow colors indicate low and brown colors high potential for land-use conflicts. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.).

Table 3
Concerns and visions regarding the future of tourism, renewable energy, and fish farming/processing, as mentioned by respondents.

Concerns	n	Visions	n
Tourism	472		111
Unsafe and unregulated	134	Economic revenues	64
Disturbance of wildlife/nature/ landscape	131	Accessibility attractive places/ development preferences	25
Too many tourists, in too many places	72	Sustainable tourism	10
Disturbance of small communities/ sheep/private property/traffic	76	More than nature (indoor activities, cultural events, museum)	12
Lack of information and tourist facilities	47		
Too expensive for locals	12		
Renewable energy	120		163
Negative impact on rivers/lakes	66	Wind energy	69
Negative impact on landscape/noise	42	Need for more renewable energy	61
Not well planned	12	Tidal/wave power	46
		Hydropower	24
		Solar	10
		Improved infrastructure (e.g. storage)	7
		Geothermal	6
Fish farming/processing	126		151
Pollution/ecological impact on fjords	73	Need for regulation/political action/transparency	79
Noise, smell, landscape degradation	27	Alternatives (on land, open sea, with current)	31
Monopoly industry (too much power, no room for other industry)	26	Employment/economic revenues	27
		It is fine as it is	14

RHIZOSPHERE BIODIVERSITY AS A PREMISE FOR APPLICATION IN BIOECONOMY	
69	align="right; text-align: right; line-height: normal"
39.0%	align="right; text-align: right; line-height: normal"
1.4	align="right; text-align: right; line-height: normal"
36	align="right; text-align: right; line-height: normal"
20.3%	align="right; text-align: right; line-height: normal"
0.1	align="right; text-align: right; line-height: normal"
56	align="right; text-align: right; line-height: normal"
31.6%	align="right; text-align: right; line-height: normal"
2.4	align="right; text-align: right; line-height: normal"
16	align="right; text-align: right; line-height: normal"
9.0%	align="right; text-align: right; line-height: normal"
-4.1	align="right; text-align: right; line-height: normal"
177	align="right; text-align: right; line-height: normal"
100.0%	align="right; text-align: right; line-height: normal"

(14.3% and 13.2%) than those expressing concerns (10.5% and 11.0%) (Table 3).

The two most often mentioned concerns around tourism were that the sector is unorganized and unsafe and that tourists disturb nature and wildlife (Table 3). At the same time, many respondents saw

economic revenues from tourism as an opportunity to support local development and tourist facilities. As for renewable energy development, respondents expressed general concerns regarding the negative impacts on nature and landscape, and especially regarding the negative effects of hydropower on rivers and lakes. Regarding their visions for future developments, many respondents explicitly mentioned the need for more (or even 100%) renewable energy. Related to fish farming / processing, more than half of respondents expressed their concerns about pollution from this industry, either resulting in the ecological impacts in the fjords (chemicals, diseases, habitat destruction) or in impacts on landscapes and local communities (e.g. noise, smells, rubbish). While people acknowledge benefits of fish farming industries in terms of employment and economy, they wish to limit the impacts on the environment and preserve landscapes by regulating the industry or finding alternatives to place fish farms outside of the fjords.

4.6. Narratives of development preferences

For each development option, two contrasting narratives were established from the elicited concerns and visions: 1) Tourism: a) *Tourism as a double-edged sword*/b) *Incapability to control tourism*; 2) Renewable energy: a) *100% green energy*/b) *Not at the cost of nature*; and 3) Fish farming/processing: a) *Lack of political power*/b) *Polluters should pay*. Each narrative is described below with quotes highlighting its essence. (For more examples see Appendix C.)

4.6.1. Tourism

The *Tourism as a double-edged sword* narrative (57.3% of responses) reveals a tension between hospitality and tourism impact on natural and cultural values. Faroese are proud of their country and want other people to experience this too. But the pressure of tourism is becoming a threat to their way of living peacefully and with respect for nature. For example, respondents expressed:

“Tourism is a good supplement for our economy. [...] We need to be careful that the tourists don’t tramp the landscape and that we don’t change too much in order to please those tourists.” (male, 47)

Incapability to control tourism, the other narrative (42.7% of responses), is focused on the lack of political or governmental strategies and resources for tourism management. There is fear that the small Faroese villages are not capable of governing tourism themselves. Lack of resources and lack of economic spirit leave tourists on their own, with marginal profits for the community. For example, respondents expressed:

“My biggest fear is that people from small places cannot choose not to have tourism, and they don’t have the means to control it. This makes it impossible for them to conserve their towns and the nature. The only thing they can do is sell themselves for money.” (male, 42)

