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The social acceptance of wind energy

Where we stand and the path ahead

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Title: Social acceptance of wind energy

Abstract:
Social acceptance is a key challenge for the deployment of wind energy and could limit the overall wind resource we are able to exploit to meet climate change targets. Social acceptance can be influenced by a very wide range of factors, including project characteristics, perception of the distribution of costs and benefits, degree of public participation. Perceived impacts of projects on landscapes, property values, health and biodiversity also influence social acceptance. This complexity means that acceptance cannot be addressed through simple fixes such as community benefit funds or just more consultation, but we need a far more fundamental reform of how energy systems engage with communities and citizens.

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Executive summary

This report reviews the research literature related to the social acceptance of wind energy and aims to identify the main trends, causal factors and the major lessons learnt from 20 years of research. It concludes with a reflection on a future research agenda and some of the key implications for policy and practice.

Policy context

Europe has some of the best wind resources in the world, providing a relatively cheap and exploitable renewable resource that has been core to many Member States' strategies for climate change and energy transition. The wind energy sector has increased rapidly over recent decades and now contributes 11.4 % of Europe's electricity. The growth of this sector has involved the mobilisation of billions of Euros of private investment, reforms to energy policy and support mechanisms, an ongoing reconfiguration of grid systems and many other aspects related to the reorientation of energy systems from being those based on centralised, fossil fuel to more decentralised systems where a variety of renewables contribute to increasing percentages of overall energy requirements.

This has also involved important changes to people's relationships to energy production, and is accompanied by high-level support of wind energy *as a technology* but not always in terms of support for local projects, which appear to be facing increasing levels of opposition throughout Europe. This reflects what appears to be declining levels of community acceptance of local wind energy projects, which cumulatively can have significant consequences for Europe's energy transition. While this has some positive outcomes such as more effective regulation of wind energy projects and more innovative developer practices, it can also lead to an increase in implementation costs and delays; an erosion of wider political support for renewables; increasing risks of not meeting renewable energy targets; and most significantly, may ultimately limit the scale of the contribution of wind energy to national energy systems.

Key conclusions

One of the main conclusions to this report relates to how we understand social acceptance. This has largely been viewed in terms of individual projects and therefore primarily a responsibility of those developing individual projects. This has led to the promotion of different types of isolated 'fixes' such as community benefits or more consultation, which have been unable to increase the overall level of social acceptance.

This report has shown how social acceptance is influenced by a much wider and complex set of influences between individuals, communities, place, wind energy operators, regulatory regimes and technology, operating at a variety of geographical scales. Social acceptance should therefore be viewed within this wider set of relationships and as part of the transition to a low carbon economy. While there is a need to improve processes and practices related to the deployment of wind energy projects through well-considered, evidence-based initiatives for specific projects there is also a need to take a far more strategic and integrated approach to considering the social dimension of wind energy deployment, involving a wide range of stakeholders and framed by the needs of the energy transition. This has potentially wide ranging implications for the ownership, institutions and regulation of wind energy and requires more innovative processes for engaging with citizens.

The review also finds that while we now have a much deeper understanding of the issues that can influence social acceptance of wind, there are still some important research areas that need to be addressed. There is also a need to make more effective use of research being undertaken in this field. The report therefore calls for a comprehensive, systematic review of existing evidence and the development of more standardised protocols, variables and definitions to guide future work. There is also a need to focus on how research on social acceptance of wind energy can be more effectively translated and applied into policy and practice.

The report also considers the specific implications this has for policy and practice. This calls for a more strategic approach for promoting social acceptance based on building trust between the key actors and new forms of citizen engagement to promote deliberation and respect between the main stakeholders. There is also a need to review the process of how national energy policy is translated into local projects, the role of planning systems, alternative ways of promoting community ownership and how we conceptualise wind as a community asset.

