Understanding community acceptance of a potential offshore wind energy project in different locations: an island-based analysis of 'place-technology fit'

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1. Introduction

In order to restrict global warming to 1.5 degrees, significant investments in climate change mitigation technologies such as renewable energy projects are required, consistent with rapid and far-reaching energy transitions (IPCC, 2018). However, a lack of social acceptance, manifest by repeated controversies over the siting of projects such as wind farms and associated infrastructure such as power lines, poses a significant challenge to this goal. Therefore, it is important to fully understand the dynamics of social acceptance relevant to different pathways towards the decarbonisation of energy systems (Foxon, 2013).

Offshore renewable energy projects are a crucial element of energy policies for many countries and a significant future pathway towards low carbon electricity globally. In the UK, 5.7GW of offshore wind capacity has been installed to date, due to increase to 10GW by 2020, and then to increase further by an estimated 10GW by 2030 (Department for International Trade, 2019). If achieved, this would generate approximately 20% of UK electricity supply (RenewableUK, 2018). Crucially, this is to be sited either offshore or in remote island contexts, deemed most suitable by policy makers for wind energy deployment (Department for Business, Energy and Industrial Strategy (BEIS), 2017). Accordingly, it is highly relevant to better understand acceptance of wind energy in offshore and island locations, which face higher costs for decarbonisation due to spatial distance and lack of grid connection.

Social acceptance is a multi-dimensional concept with inter-related socio-political, market and community aspects (Wüstenhagen et al., 2007; Devine-Wright et al., 2017; Wolsink 2018). This study focuses on community acceptance, while recognising the interactions between dimensions. Community acceptance research has been dominated by case studies of local responses to specific proposals, with a primary interest in identifying the factors influencing objections or support (e.g. Ellis et al., 2007; Devine-Wright and Howes, 2010; Gross, 2007; Upham, 2005). While these have been successful in drawing attention to the inadequacies of the 'NIMBY' (Not In My Back Yard) explanation to capture the complexity of issues involved (Burningham, 2000; Wolsink, 2006; Devine-Wright, 2011), *post hoc* research designs have inherent limitations in providing information about what potential future projects communities might accept, and why.

Understanding 'conditional' public support for low carbon energy projects has been a longstanding goal of literature on social acceptance (Bell et al. 2005; 2013; Graham et al., 2009; Devine-Wright, 2011, Wolsink, 2007). In this study, we compare community acceptance of a potential future offshore wind energy project in multiple locations a similar distance from the coast, with an emphasis on the symbolic meanings associated with both place and technology, described as 'place-technology fit' (Devine-Wright, 2009; McLachlan, 2009). Project details were identified through collaborative exchanges with policy makers, based upon extensive assessment of resource availability and environmental impact. The aim was to identify what attributes of people, place and project are most important in explaining community acceptance, informing local trajectories of technology deployment as well as providing broader lessons relevant to other geographical contexts.

1.2 Social acceptance

Driven by interest in social conflict over the siting of renewable energy projects, researchers for several decades have been attempting to clarify why such conflicts arise (Bell et al., 2005; Kempton et al., 2005; Wolsink, 2007; Devine-Wright, 2005). In addressing widespread academic scepticism over the value of the the NIMBY concept (Burningham, 2000; Wolsink, 2006; Devine-Wright, 2011), social acceptance has provided an alternative pathway for social science research into low carbon energy deployment (Ekins, 2004; Wustenhagen et al., 2007). Social acceptance is often conflated with public or community acceptance (Wolsink, 2018); however, it is more accurately described as a concept that encompasses multiple socio-cultural, political, market and community dimensions (Wustenhagen et al., ibid, Batel, 2018; Devine-Wright et al., 2017; Wolsink, 2018), even if empirical research tends to concentrate upon one specific dimension (see Scherhaufer et al., 2018 for a notable exception).

Community acceptance refers to the responses of local stakeholders, particularly residents to renewable energy projects sited nearby (Wustenhagen et al., ibid). In part due to the relevance of community acceptance for the NIMBY concept, many studies have attempted to validate NIMBY assumptions (e.g. concerning spatial proximity as a determinant of local attitudes – Swofford and Slattery, 2010) or to find alternative explanations that go beyond specific problems with the concept. Along this latter pathway, one can identify studies that focus on justice aspects (procedural, recognition and distributive, e.g. Gross, 2007) and trust (Huijts et al., 2007) as important determinants of community acceptance. Other studies have pointed to the importance of 'place-technology fit' (Devine-Wright, 2009; McLachlan, 2009), which refers to the role played by symbolic beliefs about the local landscape or seascape and the degree to which a given technology project is interpreted to be suited or 'out of place' in that context.

Research has consistently shown that beliefs about landscape and place, conceptualising place as a locus of meaning and a locus of attachment (Williams, 2014), play an important role in shaping community acceptance, across case studies of nuclear power (Venables et al., 2012), hydro-energy (Vorkinn and Riese, 2000), offshore wind energy (Devine-Wright and Howes, 2010), tidal energy (Devine-Wright, 2011b), power lines (Devine-Wright, 2013) and shale gas (Jacquet and Stedman, 2014). More broadly, it has been shown that societal acceptance of wind energy projects varies systematically across landscape types, with projects considered more acceptable when located in industrialised or military locations and less acceptable in locations regarded as pristine or wild (Wolsink, 2010; Gee, 2010). In part, this has been shown to derive from a tendency to 'essentialise' symbolic meanings about places and landscapes as 'natural' in character, and therefore unsuited to the siting of large-scale energy infrastructure interpreted to 'industrialise' or spoil that landscape (Batel and Devine-Wright, 2015).

Although this literature has enriched our understanding of community acceptance, there remains an important gap that research has tended to overlook. Most studies adopt a *post hoc* research design that follows the announcement of a particular proposal and attempts to understand why residents have taken certain views or act in certain ways in response. Relatively few studies have taken place prior to specific projects being proposed. *A priori* studies may have greater impact on policy makers, industry and civil society since findings can inform pathways of local low carbon energy deployment consistent with the IPCC call for rapid and extensive climate mitigation (2018). This is by no means inevitable for *post hoc* studies, whose findings may be regarded as particular to that community, place and moment in time.

The offshore wind energy sector receives strong policy support in the UK, with intentions to increase capacity to a total of 20GW by 2030 or 20% of national electricity demand (Department of International Trade, 2019). Government funded research suggests strong socio-political acceptance of offshore wind - 79% of public respondents in large-scale nationally representative surveys have expressed support for offshore wind energy, with little gender or regional variation (BEIS, 2018). However, local opposition to specific proposals has still occurred, arising from concerns about the visual impacts of large-scale projects on seascape character, the tourist economy, and distributional and procedural justice (Haggett, 2008; Devine-Wright and Howes, 2010; Devine-Wright 2012). Kerr et al.

(2014) recommmended more research on public attitudes towards marine renewable energy, including investigation of the drivers of public attitudes and the importance of socio-cultural context, a point also made by Wiersma and Devine-Wright (2014).

Some ‘upstream’ (i.e. *a priori* to specific development proposals) research on social acceptance of offshore wind energy has taken place. One example is a study that used a survey to investigate the impacts of community benefit framings on community support for a hypothetical offshore wind farm near a coastal town in South West England (Walker et al., 2014). While the study showed that different framings of financial benefit (i.e. as a bribe to influence the community) have significant impacts on community acceptance, it neglected to investigate other conditions that might provide a more comprehensive explanation of acceptance (e.g. number of turbines, distance from shore).