4.6.2. Renewable energy

The *100% green energy* narrative (34.5% of responses) envisions the Faroe Islands using 100% renewable energy sources in the near future. This requires investments in new technologies, infrastructure, and storage, and may require some sacrifices in terms of landscape conservation. The use of different energy sources will reduce costs for electricity and make the supply more reliable. Respondents highlighted:

“Renewable energy should be prioritized. A mark in the nature is a small price to pay for the benefits of renewable energy.” (male, 25)

Not at the cost of nature, the counter-narrative (linked to a higher number of responses, 45.8%), argues that renewable energy is good, but should not be prioritized at the cost of nature. Precaution is needed to

limit the impact on natural landscapes and to ensure that people are still able to enjoy the natural landscape in the future. This means that alternatives need to be sought for high impact sources such as hydro-power and wind turbines. Respondents reflected for instance:

“The energy can come from our rich nature. But we should not drain the land and destroy for the future.” (female, 64)

4.6.3. Fish farming/processing

The *Lack of political power* narrative (35.0% of responses) perceives the Faroese society to be dominated by large, foreign companies. Local governments do not set the agenda, but the industry does. The latter provides employment and boosts the economy, but the profits are not invested in the local environment or mitigation of impacts. Faroese interests (people and nature) should be placed above economic revenues. For example, respondents stated:

“Foreign companies are destroying our fjords with the blessing from our politicians, who do not dare to take the decisions that are necessary, because too many jobs are in danger.” (female, 61)

The *Polluters should pay* narrative (44.8% of responses) is related to the concerns that fish farms pollute the environment. Respondents expressed their views that the industry needs to take responsibility and invest in cleaning up and mitigating their impact on the environment (or ‘the polluter pays’ principle). Respondents stated:

“Pollution is horrible and it should be a requirement that a fish farming company should set aside money for clean-up, if the company for example goes bankrupt.” (female, 46)

5. Discussion

This study set out to elicit land- and seascape values and development preferences in a Northern Atlantic islands setting. To do so, we chose a comprehensive approach that included qualitative and quantitative information and that combined landscape values and development preferences to identify potential for land-use conflicts. Given the characteristics of the Faroe Islands, it was a regional-scale and national-level assessment at the same time.

Similar to other PPGIS studies (Blake et al., 2017; Klain and Chan, 2012), beautiful landscape/landmark; recreation activities; and culture, history, heritage were the most frequently recorded types of values. Our analysis demonstrated that mapped landscape values are spatially clustered (with NN ratios being similar to other PPGIS exercises, e.g. Fagerholm et al., 2016). Culture, history, heritage was the most clustered landscape value across all value types. These geographic patterns were further consolidated by quantitative analysis. The short distances of all mapped values to the coastline highlight that coastal landscapes are appreciated for a multitude of reasons (Brown and Hausner, 2017) however, with some differences between values. The proximity of culture, history, heritage locations reflects the coastal nature of all settlements on the Faroe Islands. Recreation activities and harvesting, fishing, hunting values were located further inland, probably as these activities are often related to the use of mountains for hiking, hare hunting, and sheep farming. In some cases, these values were located out in the ocean, relating to boating and fishing. An interesting finding was that mapped values were generally relatively distant from respondents’ homes. Many PPGIS studies found that people generally identify valuable places close to their homes and those that they dislike further away, a phenomenon called “geographic discounting” (Brown and Kytta, 2014). Our data show exactly the opposite, and the same trend was found in the Falkland Islands (Blake et al., 2017). We conclude that, in remote island settings – especially when islands form an

own nation – landscape values are not limited to a particular community, but people identify themselves comprehensively with the values of the whole archipelago. Such understanding may be further reinforced through migration processes from rural to urban communities (currently occurring on the Faroe Islands) that create social connections to different parts of the archipelago. As may be intuitively expected, values more related to natural lands (beautiful landscape/landmark; plants, animals, ecosystems) were located further away from main settlements and roads. In contrast, those values that depend on access (recreation activities) or are linked to anthropogenic landscapes (culture, history, heritage) were situated closer to main settlements and roads.