Main findings

The review of social acceptance of wind energy is discussed under four headings:

Conceptual issues: Our understanding of social acceptance is theoretical development from denoting a bi-lateral, society-technology relationship to a more complex multifaceted, dynamic concept that can be undertaken through a wide range of disciplinary perspectives and theoretical frameworks. Although there are some criticisms of the concept, it continues to have a strong resonance amongst a wide range of actors and thus creates an important space in which the wider social and political dimensions of wind energy can be confronted and debated. When researching this field, it is also important to engage a number of other concepts including place attachment, trust and procedural justice which provide important foundations for social acceptance.

Community attitudes: A core of element of research on social acceptance has examined the attitudes of people living near wind energy projects. Using a variety of methods and disciplinary perspectives this has provided evidence of the issues that can drive community opposition and as such, has provided evidence for many of the initiatives used to promote social acceptance. Although this is useful, the methods used in many attitude studies have tended to constrain the understanding of the social, dynamic and geographic complexity that shapes acceptance. As a result, there is still a poorly developed understanding of the intricate dynamics of individual disputes, the relationship between attitude and action and the links between attitudes, social acceptance and the wider structural elements of the energy regime.

Impacts: The challenges facing social acceptance can also be related to a wide range of actual, potential or perceived impacts a wind energy project. There is a large number of concerns that have been identified by communities and some of the main issues are reviewed in this report. This includes impacts on landscape, bio-diversity, health, noise and property values. The evidence for each of these are reviewed and irrespective of the actual measurable impact, they contribute to the way people frame the value of a project, which influences social acceptance.

Governance of wind energy projects: The way in which projects are regulated and the perceived distribution of costs and benefits that arise from a wind energy project also shape levels of social acceptance. This includes the degree of procedural justice that is promoted through public participation, the degree of community stake in a project through ownership or as recipients of other benefits and the effectiveness of the broader policy environment to take account of community concerns.

Summary of influences on social acceptance of wind energy projects

Issue	*Key influences*
Individual attitudes	Age, gender etc. Strength of place attachment Political beliefs and voting preferences Emotional response Prior experience of wind turbines Attitudes to environmental issues Psychological factors including perception of social norms Individual roles (consumer, landowner etc.) Familiarity with wind energy
Relationships	Type and level of social capital Trust in government other public agencies and developers Proximity to, and visibility of, turbines Technology-society relationships Time, reflecting the dynamic nature of social acceptance National-local policy Regulator-developer links Discourses within and between communities
Contextual issues	Policy regimes Project design — turbine height, colour number and massing Place attachment Range and mix of actors Ownership of proposed project Specific siting issues Cumulative impacts
Perceived impacts	Noise Landscape Shadow flicker Property values Level of economic benefit Bio-diversity: bats, birds Infrasound Navigation lights Health concerns Levels of economic benefits Disruption of 'place' Efficiency of turbines and wind energy Distributive justice
Process-related issues	Trust in institutions involved Transparency and openness Procedural justice Expectations and aspirations of public participation Availability and quality of information Power in the participation process Value places on lay and expert knowledge Timing Discourses of community, developer, regulatory bodies Fait accompli

Quick guide

This report reviews the research literature related to social acceptance of wind energy, and increasing levels of local opposition to project proposals. The report examines the meaning of social acceptance and highlights the main factors and the complex interactions between them. Key influences include the attitudes of individuals living in host communities; poor decision-making processes; questions over who gains and loses; and concerns over impacts such as visual intrusion, property values and health. The

report concludes by highlighting the need to take a more strategic approach to addressing social acceptance involving a wide range of stakeholders and the need to make more effective use of research.