Another notable study by Kreuger et al. (2011) used a choice experiment methodology to study public support for potential wind farms off the North East coast of the United States. Of relevance to this study is the way that the research took account of different offshore locations and distances from the coast, using maps integrated within the survey to depict different spatial areas and photo simulations to indicate changes to the seascape. The study showed that the majority of participants’ attitudes did not vary by location but did vary by distance, becoming more favourable at greater distances from the coast. Similar findings about the impact of spatial proximity show that hypothetical offshore projects are typically favoured over onshore projects, and distant over nearshore (e.g. Ek, 2006; Jones and Eiser, 2011; Ladenburg, 2009; Ladenburg and Dubgaard, 2009; Ladenburg and Lutzeyer, 2012).

However, there is some variation in findings. For example, McCartney (2006) found that participants preferred an onshore to an offshore location when that offshore location was a specific marine park area. In sum, to fully understand community acceptance, quantitative indicators of distance, which conceptualise space in a Cartesian, objective manner, need to be complemented with qualitative indicators of place meanings and attachments, derived from a perspective on spatiality described as an 'ethic of the particular' (Drenthen, 2010).

Given UK policy support for offshore and island based wind energy projects, the socio-cultural context of islands as locations for low carbon energy projects is important to consider. De Groot and Bailey (2015) studied the drivers of public attitudes towards marine renewable energy in three UK island locations drawing on data from surveys and interviews. While local attitudes to marine energy were typically positive, based on awareness of wind, tide and wave resources, there was also considerable uncertainty about their potential impacts. Concerns about island remoteness, vulnerability and high cost of living, as well as positive attributes such as tranquility and natural beauty were seen to provide a suitable social, economic and environmental context for the acceptance of energy projects, provided that technology proposals were seen to complement these place-based values. The authors concluded that there was a '*need for attitudinal research on renewable energy to pay greater attention to understanding local impacts and, hence, the local factors affecting how impacts are perceived, rather than assuming these to be generic' (p91).*

It is crucial therefore, to develop our understanding of the role of place in shaping community acceptance of offshore and island based energy projects. Gee (2010) argued that the sea possesses its own unique sense of place distinct from the mainland, which must be taken into account in empirical research. Bidwell (2017) found that beliefs about the sea or ocean were crucial in understanding acceptance of a proposed offshore wind farm near Block Island, off the state of Rhode Island in the United States, drawing on survey data from residents and tourist visitors. He argued that drawing out multiple symbolic meanings associated with the coast or sea associated with offshore energy projects was an important basis for future technology deployment, serving to identify, if not enable, consensus between alternative opinions of how the ocean should be managed or used. Similar findings were reported in a study of the same project that compared pre-installation and post-operation opinions amongst island and coastal residents (Firestone et al., 2018). The authors concluded by recommending future research into place meanings and its relationship to responses to offshore wind energy projects, using quantitative statistical analyses. The broader context of energy systems and policies has also been shown to be relevant. Acceptance of a specific offshore wind project varies depending on whether it is perceived as a one-off development or part of a wider programme of technology deployment, with the latter more strongly supported (Firestone and Kempton, 2007). However, few empirical studies to date have investigated ways that community acceptance of a wind energy project in an island context might relate to broader contextual issues such as economic vulnerability or autonomy in governance.

In sum, there is a need to undertake research into community acceptance of offshore wind energy that takes account of the diverse meanings associated with place and technology in island socio-cultural contexts. We argue that the plausibility and relevance of 'upstream' acceptance research will be enhanced through a process of continuous engagement with local policy makers across the research process. This can lead to the co-production (Howarth and Monasterolo, 2017) of research that draws on credible technical, environmental and economic characteristics of a potential technology project(s) (i.e. the likely conditions of acceptance, Bell et al., 2013). By doing so, social science research can reveal levels of acceptance of alternative socio-technical configurations, and feed this information back to inform public debate and policy making.

Studies of marine spatial planning have called for greater input of public and stakeholder values and preferences in order to manage potential synergies and conflicts from different forms of land and sea use (e.g. Strickland-Munro et al., 2016). There remains potential to better join up in-depth research into community acceptance, using methods such as questionnaire surveys and focus group discussions, with procedures of marine spatial planning including collaborative and participatory modes of engagement. It is also important to attend to issues of researcher positionality, avoiding the framing of research as instrumentally addressing so-called 'NIMBY' deviance or objections (Aiken, 2010; Devine-Wright, 2011). This study addressed these issues using survey data from a representative sample of adult residents (n=468) on Guernsey, Channel Islands, as part of a multi-method, collaborative research project (Wiersma, 2016). Specific research questions include:

1. Does community acceptance of a potential nearshore wind project vary by location?
2. What are the most significant factors explaining acceptance, encompassing personal, place (including spatial distance) and project-related aspects?

3. To what extent does the significance of these explanatory factors vary across different sites for development?

2. Methodology

2.1 Context

The study was conducted on Guernsey, an island situated 115km south of England and 50km west of Normandy, France (see Figure 1; States of Guernsey Government, 2017). Although not part of the UK or EU, it is a self-governing British Crown Dependency where the British Queen is head of state. The island has a total population of 62,000 and is densely populated at 995 people/km^2 with centres of population in the east and north and relatively more sparsely populated, natural areas to the west and south (States of Guernsey, 2017). It is relatively small in scale, with a total area of 38 square kilometres (15km length and 5km width approximately), meaning that the coastline is accessible to the island's population. Annual consumption of electricity is 350GWh with supply managed by a state-owned electricity company, via an undersea cable from France and a diesel-fuelled power station sited to the north east of the island. Faults to the cable occur occasionally (e.g. December 2018), requiring the diesel power station to meet total demand, which has raised public concerns over system expense, environmental impacts and security of supply (Guernsey Press, 2018).

2.2 Procedure

A survey was used to collect data, following earlier qualitative phases of research. Questionnaires were distributed through a drop and collect method to households across the island, with vouchers offered to increase response. To ensure a spatially representative sample, surveys were distributed to a predefined number of households randomly selected in 26 target zones across Guernsey's 10 parishes (see Figure 1). Questionnaire distribution took place during January-March 2015, using two methods. 638 questionnaires were delivered in person, of which 418 were returned. 17 questionnaires were excluded from the dataset due to missing data or concerns over data quality (e.g. all responses were 'strongly disagree', Jones and Hidiroglou, 2013). The final number of 401 represents a 63% response rate for this phase. A further 513 questionnaires were posted by the researcher (without return envelope) to households during visits. Of the 513 questionnaires distributed this way, 67 were returned, all of which were included in the dataset – a 13% response rate. The final sample size of 468 represents an error rate of between 4 and 5% (at a 95% confidence interval). Data from drop and collect and postal distribution were compared, and no significant differences were found on key variables, so all responses were included in the final dataset (N=468), an overall response rate of 41%.

Insert Figure 1 about here

2.3 Sample

The study aimed to achieve a sample representative of the adult population of the island. There was an even gender split and a slight oversampling of those aged between 50 and 69, and an undersampling of those aged 18-29 (see Table 6). The sample was diverse in education, income and whether or not respondents grew up in Guernsey, although no data were available on a population level to check the representativeness of the sample on these aspects. The sample was reasonably representative according to spatial distribution across the island's parishes, with the exception of St. Peter's Port (under-representation) and St. Sampson and Vale (North) (over-representation)(see Table 1).

