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The role of community acceptance in planning outcomes for onshore wind and solar farms: An energy justice analysis

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HIGHLIGHTS

- Analysis of planning outcomes for onshore wind and solar farms in Great Britain.
- Indicators for community acceptance are tested using binomial logistic regression.
- 12 acceptance variables found to be significantly correlated with planning outcomes.
- Material arguments found to be more influential than attitudinal/social influences.
- Implications for public acceptance, policymaking and energy justice are discussed.

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ABSTRACT

The deployment of renewable technologies as part of climate mitigation strategies have provoked a range of responses from various actors, bringing public acceptance to the forefront of energy debates. A key example is the reaction of communities when renewable projects are proposed in their local areas. This paper analyses the effect that community acceptance has had on planning applications for onshore wind and solar farms in Great Britain between 1990 and 2017. It does this by compiling a set of indicators for community acceptance and testing their association with planning outcomes using binomial logistic regression. It identifies 12 variables with statistically significant effects: 4 for onshore wind, 4 for solar farms, and 4 spanning both. For both technologies, the visibility of a project, its installed capacity, the social deprivation of the area, and the year of the application are significant. The paper draws conclusions from these results for community acceptance and energy justice, and discusses the implications for energy decision-making.

1. Introduction

The deployment of renewable energy technologies as part of the transition to a low carbon economy has provoked a broad range of responses from a variety of actors, bringing issues of 'public acceptance' to the forefront of energy debates [1–3]. In some cases, the views of the public have (at least ostensibly) informed energy decision-making such as the phase out of nuclear power generation in Germany, partly motivated by public concerns over safety following the Fukushima disaster [4], and the phase out of onshore wind subsidies in the UK on which the government stated: "we are reaching the limits of what is affordable, and what the public is prepared to accept" [5]. In other cases, energy policies and projects have proceeded despite strong negative public reactions, such as large-scale hydropower projects in environmentally sensitive areas of Brazil and China [6], fracking for shale gas in the UK [7], and controversial coal mining projects in Australia [8]. This raises empirical and ethical questions about the role(s) that public acceptance can, does and should play in formulating energy policy and informing energy deployment. It also leads to theoretical questions around the relationship between public acceptance and the concept of energy justice, which have received limited attention in the existing literature in this area.

As a relatively novel theoretical approach, the conceptualisation of energy justice is still taking shape. McCauley et al. [9] describe energy justice as having a 'triumvirate of tenets': distributional, procedural and recognition justice. The distributional aspect draws upon environmental justice theory, which originates from research conducted in the USA in the 1970s and 80s revealing that low environmental quality and

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high environmental hazards were frequently concentrated in minority and economically disadvantaged communities [10–11]. Similar patterns have since been identified in many other countries such as Mexico, France and the UK [12–14], showing that poorer communities tend to bear the burden of environmental ills such as air pollution, water pollution, and exposure to hazardous wastes. In relation to energy, distributional injustices have been identified in many forms including energy poverty [15–16], the labour market [17], and infrastructure siting such as fracking and nuclear power development [18–19]. However, despite some recent academic attention (e.g. [20]) the distributive elements of renewable energy development have been relatively overlooked, perhaps because it is often regarded uncritically as an environmental and social good.

Procedural justice refers to equitable participation in decision-making for all affected stakeholders in a non-discriminatory way [21]. It demands appropriate and sympathetic engagement mechanisms [22] and for the views of all stakeholders to be taken seriously throughout the decision-making process [9]. It also requires impartiality and full information disclosure by those in positions of authority, such as government and industry [23]. In relation to energy decision-making, this includes processes such as public consultation on infrastructure siting decisions, and transparency relating to information such as public subsidies for different energy sources [24]. This tenet of energy justice has received greater attention in relation to renewable energy than distributional justice, particularly relating to wind power siting decisions (e.g. [25–28]). Recognition justice, whilst similar to procedural justice, is differentiated by its focus on *fair* representation, recognising that some groups are at a disadvantage within formal participation processes [29]. A lack of recognition could manifest itself in "various forms of cultural and political domination, insults, degradation and devaluation", as well as "a failure to recognise" or "misrecognising" i.e. a distortion of people's views that does not reflect their true position [9]. Within the field of energy, recognition justice draws attention to the dominance of certain demographics within energy decision-making processes, and the need to recognise and integrate the perspectives of less powerful stakeholders.