Responses to our open question showed that people perceive landscape values in a multitude of ways. Here, items related to the plants, animals, ecosystems category were mentioned much more frequently than in the PPGIS exercise. This indicates that the value that islanders attach to biodiversity and ecosystems may be underestimated when purely relying on participatory mapping – as it may be more challenging for laypersons to map valuable habitats than it is to assess, for example, cultural heritage features or recreational activities in a spatially explicit way. Our findings also suggest that biodiversity and ecosystem values are closely interlinked to and not clearly separable from aesthetic and recreational values. The diversity of landscape values (most typically relational values) was condensed into four major narratives that are illustrative of human-nature relationships in the Faroe Islands. These themes revealed, on the one hand, a great appreciation for the biological values of the area, in particular its wildlife and landforms, and for local ecosystems appearing clean and undisturbed. On the other hand, the narratives emphasized the cultural values of the land- and seascapes. A common thread was that people are a part of nature and have also the right to use it and that land and sea have value for society by being freely accessible to all. These worldviews appeared frequently related to the island characteristics of geographic isolation, place attachment, and vulnerabilities (Ankre and Nilsson, 2016). The view of the Faroese people being integrated in nature corresponds with the notion of biocultural diversity that emphasizes that multiple expressions of biological and cultural diversity are closely interlinked within social-ecological systems (Agnoletti and Emanuelli, 2016).

In the PPGIS mapping, the number of places of supporting preferences for tourism and wind power was higher than that for places of opposing preferences. In contrast, sites with opposing preferences were more frequently mapped than sites with supporting preferences for hydropower and fish farming/processing. However, when asking respondents openly, they expressed a much higher number of concerns ($n = 472$) than positive visions ($n = 111$) about tourism – emphasizing that tourism development is a highly contested issue that the majority of respondents considers in more negative ways. The spatial overlay of mapped landscape values and development preferences allowed the identification of a relatively small number of areas that show a high potential for future land-use conflicts around tourism, renewable energy, and fish farming/processing. These locations should receive careful consideration in future spatial planning (Ruiz-Frau et al., 2013). The diverging local narratives on major development activities – tourism, renewable energy, and fish farming/processing – show deeply split viewpoints. For all these developments, respondents acknowledged the need for new economic opportunities that may create employment and wealth and (in the case of renewable energies) environmental benefits. But even more, respondents were concerned about negative effects for Faroese nature and society and in particular about the perceived inability of the Faroese society to govern these developments effectively – pointing to issues of scale, with an increasing amount of developments in a small country with limited space. Although fish farming/processing is a major industry of the Faroe Islands,

this was predominantly seen as harmful among most respondents. Our results point out that the currently rapid development of tourism has a particularly high potential for conflicts.

Our approach built on previous studies that used participatory mapping to elicit cultural values of marine protected areas (Strickland-Munro et al., 2016), coastlines (Brown and Hausner, 2017; Klain and Chan, 2012; Ruiz-Frau et al., 2013), and remote islands (Blake et al., 2017). In this study, we entered new ground in two directions by a) broadening elicitation of landscape values toward inclusion of development preferences and b) adding narratives to our PPGIS mapping (c.f. Alexander et al., 2012).

On the one hand, we expanded socio-cultural elicitation of landscape values by an assessment of development preferences, which allowed a spatially explicit identification of the potential for land-use conflicts. Building on previous work (Brown and Raymond, 2014; Moore et al., 2017), we showed how a weighted conflict index can be applied to the assessment of new types of conflict (e.g. fish farming, hydropower) across a gradient of low to high potential for conflict.

On the other hand, we added a qualitative component to the PPGIS-based mapping of landscape values and development preferences. Typically, PPGIS surveys are based on a set of landscape value categories that have been pre-defined by experts and analysed quantitatively. However, there is evidence that people's perceptions of landscape values frequently do not fit into expert-defined categories, such as ecosystem services classifications (Bieling et al., 2014; Fagerholm et al., 2016). Likewise, existing assessments have largely focused on the location and intensity of land-use conflicts rather than on their qualitative nature. Our results indicate that narratives can enrich and diversify insights from PPGIS-based valuation through personal accounts of history, ecology, and human experience (Silbernagel et al., 2015). Such inductive approach is able to validate whether the right questions are asked and the right categories of landscape values are used in PPGIS; For example, our open question on landscape values revealed 30 items that were much broader than and different from common landscape values or ecosystem services classifications. While a narrative approach cannot generate statistically testable data, it can illuminate the socio-cultural contexts around landscape values and the interlinkages between multiple values and development preferences. In practical natural resource management, place-based narratives may yield benefits by linking management actions to local worldviews, by fostering connections between local people and their landscapes, by understanding reasons for success or failure, facilitating learning and intergenerational transfer, as well as by supporting dialogues and promoting local participation (Bontje and Slinger, 2017; Fernández-Llamazares and Cabeza, 2018).