Insert Table 1 about here

2. 4 Survey design

The questionnaire was co-produced by the research team following extensive engagement with government officials and included details of a potential offshore wind project that was considered most likely by the policy makers to be proposed in the future. Details about size, location, costs and ownership were presented with the following text: '*In the future, an offshore wind farm could be developed near Guernsey, which would make its electricity supply more diverse and secure, and reduce its carbon emissions. One option could be to build a group of 10 wind turbines like the one pictured here (each 100 meters tall)'.* Figure 2 shows the image in the survey used to exemplify an offshore wind turbine.

Insert Figure 2 about here

Further details were provided of the proposed project in the survey and these are presented in Table 2, indicating the number and hub height of turbines, ownership structure, contribution to electricity demand, impact on the cost of average annual electricity bills and Environmental Impact Assessment (EIA).

Insert Table 2 about here

Three locations or 'zones' of potential development were identified (see Figure 3). Each was a similar distance from the coast in the nearshore area. These had been identified by previous engineering and ecological research as technologically and biophysically suitable for offshore wind energy (e.g. resource availability, depth of sea-bed, avoiding exclusion areas). For the survey, the zones were designed to be relatively similar in area, with borders between them based on place meanings of different sections of the coast garnered by the two preceding qualitative studies (see Wiersma, 2016 for details). Local place names (e.g. Lihou island, Cobo beach) were added to enable participants to identify the location of each zone based on familiar landmarks.

Insert Figure 3 about here

The questionnaire was piloted with 15 residents of varied age who completed the questionnaire first, then during an informal face-to-face discussion talked through their answers and pointed out anything that needed clarification. This led to a few minor changes to the information provided, question wording and design of the maps in the questionnaire.

2.5 Measures

The survey included items on personal characteristics (e.g. age, gender, education, income relative to the average on the island, residential location), leisure activity (e.g. use of the sea), place attachment and identities, energy system beliefs, meanings associated with each place and project characteristics. Residential location was measured using information about the parish where each respondent's home was situated. Although ten parishes were captured in the survey (see Figure 1), since some parishes were very small in area and numbers of respondents, smaller parishes were clustered by area for further analyses. Respondents from Forest (n=11) and St. Andrew parishes (n=27) were clustered into a 'South East' area of residence variable. Respondents from St. Peters (n=23), St. Saviour (n=14) and Torteval (n=9) parishes were clustered into a 'South West Parishes' residence variable. These variables were added to the larger parishes (Castel, St. Peters Port, St. Sampson, Vale) to form six area variables for further analyses.

Place attachment was measured using nine items capturing different varieties of relations (Lewicka, 2011a) with the island. Principle components analysis (see Table 3) revealed a three factor structure explaining 67.87% of the variance. Factor one consisted of five items that indicated traditional attachment with Guernsey. A high score on this measure indicates someone who is strongly attached to Guernsey with little interest in living anywhere else. Factor two consisted of three items that represented active attachment with Guernsey. A high score on this measure indicates someone who is strongly attached to Guernsey and who actively keeps up with local changes and experiences. Factor three consisted of one item indicating the variety described as Placelessness, where a high score indicates that feeling attached to Guernsey is not of personal relevance.

Insert Table 3 about here

Six items were used to capture diverse place and social identities, including the parish, Guernsey, Channel Islands, English, British and European. Principle components analysis revealed a two factor structure that explained 68.45% of the variance. Factor one consisted of four items that represented local identity (e.g parish, Guernsey) with a high level of internal reliability (Cronbach's alpha = 0.81). A high score indicates someone who strongly identifies themselves as a Guernsey type of person. Factor two consisted of two non-local items (British, English) with a low Cronbach's alpha of 0.56, therefore the two labels were used separately in further analyses.

Beliefs about the island's energy system were captured using nine items, with content drawn from previous qualitative research. Principle components analysis revealed a three factor solution that explained 62.9% of the variance (see Table 4). Factor one consisted of four items that represented support for greater autonomy and security in island energy supply. Factor two consisted of two items that represented the view that electricity on the island was too expensive (Pearson's $r = 0.23$, $p<.000$, $n=466$). Factor three consisted of three items indicating satisfaction with the current energy system and the feeling that it does not need to change.

Insert Table 4 about here

A single item was used to measure perceptions of the sea around the island as a resource to be utilised. Meanings associated with the coastal areas near each wind farm location or 'zone' were measured using seven items that were devised from previous research (e.g. Wolsink, 2007) and the qualitative research on the island that preceded the survey, which were similarly applied to the three zones. Principle components analyses were conducted separately for each zone. For zone A, two factors were identified that explained 65.38% of variance. Factor one consisted of five items indicating a place of natural beauty and fantastic views, with an alpha of 0.85. Factor two consisted of two items indicating a place that was perceived as quite industrial and not pristine (Pearson's $r = .281$, $p<.000$, $n=419$). For zone B, analysis indicated a two factor solution that explained 67.06% of variance. Similar to zone A, the factors indicated a place of natural beauty and fantastic views (four items, alpha = 0.86) and a place that was considered industrial/not pristine (Pearson's $r = .340$, $p<.000$, $n=419$). For zone C, a two factor solution was identified that explained 68.05% of variance. As with the other zones, factor one consisted of four items indicating a place of natural beauty and fantastic views (alpha = 0.88) and factor two indicated a place that was industrial/not pristine (Pearson's $r = .431$, $p<.000$, $n=418$).

Beliefs about the wind energy project were measured using 9 items, drawn from the previous qualitative studies. Principle components analysis of the items revealed a three factor structure that explained 65.77% of the variance (see Table 5). Factor one indicated support for generating electricity for local use from the wind. Factor two consisted of two items that represented the belief that electricity on the island should be locally owned, with an inter-item correlation of 0.514 (p<.000, n=459). Factor three consisted of four items referring to negative impacts of the wind project on wildlife.

Insert Table 5 about here

Acceptance was measured separately for each zone. Participants were asked to indicate whether they agreed with two statements in relation to each: '*I would support this 10-turbine wind farm/I would accept this 10-turbine wind farm in location [A-C]'* with responses on a Likert type scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Very high correlations were observed for the pairs of items across the three locations (r>.95, n>410, p=.000), therefore items were summed to create a single measure of acceptance applied to each location. Table 6 provides a summary of measured used and descriptive data for each.

Insert Table 6 about here

3. Results

Findings are structured in three sections. First, to address research question one, analyses are presented of differences in community acceptance across wind project locations. Second, to address research questions two and three, ANOVA and regression analyses are presented of the explanatory variables that explain acceptance in each location. The final section presents a mediation analysis to examine whether the effect of support for energy security on the island on community acceptance is mediated by use of the wind for local electricity supply.

3.1 Comparing acceptance of the wind project in different locations

Descriptive data showed that acceptance was lowest for zone A, below the mid-point for zones A and B, with only zone C above the mid-point of the scale (see Table 5). Paired-samples t-test analysis indicated significant differences across the three locations (zone A*zone B: $t(348) = -5.194$, $p<.000$; zone A*zone C: $t(348) = -8.768$, $p<.000$; zone B*zone C: $t(348) = -6.032$, $p<.000$). Correlational analysis indicated that the acceptance measures strongly correlated for zones A and B (Pearsons $r = 0.836$***), but less so between these two measures and zone C (A correlated with C $r = .587$*** and B correlated with C $r = .679$***). Although these show strong associations, it was considered appropriate to treat each acceptance measure as a separate dependent variable in further analyses in order to investigate potentially different patterns of explanatory variables between them.