In this paper, we consider the implications for these tenets of energy justice (particularly distribution) of onshore wind and solar farm deployment in Great Britain (GB). These are the two most commonly deployed land-based renewable technologies in the country [30], having experienced major growth in recent years. We investigate the role that community (i.e. local) acceptance has played in planning outcomes for these technologies through statistical analysis of variables which correlate with successful and unsuccessful planning outcomes. All applications made between 1990 and 2017 are analysed (as far back as data are available). Whilst some existing studies consider similar issues in relation to a case study area or individual development (e.g. [31–32] the approach of this paper is novel in that it uses geospatial datasets to analyse planning outcomes across the whole of GB over an extended time period. In Section 2, we present a conceptual framework Fig. 1) for understanding the variables which influence community acceptance of onshore wind and solar farms, based on a detailed literature review. The methods for the statistical analysis are outlined in Section 3, and results are presented in Section 4. Section 5 then discusses these empirical results and considers the relationship between public acceptance and energy justice: a theoretical gap in the existing literature on the topic. Section 6 provides key conclusions and recommendations for future research.

2. Theory

'Public acceptance' can be divided into three dimensions [33]: *socio-political* (acceptance by policymakers and the general public, typically gauged through opinion polls which provide an aggregated representation of attitudes); *market* (acceptance of new technologies by adopters such as households and businesses, or as indicated through willingness-to-pay models); and *community* (acceptance by local communities affected by the implementation of a technology, for example siting decisions for renewable energy). In this paper, we focus on community acceptance i.e. the reaction of citizens when an onshore wind or solar farm project is proposed in their local area. Fig. 1 synthesises insights from the public acceptance and environmental planning literature on the variables which are expected to influence community acceptance of onshore wind and solar farms. Variables can be categorised as 'material arguments' used to oppose and/or support projects, or 'attitudinal/social influences' i.e. factors which influence positive/negative social responses to these technologies.

Material arguments against onshore wind and solar farms are commonly based around visual impacts on scenic areas and 'wild' landscapes [34–36]. The type of land cover can also influence acceptance of these technologies [37–38]. Other material arguments focus on environmental impacts and ecosystem services, such as bird collision with wind turbines, given the implications for biodiversity conservation [39]. Economic concerns are another category of material argument in support of and/or opposition to these technologies, such as impacts on property prices, tourism, employment, and agricultural production [17,40–42]. Finally, project details also contribute to material reasons for support or opposition, including the size of the project [43], irritations such as noise and shadow flicker in the case of onshore wind [44] and glare in the case of solar farms [45], as well as project ownership structures i.e. whether the project is owned and managed by a private company, individual or community group [46].

As well as material arguments, community acceptance can be affected by the attitudes and characteristics of local residents [47–48]. For example, demographic attributes can influence views towards renewable energy, particularly age, with older people tending to be less accepting that younger people [49–50]. Demographic variables such as social deprivation can also influence the extent to which residents take action on renewable energy projects proposed in their local area; communities with higher social capital are more likely to engage in official planning processes due to their higher capacity, agency and access to networks [51–52]. Political values and beliefs have also been found to influence attitudes towards and acceptance of renewable energy developments [53], as well as temporal factors, with people tending to become more accepting as a result of exposure over time [54–55]. These types of variables can be expected to have an effect on which type(s) of people support/object to onshore wind and solar farm projects, and (in turn) the geographical distribution of support for and opposition to these technologies e.g. by country/region.

These 'acceptance variables' feed into decision-making in different ways in different contexts. Details of how this process operates in this paper's case study of GB follows in Section 3. We acknowledge that the material arguments outlined in this section may also be fed into decision-making through channels other than local citizens; NGOs, pressure groups or statutory agencies may also raise concerns around biodiversity or visual impacts, for example. We discuss the implications of this potential collinearity between influences on decision-making in our discussion in Section 5. It should also be acknowledged that there is more research on community acceptance of onshore wind than solar farms, meaning that higher confidence can be placed in the acceptance variables identified for onshore wind.

3. Material and methods

3.1. Case study

GB (comprising England, Scotland and Wales) was selected as a case study due to the broadly similar policy drivers and planning legislation for renewable energy over this time period, as well as comparable data availability. Since the early 1990 s, the configuration of the electricity supply system in GB has shifted from centralised conventional power stations and remote hydropower stations to increasingly visible