As this was the first assessment of landscape values and development options on the Faroe Islands, the representativeness and remaining uncertainties of the study need to be scrutinised. Our survey covered about 1.5% of the population of the national population of the Faroe Islands. In absolute terms, the number of respondents is higher than in most similar PPGIS studies (e.g., only three out of 32 reviewed PPGIS studies had higher respondent numbers in Brown and Fagerholm, 2015). As our survey was announced in the public media, it was impossible to ensure representativeness, for example in terms of gender, age group, or urban/rural residency, among the respondents. A post-hoc evaluation showed that the distribution of gender and respondents' places of residence (as expressed in the ratio of residents living on the main islands and those living on the peripheral outer islands) was similar to the national-level distribution (Appendix B). However, young and old age groups were clearly underrepresented (Appendix B). By that, we may have missed some perspectives both on particular uses and values of but also on specific conflicts around land

that a random sampling might have revealed (Brown, 2017). As tourism, renewable energy, and fish farming/processing develop quite dynamically, longitudinal studies may be helpful to assess how values and conflicts vary over generations. Further, our approach did not limit the number of statements or points that respondents could enter in the survey. By that, there is the possibility that some individuals may have particularly bolstered their views. However, a total of 417 respectively 765 different individuals contributed information to the open questions and to the mapping exercise. Careful evaluation of the content and comparison of the qualitative and spatially explicit data showed that our narratives were not overly influenced by particularly vociferous individuals. Survey questions were formulated in a neutral way. However, as questions of future land development are inherently political, responses may reflect not only personal feelings, but also political views as taken up from public debates in the media.

6. Conclusions

Current marine spatial planning, integrated coastal zone management, and integrated landscape management approaches have been limited by a weak consideration of cultural values (Poe et al., 2014; Vanclay, 2012). The approach developed in this study points out that combining landscape values with development preferences may be helpful for better understanding conflicts of land and sea use and their spatial properties. Our survey offered the following key lessons on landscape values and development preferences in the Faroe Islands:

- Plants, animals, and ecosystems, beautiful landscapes/landmarks, and recreation activities are at the core of islanders' interlinked understanding of multiple landscape values.
- Geographical discounting of landscape values is not prominent in a remote island setting.
- Islanders identify landscape values comprehensively, and this does not fit well into current landscape value or ecosystem services frameworks.
- Concerns about land development and the potential for land-use conflicts are particularly high in the case of tourism.
- Though people show deeply diverging viewpoints on the future development of tourism, renewable energies, and fish farming / processing, a high potential for land-use conflicts is concentrated on only a few sites.

In the light of these co-existing values, preferences, and identified conflicts, it is evident that sustainable development of the Faroe Islands requires effective spatial planning, as provided by marine spatial planning, integrated coastal zone management, or integrated landscape management. Such spatial planning should promote a cross-sectoral approach rather than focussing on one prevailing development challenge, such as tourism. In particular, our results indicate the need for a more integrated consideration of marine, coastal, and landscape planning, which are often performed separately.

Declarations of interest

None.

Acknowledgements

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Appendix A

Social and ecological characteristics of the seven regions of the Faroe Islands.

Region	Extent (km ²)	Population	Social characteristics	Ecological characteristics
Norðoyggjar (Six islands)	239.3	5,992	Diversified societies. From small secluded islands with old fashion living to second largest city.	Steep alpine landscape with astonishing mountain scenery. Few lakes.
Eysturoy	286	11,069	Modern way of living. Population living in 25 builtup areas, with between 25 and 1,600 inhabitants in each.	Steep and high in the North with fjords in SE direction.
Streymoy	374	23,511	Modern way of living. Largest island. 20 built-up areas, with between 7 and 19,000 inhabitants in each. Includes the capital city, Tórshavn.	North and west coast steep. East coast with fjords. Some remote areas.
Vágar /Mykines	176 / 10	3,140 / 14	Secluded island. Old solitary. No cars (Mykines). Includes the islands' only airport (Vágar).	Identified as Important Bird Area. Has the country's two largest lakes - Leitisvatn and Fjallavatn. Magnificent and rich bird life. Spectacular beauty.
Sandoy	111	1,245	Modern way of living. Population living in six builtup areas, with between 40 and 500 inhabitants in each.	Low altitude. Several lakes. The most agricultural of the islands.
Suðuroy	165	4,611	Moderately isolated. Modern way of living. Population living in 11 built-up areas, with between 30 and 1400 inhabitants in each.	West coast steep. Short from road to cliffs. Eastcoast calm.

Source for “Extent (km²)” and “Population”: Statistics Faroe Islands (2017) Faroe Islands in figure 2017, Torshavn.

Appendix B

Comparison between respondent and national populations.

	Respondents	National population
Gender		
Female	44.7%	48.8%
Male	55.3%	51.2%
Age group (% of the population being > 13 years old)		
14-24 years	10.2%	17.9%
25-59 years	79.9%	53.3%
≥ 60 years	9.9%	28.6%
Residence		
Main islands	98.5%	99.2%
Outer islands		

Source for national population data (reference year: 2017): <http://www.hagstova.fo/fo>.