3.2: Examining factors explaining community acceptance of the wind energy project

3.2.1 Analysis of the relation between spatial proximity and project support in each zone

In order to investigate potential effects of spatial proximity – measured using parish location - on project support, ANOVAs were undertaken for each of the three measures of project acceptance by each of the six variables of parish residence. Results indicated no significant differences for zone A, but significant differences for zones B and C (see Table 7 for mean values). For zone B, the difference between residents of Castel (West) and St. Sampson (North) approached statistical significance (mean difference = -.75 (SE = 0.23), p=.059) with Castel residents more supportive of an offshore wind farm in Zone B (mean = 3.05, SD=1.30) and St. Sampson residents least supportive (mean = 2.30, SD =1.31). Standard deviations indicate least consensus about whether a wind project should be sited in Zone C. In this zone, support was strongest amongst residents in the East, South East, South West and West parishes – who lived furthest away - and weakest in the residents of the Northern parishes of Vale and St. Sampson - who lived closest to this zone. Residents in Vale (North) significantly differed from residents in two of the other parishes (versus Castel mean diff. = -1.04 (SE = .25), p<.005; versus St. Peters Port (East) mean diff = -.86 (SE = .23), p<.015). Differences between Vale residents and those in the South East and South West parishes approached significance (Vale*South East p<.057; Vale*South West p<.090). Residents in St. Sampson (North) significantly differed from residents in three of the other parishes (Castel mean diff. = -.97 (SE = .23), p<.004; St. Peters Port (East) mean diff = -.80 (SE = .20), p<.01; South East mean diff = -.75 (SE = .23), p<.053). While descriptive statistics should be interpreted with caution (see Table 1 concerning parish samples and spatial representativeness), in summary, analyses suggest heterogeneous effects of spatial proximity, with no relationship for zone A; weak differences among neighbouring parishes for zone B and a negative relation for zone C, in which residents of neighbouring parishes were least supportive and residents of more distant parishes most supportive.

Insert Table 7 about here

3.2.2 Examining people, place and project factors explaining community acceptance

Given constraints of sample size, correlational analysis was undertaken as a preparatory step to identify measures strongly associated with acceptance for each zone (see Table 8). Certain variables correlated with acceptance in each location (age, education, traditional attachment, system autonomy, system satisfaction, local electricity from wind, industrial impacts, coast zone beauty and coast zone industrialisation), if sometimes weakly in strength. The valence of these associations was consistent. Positive associations were found with educational attainment, support for system independence, support for use of wind for local electricity supply and belief that the coastal location was not pristine but already industrialised. Negative associations were found with age, traditional attachment, satisfaction with the current energy system and the belief that a coastal location was characterised by natural beauty. Five measures were only associated with acceptance in zone C (active attachment, local and British identity, current energy system too expensive, support for local ownership of a wind project). Viewing the sea as a resource was strongly associated with acceptance in zones B and C, but not zone A.

In terms of spatial proximity, no consistent pattern of association is apparent. For those living in parishes in the South West and South East, no associations were found with acceptance in any of the three zones. For those living in the West (Castel), a positive association was found with zones B and C, but no association with zone A. For those living in the East, a positive association was found with zone C, but there was no associations with A or B. For those living in the North (Vale and St. Sampson), negative associations were found with zones B and C, but there was no association with zone A. Gender, income, use of the sea for leisure, English identity and placelessness did not correlate with acceptance in any location and were excluded from further analyses.

Potential multi-colinearity between independent variables was assessed through analysis of correlations between the measures (see appendix B). None of the variables correlated greater than 0.8 (Field, 2011). Therefore, only the significant variables for each zone were taken forward into the regression analyses as independent variables (see Table 8).

Insert Table 8 about here

Linear multiple regressions were conducted to identify which variables explained acceptance of the project in each of the three zones. In each regression, scale measures were used, apart from the variable for educational attainment (categorical). Drawing on the framework of Person, Place and Project (Devine-Wright, 2013), independent variables were entered in three blocks. Block one consisted of personal characteristics (age, educational attainment). Block 2 consisted of place and context-related measures (place attachment types (traditional, active), local and British identity, sea as resource, energy system beliefs (autonomy, expensive, satisfaction), coastal meanings (natural beauty or industrialised) and spatial proximity (parish residence). Block 3 consisted of measures specific to the proposed wind energy project (local supply from wind, local ownership, negative industrial impacts)[1].

For zone A, block one (age, education) explained 4.7% of the variance, with education positively related to acceptance (see Table 9). Block two explained a total of 14.8% of variance, with education, system autonomy and industrial place meanings significant. Support for system autonomy and associating this place with industrial meanings positively explained wind farm acceptance. The final model indicated three significant predictors that explained a total of 36.7% of the variance. The most significant predictor was use of the wind for local electricity supply, in addition to education and industrial impacts of the project. Neither coastal industrialisation nor system autonomy were significant in the final model.

[1] Multicollinearity was not found to be an issue in any of the models, as VIF values were all between 1.02 and 1.79 (well under the threshold value of 10; Field, 2013), while all the tolerance values were well above 0.2 (between .56 and .95).

For zone B, block one explained 5.6% of the variance, with age negatively related and education positively related to acceptance (see Table 10). Block two explained 21.4% of the variance, with education, system autonomy, Vale parish residence, beauty and industrial place meanings significant. Education, support for system autonomy and industrial place meanings were positively related to acceptance in this zone. Residence in Vale, a parish predominantly situated on the north coast of the island, but with a small part situated on the west coast, as well as beauty place meaning, was negatively related to acceptance. The final model indicated four significant predictors that explained a total of 46.4% of the variance. Similar to zone A, the most significant predictor was use of the wind for local electricity supply, in addition to education, coastal industrialisation and industrial impacts. As with zone A, system autonomy was significant in the second model but not the final one.

For zone C, nineteen explanatory variables were included with acceptance of the wind farm as the outcome variable (see Table 11). Variables included in block one explained 6% of variance. Of these, age was significant and negatively related to acceptance while education was significant and positively related. Block 2 explained 29.6% of variance, with education, Vale parish residence, system autonomy and industrial meanings as significant predictors. The final model indicated five significant predictors that explained a total of 53.7% of the variance – education, Vale parish residence, coastal industrialisation, use of the wind for local electricity supply and industrial impacts. As with zones A and B, use of the wind for local electricity supply was the most important explanatory variable. Education was consistently positively related with acceptance, as was associating the place with industrialisation. Living in Vale - the parish with closest spatial proximity to the project site -

was negatively related with acceptance, as well as associating the project with industrialisation.

Across all analyses, a similar pattern was observed of system autonomy being significant in model 2 but not significant in the final models. Accordingly, further analyses were undertaken to investigate whether the effect of system autonomy on acceptance was mediated by supporting the use of wind for local electricity supply.