1. Introduction

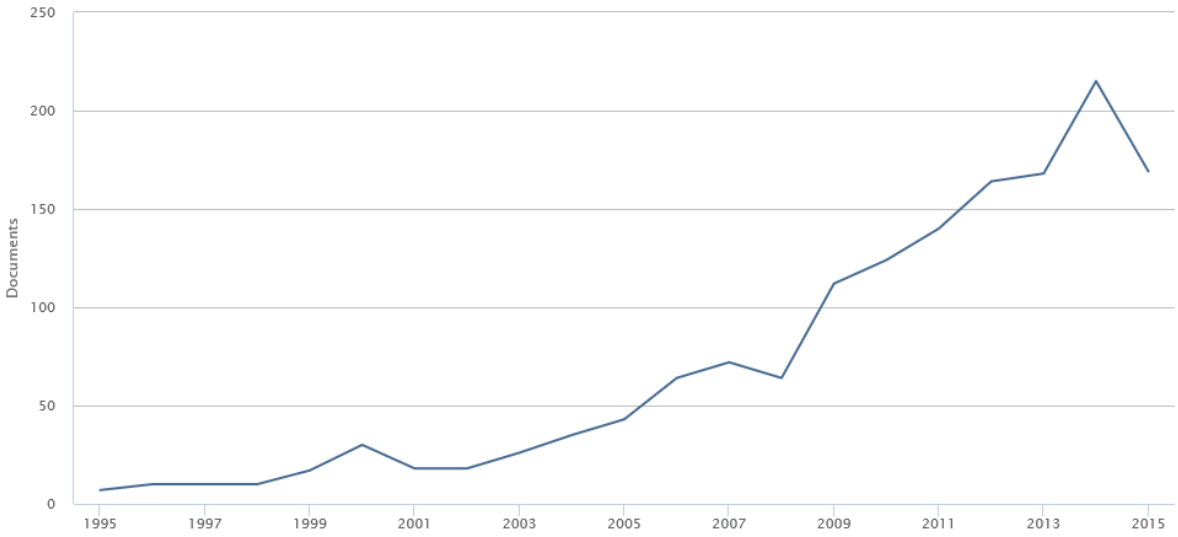
The European wind energy sector has increased rapidly over the last 20 years, from 2.5 Gigawatts (GW) in 1995 to over 142 GW of capacity in 2015 (EWEA 2015). 76 % (131 GW) of this capacity is in the form of onshore wind energy projects, with the remaining 14 % (11 GW) in the increasing offshore sector. The wind sector already has the capacity to produce 315 Terawatt (Hours) and cover 11.4 % of the EU electricity consumption in a normal wind year. Indeed, Europe is blessed with some of the highest wind resources in the world, which has already provided a relatively cheap and exploitable renewable resource that has been core to many MSs' strategies for climate change and energy transition. 16 MSs (MSs) have over 1 GW of installed capacity with Germany (45 GW), Spain (23 GW), the United Kingdom (UK) (14 GW) and France (10 GW) having the largest wind energy capacities (EWEA, 2015). The EWEA has suggested (in its central scenario) that there will be 320 GW of installed capacity by 2030 (254 GW onshore), equivalent to 24.4 % of the EUs electricity demand, providing over 334 000 jobs. The growth of this sector has involved the mobilisation of billions of Euros of private investment, a reform of energy policy and support mechanisms, an ongoing reconfiguration of grid systems and many other aspects related to the reorientation of energy systems from being those based on centralised, fossil fuel to more decentralised systems where a variety of renewables contribute to increasing percentages of overall energy requirements.

This has also involved important changes to people's relationships to energy production, as increasing numbers of communities all over Europe now host wind energy projects. The last EU survey on attitudes to energy technologies (European Commission, 2007) suggested that 71 % of people were in favour of the use of wind energy and only 3 % opposed. This high-level support of wind energy as a technology is not always reflected in the degree of support faced by local projects, which appear to be facing increasing levels of opposition throughout Europe. Although the majority of projects are successfully established, growing levels of local opposition has a number of consequences (Toke, 2005, Ogilvie and Rootes, 2015), including:

- increasing implementation costs and risks arising from challenges to decisions, prolonged political debate, and in some cases, direct protest;
- a profusion of local conflicts around wind energy project can begin to change nation discourses on the need to develop wind energy and, potentially, erode wider political support and a failure to achieve renewable energy targets;
- related to this, increased sensitivity to the potential impacts of wind energy projects can lead to more demanding regulations for wind energy projects, potentially reducing its attractiveness as an investment opportunity;
- increased emphasis on offshore development;
- increasing levels of concern are also promoting innovation in developer strategies as they experiment with community benefit packages, participative processes and ownership models in response to these pressures.