Appendix C

Details on the narratives around landscape values and development preferences.

Analysis of question: “Please share with us the values that you most enjoy from the Faroese landscapes.”Landscape value narratives and quotes supporting the establishment of each narrative..

Narrative	Quotes supporting establishment of the narrative
Valuable wildlife, vegetation and landscape features (40.1% responses): The Faroe Islands hosts valuable and beautiful nature that should not be disturbed. Particularly diversity of wildlife (birds, sheep) and vegetation (flowers) as well as landscape features (mountains, cliffs, streams and lakes) have value. One can experience the peace in nature without noise pollution and crowding. There should be stronger political mandate to regulate development and promote nature conservation.	“I think, that it is important to recreate a Faroese landscape with a natural biodiversity. It is also important to preserve the nature that we have. I give pleasure to the different landscapes, where you can't see anything manmade. I think it is a pity as soon as I see a road or a building, because then I can't see the landscape. Even is the building is just a promille of the total area, it takes much more of the landscape.” “The diversity of nature. That we take care of nature and don't destroy it. That birds, sheep etc. Will get their peace and won't be disturbed by us

<p>Untouched and clean nature (32.3% responses): The nature and landscapes in the Faroe Islands are very beautiful and untouched. Nature is also clean from waste or pollution. You are very close to the nature and can enjoy it.</p>	<p>humans a lot.” <i>“The green landscape. Many beautiful cliffs to watch. Peace and quiet when you walk in the outfields, hearing the warbling of birds and so on. That you all see the sea.”</i> <i>“The nature that is the mountains, valleys, cliffs, sheep, bird, and all animals. Everything that was made naturally.”</i> <i>“That the nature will get "tired/exhausted", so that the traffic that is the area (tourists, Faroese tourists, farmers etc.) don't impoverish the environment, you travel in. A general policy, so we all have the possibility to use the nature without putting too much strain on it. This policy has to be an elaboration with experts (association of biologists and others). This policy has to be for both land and sea. That we have an authority that has the mandate to apply the policy that is agreed on. This authority has to have a strong profile, both politically and among the population. That our policy can assure that we profile ourselves as eco-friendly.”</i> <i>“That there still are places without any tourists. A diversity of growth (sheep farming could decrease a bit in the islands as a whole, so that the growth (flora) would get better conditions). The nature as a whole does not have a authority that cares for the it, and it is a shame, especially when we use words as "untouched, unspoiled etc" in the marketing.”</i> <i>“The flora, wild life, peace and quiet, the silence, that you can walk in the outfields and be the only "soul" there. The beauty and unspoiled, the raw and primitive. It is a fantastic feeling to be so close to nature and it is around you all the time.”</i> <i>“That it is so raw, natural and unspoilt - it's the real thing!”</i> <i>“Peace and cleanliness. Being out in nature without seeing another human being.”</i> <i>“I think our islands are so beautiful, the mountains are a beauty for the eye. Yes, beauty so I have to catch my breath every time I see them. The Faroese landscape still seems to be untouched, unspoiled and therefore natural, and I think this is a strong and important value.”</i> <i>“The cleanness of the nature. That you still in 2017 has 10-15 minutes from your house until you are in a perfect gem of nature that is untouched by society.”</i> <i>“The unspoiled nature, untouched by humans gives me peace in the soul and remedy. To walk freely in the out-fields in peace and quiet and to be happy about life in all its diversity, has big importance for me.”</i> <i>“That you can see long distances, that it is as untouched as possible. I think is has a great value that the nature is as untouched as possible. Because of that it is important that we protect what is untouched.”</i> <i>“I haven't thought a lot about it until I walked to the end of Sandavágur (that is also why I have pointed that place out), that it is seldom, that I walk on a path, and the growth (plants of the out-fields, grasses etc.) still are the same as when I was a child. In other words it is preserved and untouched and nothing special has been done to improve the appearance.”</i> <i>“Beauty, fresh air, peace, closeness to the nature and distance from the daily city life and masses of people, the "bird" perspective from the mountains.”</i> <i>“To walk freely without following the paths. Free wildlife, and to go in the outfields when I want to.”</i> <i>“That we actually (not in the laws) have every-mans-right to walk freely, that no ones (normally) comments where you walk.”</i> <i>“I value quite a lot that you are able to travel quite freely both on the paths between the villages but also up on the mountain tops. You can do this without meeting anyone else than sheep.”</i> <i>“Grand nature and peaceful places with a rich birdlife and the life in the lakes and rivers. Access to the shoreline is very important giving the possibility to go fishing. Accessibility into the landscape is in general is very important giving the possibility to see all that nature intails. To hear the birds in the outfield, see seal, gannet, European shag, eider in the fjord and the Rock doves fly by gives purpose to my day. And the joys of seen a artic tern couple return to my home town.”</i> <i>“To walk freely in the mountains. Beautiful views, streams and lakes, all growth and birdlife.”</i> <i>“The wildlife and flora in the Faroe Islands is diverse, small and vulnerable. Everything wild should be preserved, but it is important that the Faroese</i> </p>
<p>Accessible nature (11.9% responses): The outstanding nature at the Faroe Islands is easily and freely accessible to everyone. No permission is needed to walk or to do other activities in the nature.</p>	
<p>Cultural landscape (7.1% responses): The Faroe Islands are a cultural landscape where people and nature live together. Past and current</p>	