Insert Tables 9-11 about here

3.3 Investigating the mediating effect of use of wind for local electricity supply on the relationship between system autonomy and acceptance of the wind project

Further analyses were conducted to test whether support for use of the wind resource for local energy supply mediated the relationship between energy system autonomy and community acceptance in zones A-C. First, multiple regression analyses were conducted to assess each component of the proposed mediation model. It was found that energy system independence was significantly associated with acceptance of the wind project in zone C ($\beta = .204$, $t(2, 416) = 2.64$, $p < .009$) but not in zones A ($\beta = .152$, $t(2, 408) = 1.82$, n.s.) and B ($\beta = .123$, $t(2, 408) = 1.54$, n.s.). This indicates that for Zone C only, individuals who expressed support for a more autonomous and secure energy system on the island were more likely to accept the wind project. Energy system independence was positively related to use of the wind resource for local supply in all zones (zone A: $\beta =.419$, $t(1, 409) = 5.98$, $p< .000$; zone B:

β =.404, t(1, 409) = 5.75, p< .000; zone C: β =.410, t(1, 417) = 5.89, p< .000). Results indicated that use of wind for local supply was positively associated with support for the wind project in each zone (zone A: β =.767, t(2, 408) = 13.56, p< .000; zone B: β =.900, t(2, 408) = 16.610, p< .000; zone C: β =.995, t(2, 416) = 18.996, p< .000)

We followed the recommendations of Preacher and Hayes (2004), who suggest using a bootstrapping procedure to compute a confidence interval around the indirect effect (i.e. the path through the mediator). If zero falls outside this interval, mediation can be said to be present. We used the SPSS macros PROCESS that Preacher and Hayes (ibid) provide for this procedure. In these analyses, energy system independence was the independent variable, acceptance of the wind project in zones A, B and C were the dependent variables, and use of the wind for local supply was the mediator. Using a bootstrapping method (Preacher and Hayes, ibid) in each case, analyses showed a complete mediation effect (see Figures 3-5). The indirect effect of local wind resource on acceptance of the wind project in Zone A was .32, the 95% confidence interval ranging from .206 to .439 (SE = .059). The indirect effect of local wind resource on acceptance of the wind project in Zone B was .363, the 95% confidence interval ranging from .232 to .499 (SE = .068). The indirect effect of local wind resource on acceptance of the wind project in Zone C was .408, the 95% confidence interval ranging from .263 to .552 (SE = .073). The fact that zero falls outside these intervals indicates a significant mediation effect in each case. The direct effect of system independence on support for a wind project was significant only in Zone C (p<.009), suggesting that use of the wind for local energy supply fully mediates the relationship between energy system independence and wind project support in Zones A and B, and partially mediates the relationship between between energy system independence and wind project support in Zone C.

Insert Figure 4-6 about here

4. Discussion

This paper aimed to deepen understanding of community acceptance of offshore wind energy through analysis of 'place-technology fit'. Using a survey method, acceptance of a potential project was measured in three nearshore locations, each of which met engineering and ecological criteria suitable for deployment and were a similar distance from the coast of Guernsey, Channel Islands. The research is based on the proposition that 'upstream' (i.e. *a priori)* social research into acceptance of a potential project can complement technical and ecological analyses to inform trajectories of local deployment, providing they are based on sound project configurations, close engagement with local policy makers and sensitive to researcher positionality (Wiersma and Devine-Wright, 2014).

Findings show that place matters. Significant differences were found in acceptance of the same project across three locations. Zone A was generally considered least acceptable while Zone C was generally considered the most acceptable. It is notable that zone C indicated the highest level of explained variance and the greatest number of potential predictor variables (see tables 8 and 11). This suggests that public beliefs about offshore wind energy in this zone are characterised by greater certainty and detail. Drawing on the concept of 'place technology fit' to explain these findings, it is useful to begin with descriptive data for place meanings (see Table 6). These show that zone C was less likely to be viewed as a 'naturally beautiful' or pristine place compared to zone A, and more likely to be viewed as 'industrialised' in comparison to zone A. This is not surprising given that the island's land-fill site and diesel power station are both located in the north of the island. In short, acceptance of an offshore wind project was highest in the area considered to be relatively more industrialised and less natural, supporting previous research (Wolsink, 2007; Gee, 2010; Batel and Devine-Wright, 2016).

But this is not the whole story. Average differences in place meanings across the zones masks variation within the sample linked to residence location. While there was strong consensus within the sample that zone A was a place of natural beauty, there was less consensus that zone C could be viewed in a similar manner. Although the differences were not statistically significant[2], and therefore this interpretation is somewhat speculative, zone C was more strongly viewed as a place of natural beauty by residents of the Northern parishes in comparison to residents elsewhere on the island. This suggests that local residents in the Northern parishes viewed a potential wind farm in zone C as more of a threat to the beauty of this part of the coast in comparison to residents living further away, consistent with theory that place meanings are social constructions (Williams, 2014) and that place protection is a driver for community objections (Devine-Wright, 2009).

One conclusion is that the effect of place meanings, place attachments and spatial distance interact in ways that deserve more research attention. Of relevance is research by Bonaiuto et al. (1996) who found that residents living in a UK coastal town rejected the designation of

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[2] ANOVA indicated a significant main effect of parish residence on natural beauty place meanings for zone C ($F = 2.79$, df5, 400), $p<.017$). However, post-hoc tests revealed no significant differences between parishes. There was no main effect of parish residence on industrial place meanings for zone C.

their local beach as being polluted by a Europe-wide monitoring scheme. They explained this effect by concluding that denial of pollution was a strategy used by residents to cope with a threat to their sense of place. It might be that Northern residents who take pride in their part of the island are more likely to overlook objective characteristics of the area (e.g. the presence of the landfill site and power station) in order to preserve a positive sense of identity at the parish level, in contrast to those living elsewhere on the island who are less personally invested in that area. Another explanation could be that a wind farm proposed for zone C was viewed as further 'industrialisation' of the area by residents in the Northern parishes, who indicated lower levels of acceptance arising from a sense of distributional injustice (Gross, 2007), whereby 'locally unwanted land uses' accumulate in one part of the island. Further research is required to investigate which of these explanations is the most accurate.

Regression analyses showed that place and project variables have greater explanatory power in comparison to personal variables. Certain person and place variables were consistently not significant across the models, notably gender, income, place attachment varieties, place and social identities, use of the sea for leisure and considering the sea as a resource. This finding contrasts with previous studies in which these variables emerged as significant for explaining acceptance (e.g. Devine-Wright, 2013). Educational attainment emerged as a consistent predictor of acceptance, with more highly educated participants more strongly in favour of siting a wind farm in each of the three zones.

Place meanings – ‘natural beauty’ and ‘industrialised’ - showed consistent associations with acceptance, if varying across locations. Natural beauty was always negatively associated with acceptance and industrialisation always positively associated with acceptance, with industrial place meanings significant in the final models for zones B and C. This pattern of findings between place meanings and acceptance supports previous research (Wolsink, 2007; Gee, 2010; Batel and Devine-Wright, 2016), reinforcing the conclusion that energy projects are less likely to be supported when seen to be out of place in a ‘natural’ area, and more likely to be supported when seen to ‘fit’ with an already industrialised or developed place.