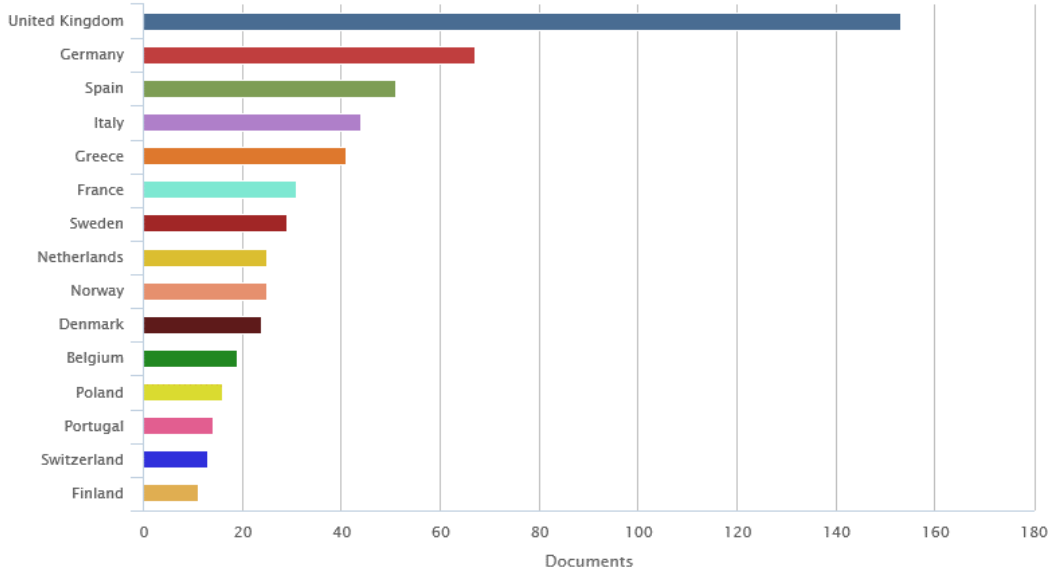
As a result, levels of social acceptance can have a significant impact on the nature of the wind industry and potentially, limit the ultimate scale of the wind energy sector and its contribution to national energy systems. It has also given rise to new forms of community tension (Warren et al., 2005) and social innovation. Those involved in the wind energy industry, in conjunction with a range of state actors have attempted to influence social acceptance through new practices and policies, including enhanced public participation programmes, community benefit schemes, share ownership regulations and other initiatives. It is still unclear whether such approaches have had significant impacts in specific contexts, but levels of opposition appear to be generally increasing.

There has been a growing research interest that seeks to understand the factors that can influence social acceptance. This can be illustrated by a search of research outputs using the Scopus database ([1]) as shown in Figures 1 and 2 ([2]). Figure 1 indicates how the relationship between communities and wind energy has become an increasing concern since 1995, peaking in 2014 while Figure 2 highlights the European country affiliated with research in this area.



(*Source*: Scopus)

Figure 1: 'Wind energy' and 'community' research outputs, 1995-2015



(*Source*: Scopus)

Figure 2: Most common European countries affiliated with 'wind energy' and 'community' research outputs, 1995-2015

([1]) See https://www.elsevier.com/solutions/scopus

([2]) This search was undertaken on 16/10/16 using the search string '(TITLE-ABS-KEY (wind energy) AND TITLE-ABS-KEY (community))' which identified 15 164 outputs from between 1995 and 2015.