anthropogenic development is seen on the nature. Conservation of the landscapes and nature is important but development such as tourism and use of resources should be allowed but carefully considered.

people are not afraid to use it, but are conscious of they should behave in nature.”
 “That it is wild and touched by the sea, but still a cultural landscape where you can see and feel our ancestors and their way of living.”
 “It is necessary to preserve the Faroese landscapes as clean as possible. But because we need to evolve as other countries do, we have to use our own resources as much as possible.”
 “I don't value something more than something else. I think that beauty, usefulness and biology in the Faroese nature should be valued the same. It is a question about getting as much benefit as possible and on the same time limit the use of nature, that it won't get ugly or the biology won't suffer.”
 “The Faroese landscape is special and the values are complex, so that for example tradition, history, the physical landscape and the cultural landscape act together. Because of that you should consider what you do before chancing the nature to a cultural landscape that is influenced by fish farming, tourism and sheep.”

Narrative analyses of the following questions: “Please share with us 2-3 of your main hopes and/or concerns about the future development of: (1) tourism, (2) renewable energy, (3) fish farming / processing”

Tourism narratives and quotes supporting the establishment of each narrative.

Narrative	Quotes supporting establishment of the narrative
<p>Tourism as a two-edged sword (57.3%): Tension between hospitality and tourism impact on natural and cultural values. Faroese are proud of their country and want other people to experience this too. But the pressure of tourism is becoming a threat to their way of living peacefully and with respect for nature.</p>	<p>“I want people to be able to experience the Faroe Islands, but we have to be careful that it doesn't become like Mallorca, where the locals move because they don't get peace.” “Tourism is a good supplement for our economy. [...] We need to be careful that the tourists don't tramp the landscape and that we don't change too much in order to please that tourists. The country shouldn't change too much, because we will lose our charm. The Faroe Islands shouldn't be the new Sunny Beach.” “As many people as possible should be able to get the same joy out of the Faroese landscape, as I have. But it is also my greatest concern, that too many tourists will use the Faroese nature, and will limit my freedom to use the nature.” “The tourism industry is a two-edged sword. The largest part of the tourists are people that have too much money and travel without considering and valuing the places they are traveling to. But cosmopolitans are welcome.” “I worry about tourism. Our country is so peaceful and everyone should be able to experience this peace, the beautiful nature, the friendliness, but with reason.” “I have mixed feelings about tourism. I like traveling myself and also showing people around in my own country. But tourism is a polluted and greedy industry.” “I worry that tourism destroys the clean and unspoiled nature that we brand ourselves on. I worry that we need to modify ourselves to tourism instead of the other way around.” “Tourist are welcome, but under organized circumstances. We are such a small country and we need to protect what we have that can't be summed up in money.” “I worry that tourism becomes too big of a part of our economy. This will result in that we will have to develop it without taking nature into considerations.” “My concern is that tourism will grow so big, that it can't be managed, and that tourists will destroy our beautiful and unspoiled landscape. Just take the growing tourists-storm in Mykines as an example. I wish the mountains and gem of nature, that we have in the Faroe Islands, will be preserved.”</p>
<p>Incapability of Faroese to govern / control tourism (42.7%): There is no political or governmental strategy or guidance for tourism development. There is concern that the Faroese villages are not capable of governing tourism themselves. Lack of resources and lack of economic spirit leave tourists on their own, with marginal profits for the community.</p>	<p>“My biggest fear is that people from small places cannot choose not to have tourism, and they don't have the means to control it. This makes it impossible for them to conserve their towns and the nature. The only thing they can do is sell themselves for money.” “I also worry that the different small places with many tourists are not able to control the pressure and possibilities of tourism. They don't see the possibilities, but are irritated by the tourist. And this makes the tourist only</p>

walk around by themselves.”
 “[...] missing political will and courage to point out some places for tourism like we do with fish farming.”
 “We are without a doubt able to have tourism and create jobs in this industry, but my impression is, that we mentally are not ready to receive a great number of people, as we don't like that every single spot is filled by Asians who take pictures and other curious eyes.”
 “The tourism industry is a sick industry. Tourist that come her to participate in our society are welcome. But we have lost control of tourism. The best development of tourism is to abolish tourism.”