In terms of spatial distance, parish residence emerged as a significant predictor in regressions for zones B and C only, yet in contrasting ways. Residence in Castel, a parish in the West of the island, positively explained support for a wind farm in zone B, if only in model 2, not the final model. At first glance, the positive association for Castel seems an unexpected and contradictory finding. Castel parish is on the coastline that would be directly impacted by a wind farm in zone B, yet the residents are significantly more supportive. Two explanations are tentatively provided here. The first is that this might be commonly regarded as a very windy place by local residents, who thus view a wind farm off the coast as representing a good ‘place technology fit’ (Cresswell, 1996; Devine-Wright, 2011; Bates and Firestone, 2015). The second is that the orientation of popular beaches on this coast (e.g. Cobo) is directed to the West and South West, meaning that views to the north are impeded by headlands (see Figure 1), placing a wind farm in zone B largely out of view. If this is the case, it underlies the value of future studies using realistic photo-simulations from set vantage points as a method to investigate acceptance of hypothetical wind energy projects. The finding that residence in the Vale parish in the North of the island negatively explained support for a wind farm in zone C is consistent with the observations on place meanings provided above, and suggests that consideration of benefit distribution to this parish, given its existing proximity to the land-fill and power station, should be considered in order to ensure that the interests of residents are taken into account in any actual deployment in the future.

Explanatory variables about project characteristics (wind for local supply, ownership and negative impacts) consistently added the greatest amount of explanatory variance to the models. However, local ownership was not significant in any analysis, suggesting that while local ownership is considered favourably by the islanders (see Table 6), it is less important as a predictor of acceptance by comparison with use of the wind for local supply (always positive and highly significant) and associating the wind farm with negative, industrial impacts (always negative, if less strongly significant).

Explanatory variables about the broader context of energy provision have been shown in the literature to be important predictors of community acceptance (e.g. Firestone et al., 2009). Surprisingly, in this research viewing the current system as expensive was not a significant predictor of acceptance. This was unexpected given that the proposed wind farm was stated to increase electricity bills by 5-10% per annum. It may be that this cost increase was countered sufficiently by the positive value of the wind farm to enhance system security. This hypothesis is consistent with the finding that support for greater autonomy and security of supply for the island emerged as a positive and significant predictor of acceptance in model 2, but not in model 3 across the three wind farm locations. Further analyses indicated that the most significant explanatory variable (support for using wind for local energy supply) mediated the effect of greater system autonomy and security in each case. This is a noteworthy finding, since it connects literature conventionally treated separately by past research– energy security and social acceptance.

Research on energy security tends to take the nation state as the unit of analysis while acknowledging its relevance at sub-national and supra-national scales (e.g. Demski et al., 2018). Empirical studies of dimensions of energy security help to explain the findings of this research, indicating the importance of reliability, affordability, vulnerability, import dependency and fossil-fuel dependency (Demski et al., ibid). Each of these dimensions is relevant to island contexts and help to explain the mediation effects shown in the analyses – the island currently has only one source of power generation, a diesel power plant that relies on imported, costly and environmental damaging fuel. Developing a wind farm for local power supply would not only lessen dependence upon imported fuel but also lessen reliance upon the French power cable with a history of intermittent faults (Guernsey Press, 2018). In that sense, community acceptance of an offshore wind farm in a location with good 'place-technology fit' would be consistent with the place-based values identified by de Groot and Bailey (2016) as an important driver of public attitudes towards marine renewable energy.

This finding is not only relevant to island contexts. The low carbon transition is characterised by a strong discourse of decentralised energy provision where cities, towns and villages take more active roles in energy provision (Willis, 2006; Wolsink, 2012). Moss and Francesch-Huidobro (2017) used socio-historical analysis to document ways that cities such as Berlin and Hong Kong valued 'autarky' (autonomy and security) in local power supply. Given that, there is a need to further investigate ways that energy security and autonomy can play a positive role in enhancing community acceptance specifically, and social acceptance more broadly, of renewable energy projects. While proposers of wind farms have tended to emphasise environmental or economic discourses, these findings suggest that security discourses may play a positive role in influencing community acceptance of decentralised energy transitions, not just in island but mainland contexts.

Given that the survey was designed in dialogue with local policy makers, the study supports the view that a 'co-production' approach (Howarth and Monasterolo, 2017) can have benefits for community acceptance research. Not only does it provide a means to go beyond techno-economic analyses of the 'potential' of energy sectors, it can inform public debate and policy making. Research has shown that if spatial zoning of suitable areas for wind energy deployment is imposed 'top down' on communities, it can become a focus of public objections and fail to achieve policy targets (Cowell, 2010). By incorporating findings about acceptance of different technology and project configurations in different locations, policy making can guide future development in ways that take account of conditional acceptance (Bell et al., 2013). In this case, findings have practical value for Guernsey. It can be hypothesised that implementing offshore wind proposals in zone A would garner less acceptance in comparison to zone C. It can also be hypothesised that residents in the Northern parishes might strongly object to a wind farm in zone C, even if this location is deemed suitable by those living elsewhere on the island. To achieve procedural and distributional justice in technology siting (Gross, 2007), the results suggest the merit of an island-wide dialogue involving citizens and policy makers (Wolsink 2007) about where industrial features that generate benefits for the island collectively – including a locally owned offshore wind farm - should be sited, given decisions already taken in the past about other land-uses, and to whom specific benefits or compensation should be distributed.

The study has several limitations. It investigated an offshore wind project characterised by singular configurations of scale, ownership, supply mode, cost and capacity, each of which might variably impact on acceptance. In terms of visual appearance and impact, the use of more extensive and realistic visualisations can provide a more accurate depiction of future seascapes upon which participants can express their opinions. There is room for future studies to combine different methods, using conjoint analysis (i.e. choice experiments) to quantitatively reveal the impacts of different attributes such as ownership models or impact on household bills, alongside qualitative methods to reveal place meanings. Deliberative methods could examine whether dialogue between publics, experts and policy makers can lead to shifts in opinions and policies better grounded in public as well as expert values. Finally, the scope of place-related factors could be extended to include multiple scales (from specific parish to whole island) and specific offshore locations directly impacted by the wind farm, as well as interactions between spatial proximity, place meanings and place attachments, using accurate measures of spatial distance than were employed here.

5. Conclusion and policy implications

Feedback of results to policy makers challenged pre-existing assumptions in a number of ways. First, they have challenged assumptions about low levels of community acceptance for offshore wind in comparison to other marine energy technologies, therefore providing evidence that opens up a potential trajectory for low carbon energy previously assumed to be too controversial (Wiersma, 2016). Second, findings provide evidence about the importance of location and spatial proximity in influencing community acceptance, over and above technical indicators of suitable sites. In doing so, the findings underscore the interdependencies between socio-political and community dimensions of social acceptance (Wüstenhagen et al., 2007) that deserve investigation in future research, particularly concerning perceptions of the value of different social science methods (focus groups, surveys) as sources of evidence about community acceptance to legitimise policy change. In this case, the large and representative sample was considered essential by policy makers, supporting previous research showing the greater appetite of policy makers for large-scale quantitative findings by comparison to small n research (Valentine, 2006).

To conclude, the findings of this study show that acceptance of the same project design differed significantly across alternative development locations. Regression analyses compared the roles of personal, place and project-related factors in explaining acceptance. Greatest variance was explained for the location that was also the most acceptable. Common patterns in acceptance across locations include significant effects for education (positive), industrial place meanings (positive) and local resource use (positive). Using wind for local energy supply was the most important predictor, and mediated the relationship between island energy security and community acceptance. We conclude that place matters for community acceptance and that future research should address interactions between place attachment and spatial proximity, as well as issues of security and autonomy, in island as well as mainland locations.

Acknowledgements:

The authors would like to acknowledge funding received from the Economic and Social Reseach Council's Impact Accelerator Award programme and the States of Guernsey government. We would also like to acknowledge the participants in the research, those who helped to distribute the survey, and local policy makers.

References:

Aitken, M. (2010) Why we still don’t understand the social aspects of wind power: A critique of key assumptions within the literature. *Energy Policy*, 38, 1834-1841.

Bates, A. and Firestone, J. (2015) A comparative assessment of proposed offshore wind power demonstration projects in the United States. *Energy Research and Social Science,* 10, 192-205.

Batel, S. (2018). A critical discussion of research on the social acceptance of renewable energy generation and associated infrastructures and an agenda for the future, J. Environ. Policy Plan. 20, 356–369.

Batel, S., Devine-Wright, 2015. A critical and empirical analysis of the national-local ‘gap’ in public responses towards large-scale energy infrastructures. *Journal of Environmental Planning and Management*, 58, 1076–1095.

Batel, S., Devine-Wright, P., Wold, L., Egeland, H., Jacobsen, G. and Aas, O. (2015). The role of (de-)essentialisation within siting conflicts: An interdisciplinary approach. *Journal of Environmental Psychology*, 44, 149-159.

Bell, D., Gray, T., and Haggett, C., 2005. The ‘social gap’ in wind farm siting decisions: explanations and policy responses. *Environmental Politics*, 14 (4), 460–477.

Bell, D., Gray, T., and Haggett, C. & Swaffield, J. (2013) Re-visiting the ‘social gap’: public opinion and relations of power in the local politics of wind energy, *Environmental Politics*, 22, 115-135.

Bidwell, D. (2017) Ocean beliefs and support for an offshore wind energy project. *Ocean and Coastal Management,* 146, 99-108.

Bonaiuto, M., Breakwell, G. M., & Cano, I. (1996). Identity processes and environmental threat: The effects of nationalism and local identity upon perception of beach pollution . *Journal of Community & Applied Social Psychology*, 6, 157–175.

Burningham, K. (2000). Using the Language of NIMBY: A topic for research not an activity for researchers. *Local Environment*, 5, 55–67.

Cowell, R. J. W. (2010). Wind power, landscape and strategic, spatial planning - The construction of 'acceptable locations' in Wales. *Land Use Policy*, 27, 222-232.

De Groot, J. and Bailey, I. (2016) What drives attitudes towards marine renewable energy development in island communities in the UK? *International Journal of Marine Energy,* 13, 80–95.

Department for International Trade (2019) *Offshore Wind Energy.* Available at: https://invest.great.gov.uk/industries/offshore-wind-energy/ (last accessed March 4th 2019)

Department for Business, Energy and Industrial Strategy (2017) *Boost to remote island wind projects as consultation launched.* Available at: https://www.gov.uk/government/news/boost-to-remote-island-wind-projects-as-consultation-launched (last accessed March 4th 2019)

BEIS (2019) Public Attitude Tracker, Wave 27. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/754515/W27_Summary_Report.pdf (last accessed March 4th 2019)

Demski, C., Poortinga, W., Whitmarsh, L., Böhm, G., Fisher, S. Steg, L., Umit, R., Jokinen, P. and Pohjolainen, P. (2018) National context is a key determinant of energy security concerns across Europe, *Nature Energy,* https://doi.org/10.1038/s41560-018-0235-8.

Devine-Wright, P. (2005) Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. *Wind Energy*, 8, 125-139.

Devine-Wright, P. (2009) Rethinking Nimbyism: the role of place attachment and place identity in explaining place protective action. *Journal of Community and Applied Social Psychology.* 19, 426-441.

Devine-Wright, P. and Howes, Y. (2010) Disruption to place attachment and the protection of restorative environments: a wind energy case study. *Journal of Environmental Psychology*, 30, 271-280.

Devine-Wright, P. (2011) Public engagement with large-scale renewable energy: breaking the NIMBY cycle. *Wiley Interdisciplinary Reviews: Climate Change,* 2, 19-26.

Devine-Wright, P. (2011) Enhancing local distinctiveness fosters public acceptance of tidal energy: a UK case study. *Energy Policy*, 39, 83-93.

Devine-Wright, P. (2012) Fostering public engagement in wind energy development: the role of intermediaries and community benefits, in J. Szarka, R. Cowell, G. Ellis, P. Strachan & C. Warren

(Eds.*) Learning from Wind Power: Governance, Societal and Policy Perspectives on Sustainable Energy*. Palgrave Macmillan, Hampshire, UK, pp. 194-214.

Devine-Wright, P. (2013) Explaining 'NIMBY' objections to a power line: The role of personal, place attachment and project-related factors. *Environment and Behavior,* 45, 761-781.

Devine-Wright, P., Batel, S., Aas, O., Sovacool, B., LaBelle, M.C. and Ruud, A. (2017) A conceptual framework for understanding the social acceptance of energy infrastructure: Insights from energy storage. *Energy Policy* ,107, 27-31.

Drenthen, M. (2010). NIMBY and the ethics of the particular. *Ethics, Place and Environment*, 13, 321–323.

Ekins, P. (2004). Step changes for decarbonising the energy system: Research needs for renewables, energy efficiency and nuclear power. *Energy Policy*, 32, 1891-1904.

Ellis, G., Barry, J., & Robinson, C. (2007). Many ways to say no, different ways of saying yes: Applying Q-methodology to understand public acceptance of wind farm proposals. *Journal of Environmental Planning and Management*, 50, 517-551.

Ek, K. (2006) Quantifying the Environmental Impacts of Renewable Energy: The Case of Swedish Wind Power. In *Environmental Valuation in Developed Countries: Case Studies* (Ed). David W. Pearce, pp. 181-210. Northampton, MA: Edward Elgar Publishing.

Field, A. (2011). *Discovering statistics using SPSS* (3rd ed.). London, England: SAGE.

Firestone, J. and Kempton, W. (2007) Public opinion about large offshore wind power: underlying factors. *Energy Policy*, 35, 1584–1598.

Firestone, J., Kempton, W. and Kreuger, A. (2009) Public acceptance of offshore wind power projects in the USA. *Wind Energy*, 12, 183-202.

Firestone, J., Bidwell, D., Gardner, M. and Knapp, L. (2018) Wind in the sails or choppy seas?: People-place relations, aesthetics and public support for the United States' first offshore wind project. *Energy Research and Social Science,* 40, 232-243.

Foxon, T. (2013) Transition pathways for a UK low carbon electricity future. *Energy Policy*, 52, 10-24.

Gee. K. (2010) Offshore wind power development as affected by seascape values on the German North Sea coast. *Land Use Policy* 27, 185–194.

Graham, J.B., Stephenson, J.R. & Smith, I.J. (2009) Public perceptions of wnd energy developments: Case studies from New Zealand. *Energy Policy,* 37, 3348–3357.

Gross, C., 2007. Community perspectives of wind energy in Australia: the application of a justice and community fairness framework to increase social acceptance. *Energy Policy*, 35, 2727–2736.

Guernsey Press (2018) Repairs to power cable fault by peak of winter. Available at: https://guernseypress.com/news/2018/10/17/repairs-to-power-cable-fault-by-peak-of-winter/ (last accessed 4th March 2019).

Haggett, C. (2008). Over the sea and far away? A consideration of the planning, politics and public perception of offshore wind farms. *Journal of Environmental Policy & Planning*, 10, 289–306.

Howarth, C. & Monasterolo, I. (2017) Opportunities for knowledge co-production across the energy-food-water nexus: Making interdisciplinary approaches work for better climate decision making. *Environmental Science and Policy*, 75, 103–110.