Renewable energy narratives and quotes supporting the establishment of each narrative.

Narrative	Quotes supporting establishment of the narrative
<p>100% green (34.5%): People envision the Faroe Island using 100% renewable energy sources in the near future. This requires investments in new technologies, infrastructure and storage, and may require some sacrifices in terms of landscape preferences. Use of different sources will reduce costs for electricity and make the supply more reliable.</p>	<p>“It is sensible to have renewable energy. Windmills are not ugly, when you are aware of their importance. Some lakes could be ‘sacrificed’ if others are preserved from being used for the production of energy.” “Renewable energy should be prioritized. A mark in the nature is a small price to pay for the benefits of renewable energy.” “[...] we complain about the wind and rain, we should us it for energy. We should become 100% green as soon as possible, that is the dream. Do we even use all our educated energy engineers?” “Green energy is the way forward. The Faroe Island should not look for oil, but focus on windmills and solar power.” “I desire that the Faroe Islands will set a goal to be 100 percent depended on green energy in 2030.” “I value the nature in the Faroe Islands very much, but we need to be realistic as well and a modern society like the Faroe Islands needs power. We should develop renewable energy in the Faroe Islands.” “Windmills and hydropower have disadvantages. But I think that renewable energy is so important that we can live with the disadvantages.” “Hopes: even more renewable energy sources, especially using wind. Increasing in such sources to bring cheaper electricity costs for the residents.” “[...] we should create better infrastructure and be able to store the power. This will make the wind power more effective and we could use less oil.”</p>
<p>Not at the cost of nature (45.8%): Renewable energy is good, but should not be prioritized at the cost of nature. Precaution is needed to limit the impact on natural landscapes. Alternatives need to be sought for high impact sources such as hydropower and wind turbines.</p>	<p>“The energy can come from our rich nature. But we should not drain the land and destroy for the future.” “My wish is that the landscape will be taken into consideration, the visual aspect, when we plan to develop power plants. We need to leave some areas untouched also for us to look at and walk through.” “Renewable energy is good, but not at the cost of nature. Emptying all the rivers in order to be green and destroying nature in the process doesn't make sense. The same with putting up big ugly windmills. The best thing would be to get tidal power to work.” “Renewable energy is good, but precaution needs to be taken regarding the nature.” “Renewable energy is not an end in itself. As long as we don't have a long-term goal for the renewable energy in the Faroe Islands, there is a possibility the consequences will be negative rather than positive.” “We should invest more in windmills or tidal/ wave power, so the rivers are left in peace”</p>

Fish farming / processing narratives and quotes supporting the establishment of each narrative

Narrative	Quotes supporting establishment of the narrative
<p>Lack of political power (35.0%): Domination of Faroese society by large, foreign companies. Local governments do not set the agenda, but the industry does. They provide employment and boost the economy, but the profits are not invested in the local environment or mitigation of impacts. Faroes interests (people and nature) should be placed above economic revenues.</p>	<p>“Foreign companies are destroying our fjords with the blessing from our politicians, who do not dare to take the decisions that are necessary, because to many jobs are in danger.” “The boom in the fish farming reveals a big weakness in our district system. The local districts are fighting about the income, that the rich companies provide. The result being, that the nature and people are showed to the side, in order to expand these companies.”</p>

“Concern. That some of the fish farming companies already is too big, and therefore is dominating in the Faroese society. To a certain extent it is the fish farming company and not the politicians and administration who decide the agenda.”

“Fish farming has become the main industry in the Faroe Islands, this also demands space. But it shouldn't work against nature. The government should think about protecting nature in the best way possible, instead of trying to get as much money as possible out of fish farming.”

“My concern is though, that conditions in the outskirts, that are similar to monopolies, are giving one factory/company special standing. Because who dares to complain about anything regarding a workplace, if that company, with the stroke of a pen, can rip away the foundation of a village by choosing to move? My wish is, that the authorities in the area are more aware and will represent the people on the island as a protector, so the employees do not end up in a bad situation.”

The polluter pays (44.8%): Fish farms pollute the environment. The industry needs to take responsibility and invest in cleaning up and mitigating their impact on the environment.

“Also, the industry should be required to clean up after itself and treat nature with respect.”

“The consequence should be, that the fish farming companies should clean up after themselves and in the future protect the ecosystem.”