Huijtsa, N.M.A., Molina, E.J.E. and Steg, L. (2012) Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework. *Renewable and Sustainable Energy Reviews,* 16, 525– 531.

Intergovernmental Panel on Climate Change (IPCC, 2018) *Global Warming of 1.5 Degrees.* Special Report of the IPCC: London.

Jacquet, J.B. and Stedman, R.C. (2014) The risk of social psychological disruption as an impact of energy development and environmental change. *Journal of Environmental Planning and Management*, 57, 1285-1304.

Jones, C.R. and Eiser, J.R. (2010) Understanding 'local' opposition to wind development in the UK: How big is a backyard? *Energy Policy*, 38, 3106-3117.

Jones, J. and Hidiroglou, M. (2013) Capturing, coding, and cleaning survey data. In Ger Snijkers, Gustav Haraldsen, Jacqui Jones, and Diane K. Willimack (Eds.) *Designing and Conducting Business Surveys,* John Wiley & Sons, pp. 459-504.

Kempton, W., Firestone, J., Lilley, J., Rouleau, T., & Whitaker, P. (2005). The offshore wind power debate: Views from Cape Cod. *Coastal Management*, 33, 119–149.

Kerr, S., Watts, L., Colton, J., Conway, F., Hull, A., Johnson, K. and Jude, S. (2014) Establishing an agenda for social studies research in marine renewable energy. *Energy Policy*, 67, 694–702.

Kreuger, A.D., Parsons, G.R. and Firestone, J. (2011) Valuing the visual disamenity of offshore wind power projects at varying distances from the shore: An application on the Delaware shoreline. *Land Economics*, 87, 268-283.

Lewicka, M. (2011). On the varieties of people's relationships with places: Hummon's typology revisited. *Environment and Behavior*, 43, 676-709.

McCartney, A. (2006). The social value of seascapes in the Jurien Bay Marine Park: an assessment of positive and negative preferences for change. *Journal of Agricultural Economics,* 57, 577–594.

McLachlan, C. (2009). "You don't do a chemistry experiment in your best China": Symbolic interpretations of place and technology in a wave energy case. *Energy Policy*, 37, 5342-5350.

RenewableUK (2018) UK offshore wind capacity set to double. Available at: https://www.renewableuk.com/news/410144/UK-Offshore-wind-capacity-set-to-double-following-Government-announcement-.htm (last accessed March 4th 2019).

Ladenburg, J. (2009) Stated Public Preferences for On-land and Offshore Wind Power Generation—A Review. *Wind Energy*, 12, 171–181.

Ladenburg, J. and Dubgaard, A. (2009) Preferences of Coastal Zone User Groups Regarding the Siting of Offshore Wind Earms. *Ocean and Coastal Management,* 52, 233-42.

Ladenburg, J. and Lutzeyer, S. (2012) The economics of visual disamenity reductions of offshore wind farms—review and suggestions from an emerging field. *Renewable and Sustainable Energy Reviews*, 16, 6793–6802.

Lenhard, W. & Lenhard, A. (2016). *Calculation of Effect Sizes*. Retrieved from: https://www.psychometrica.de/effect_size.html. Dettelbach (Germany): Psychometrica. DOI: 10.13140/RG.2.1.3478.4245 (last accessed July 2nd, 2019).

Moss, T. and Francesch-Huidobro, M. (2016) Realigning the electric city. Legacies of energy autarky in Berlin and Hong Kong. *Energy Research and Social Science,* 11, 225-236.

Preacher, K. and Hayes, A. (2004) SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav. Res. Methods Instrum. Comput.,* 36, 717-731.

Scherhaufera, P., Höltingera, S., Salak, B., Schauppenlehnera, T. and Schmidta, J. (2018) A participatory integrated assessment of the social acceptance of wind energy, *Energy Research & Social Science,* 45, 164–172.

States of Guernsey Government (2017). *Guernsey facts and figures.* Available at:

https://www.gov.gg/CHttpHandler.ashx?id=110282&p=0 (last accessed 4th March 2019).

Strickland-Munro J., Kobryn, H., Brown, G. and Moore, S.A. (2016) Marine spatial planning for the future: Using Public Participation GIS (PPGIS) to inform the human dimension for large marine parks. *Marine Policy* 73, 15–26.

Swofford, J., & Slattery, M. (2010). Public attitudes of wind energy in Texas: Local communities in close proximity to wind farms and their effect on decision-making. *Energy Policy*, 38, 2508-2519.

Upham, P. (2005) Applying environmental-behaviour concepts to renewable energy siting controversy: Reflections on a longitudinal bioenergy case study. *Energy Policy*, 37, 4273-4283.

Valentine, G. (2006) Relevance and rigour: the advantages of reusing and scaling up qualitative data. *Environment and Planning A,* 38, 413–415.

Venables, D., Pidgeon, N.F., Parkhill, K.A., Henwood, K.L., Simmons, P. (2012) Living with nuclear power: sense of place, proximity, and risk perceptions in local host communities. *Journal of Environmental Psychology,* 32, 371-383.

Vorkinn, M., & Riese H. (2001). Environmental concern in a local context: The significance of place attachment. *Environment and Behaviour*, 33, 249-263.

Walker, G.P. and Cass, N. (2007) Carbon reduction, 'the public' and renewable energy: engaging with socio-technical configurations. *Area*, 39, 458– 469.

Walker, B.J., Wiersma, B. & Bailey, E. (2014) Community benefits, framing and the social acceptance of offshore wind farms: An experimental study in England. *Energy Research & Social Science*, 3, 46–54.

Wiersma, B. and Devine-Wright, P. (2014) Public engagement with offshore renewable energy: A critical review. *Wiley Interdisciplinary Reviews: Climate Change,* 5, 493-507.

Wiersma, B. (2016) *Public acceptability of offshore renewable energy in Guernsey: Using visual methods to investigate local energy deliberations*. Unpublished PhD thesis, University of Exeter.

Williams, D. (2014) ‘Beyond the commodity metaphor’ revisited: Some methodological reflections on place attachment research. In L. Manzo and P. Devine-Wright (Eds.) *Place Attachment: Advances in Theory, Methods and Applications*, Routledge: Oxford, pp. 89-99.

Willis, R. (2006) *Grid 2.0: The next generation.* Green Alliance, London.

Wolsink, M. (2006). Invalid theory impedes our understanding: A critique on the persistence of the language of NIMBY. *Transactions of the Institute of British Geographers*, NS31, 85–91.

Wolsink, M. (2007). Planning of renewables schemes: Deliberative and fair decision-making on landscape issues instead of reproachful accusations of non-cooperation. *Energy Policy*, 35, 2692–2704.

Wolsink, M. (2010) Near-shore wind power—Protected seascapes, environmentalists’ attitudes, and the technocratic planning perspective. *Land Use Policy*, 27, 195–203.

Wolsink, M. (2012) The research agenda on social acceptance of distributed generation in smart grids: renewable as common pool resources, *Renew. Sustain. Energy Rev*. 16, 822–835.

Wolsink, M. (2018). Social acceptance revisited: gaps, questionable trends, and an auspicious perspective. *Energy Research and Social Science*, 46, 287-295.

Wüstenhagen, R., Wolsink, M., Bürer, M.J. (2007). Social acceptance of renewable energy innovation: an introduction to the concept. *Energy Policy* 35, 2683–2691.