“I definitely think that fish farming shall be in the places, that can be utilized, but the industry should be forced to keep everything clean.”

“Pollution is horrible and it should be a requirement, that a fish farming company should put aside money for clean-up, if the company f. ex. goes bankrupt.”

Appendix D

Proportional differences in mapped landscape values and development preferences by region.

Proportional differences in mapped landscape values by region.

Value type		Norðoyggjar	Eysturoy	Streymoy	Vágar / Mykines	Sandoy	Suðuroy	Ocean	Total
Beautiful landscape / landmark	n	360	420	753	464	174	336	212	2719
	%	50.7%	47.5%	39.2%	54.1%	42.3%	51.7%	30.5%	44.4%
	St. res.	2.5	1.4	-3.4	4.3	-0.6	2.8	-5.5	
Recreation activities	n	133	183	482	113	48	116	127	1202
	%	18.7%	20.7%	25.1%	13.2%	11.7%	17.8%	18.2%	19.6%
	St. res.	-0.5	0.7	5.4	-4.3	-3.6	-1.0	-0.8	
Culture, history, heritage	n	124	121	366	100	85	98	130	1024
	%	17.5%	13.7%	19.1%	11.7%	20.7%	15.1%	18.7%	16.7%
	St. res.	0.5	-2.2	2.5	-3.6	2.0	-1.0	1.3	
Plants, animals, ecosystems	n	58	79	174	114	70	56	56	607
	%	8.2%	8.9%	9.1%	13.3%	17.0%	8.6%	8.0%	9.9%
	St. res.	-1.5	-0.9	-1.2	3.1	4.6	-1.0	-1.6	
Harvesting, fishing, hunting	n	35	81	145	67	34	44	171	577
	%	4.9%	9.2%	7.6%	7.8%	8.3%	6.8%	24.6%	9.4%
	St. res.	-3.9	-0.2	-2.7	-1.5	-0.8	-2.2	13.0	
Total	n	710	884	1920	858	411	650	696	6129
	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

St. res.–Standardized residual.

Chi-square: 409.89, df = 24, p < 0.001. *0 cells have counts less than 5.

Proportional differences a) in mapped supporting development preferences and b) in mapped opposing development preferences by region.

a) Supporting preference		Norðoyggjar	Eysturoy	Streymoy	Vágar / Mykines	Sandoy	Suðuroy	Ocean	Total
Tourism	n	89	97	155	77	59	103	29	609
	%	65.0%	56.4%	43.4%	63.6%	59.6%	54.5%	19.6%	49.8%
	St. res.	2.5	1.2	-1.7	2.2	1.4	0.9	-5.2	
Wind power	n	22	57	129	20	32	57	10	327
	%	16.1%	33.1%	36.1%	16.5%	32.3%	30.2%	6.8%	26.7%
	St. res.	-2.4	1.6	3.4	-2.2	1.1	0.9	-4.7	
Hydropower	n	11	11	50	12	1	14	18	117

	%	8.0%	6.4%	14.0%	9.9%	1.0%	7.4%	12.2%	9.6%
	St. res.	-0.6	-1.3	2.7	0.1	-2.8	-1.0	1.0	
Fish farming/ processing	n	15	7	23	12	7	15	91	170
	%	10.9%	4.1%	6.4%	9.9%	7.1%	7.9%	61.5%	13.9%
	St. res.	-0.9	-3.5	-3.8	-1.2	-1.8	-2.2	15.5	
Total	n	137	172	357	121	99	189	148	1223
	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

b) Opposing preference

Tourism	n	28	22	85	69	15	22	24	265
	%	51.9%	21.8%	41.1%	39.0%	35.7%	40.0%	14.6%	33.1%
	St. res.	2.4	-2	2	1.4	0.3	0.9	-4.1	
Wind power	n	13	23	50	36	15	18	5	160
	%	24.1%	22.8%	24.2%	20.3%	35.7%	32.7%	3.0%	20.0%
	St. res.	0.7	0.6	1.3	0.1	2.3	2.1	-4.9	
Hydropower	n	7	45	52	56	7	8	8	183
	%	13.0%	44.6%	25.1%	31.6%	16.7%	14.5%	4.9%	22.9%
	St. res.	-1.5	4.6	0.7	2.4	-0.8	-1.3	-4.8	
Fish farming/ processing	n	6	11	20	16	5	7	127	192
	%	11.1%	10.9%	9.7%	9.0%	11.9%	12.7%	77.4%	24.0%
	St. res.	-1.9	-2.7	-4.2	-4.1	-1.6	-1.7	14	
Total	n	54	101	207	177	42	55	164	800
	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

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