This and related bodies of research have developed from a few early conceptual papers on social acceptance (such as those by Wolsink, 2000) to an increasing diversity of case studies, which examine the impacts of specific projects, the attitudes of host communities in a range of geographic contexts, the evaluation of new practice or policy or the methodological basis of social acceptance research. There has also been a degree of conceptual and methodological development that has stimulated new ways of framing and researching social acceptance, moving on from narrow studies dominated by positivist–quantitative studies which tended to reify lay explanations (particularly in relation to the idea of NIMBYism — see section 3.1.2) to more interdisciplinary and holistic research and spanning a wide disciplinary range, including psychology (e.g. Huijts et al., 2012) and economics (e.g. Stigka et al., 2014). Table 1 (based on Upham et al., 2015) provides an overview of the range of research that has engaged with concepts of acceptance of wind energy.

Although most research has been undertaken by academics and published in peer reviewed journals, there is also a valuable track of research undertaken by other organisations, in the form of working groups and Government or European funded projects. This includes work undertaken by the *IEA Task 28 Working Group* ([3]), *Wise Power* project ([4]), *Good Practice Wind* Project ([5]), *REShare* project ([6]) and Wind2050 project ([7]).

This report aims to review this literature on social acceptance of wind energy with the aim of providing a review of the main trends, causal factors and the major lessons learnt, with a view to developing policy recommendations. In compiling the report, the relevant literature has been identified through a series of searches using the Scopus, Web of Science and Google Scholar databases, combined with snowballing using citations of relevant research articles. Although not exclusive, the emphasis here is on peer reviewed academic work from a wide range of disciplinary sources, and less focus on grey literature, research by companies, government and their regulatory bodies. The majority of this research has been undertaken in a European context, with also strong representation from Australia and the US.

The report is structured to first discuss some of the most relevant conceptual issues that have shaped our understanding of social acceptance, followed by a review of the research that has aimed at understanding the drivers of community concerns including attitudes, impacts and governance of wind energy projects. The report concludes with a discussion of the implications of this literature for future research, policy and practice.

([3]) http://www.socialacceptance.ch/
([4]) http://wisepower-project.eu/
([5]) http://www.gov.scot/Topics/Business-Industry/Energy/Action/leading/Good-Practice-Wind
([6]) http://www.wip-munich.de/projects/overviewofallprojects/99-projects/projects/189-reshare.html
([7]) http://www.wind2050.dk/

Table 1: An illustrative selection of perspective on acceptance of renewable energy technologies (based on Upham et al., 2015)

Discipline	***Authors and illustrative authors***	***Synopsis***
Economics	Choice models and contingent valuation (e.g. Ek and Persson, 2014, Landeburg, 2008)	- Individuals form preferences regarding energy technologies by making trade-offs between the various attributes of those technologies - Consumers are expected to act based on logically determined and articulated preferences of utility
	Behavioural economics (e.g. Frederiks et al., 2015)	- Modifies the above assumptions of economic rationality to account for psychological factors
Sociology and human geography	Equity, process, policy and institutions (Walker, 2007); practice and habit as part of social structuration (Shove, 2010, Shove and Southerton, 2000); socio-demographics and lifestyles (Claudy, 2010); environmental conflict and land use planning systems (Wolsink, 2000, Toke, 2005, van der Horst and Toke, 2010); user-driven innovation (Hyysalo et al., 2013.)	A wide-ranging set of perspectives that include attention to: - the social, economic, political and technological context of individuals that shape and constrain attitudes and behavioural responses to low-carbon energy and associated risks; - 'practices' approaches from the sociology of consumption, in which behaviour, habits and routines are viewed as shape attitudes, rather than vice versa; - participatory engagement, structures of ownership, the distribution of benefits and other institutional factors; - various types of social influence processes, including social norms; - socio-demographic characteristics such as age, gender and social class; - lifestyles, habits and needs; - resistance as a function of local, contextual factors; - technology users as shaping rather than 'accepting' innovations.
Social psychology	Theories of planned behaviour and norm activation (De Groot and Steg, 2008); risk perception (Pidgeon et al., 2008); environmental concern, values, norms, behaviour (Stern, 2000); place identity and attachment (Devine-Wright, 2013);	A wide range of models and perspectives, focusing on, for example: - attitude, social and personal norms, perceived behavioural control and intention; - personal, emotional attachments to places and

	social representations (Castro, 2006, Batel and Devine-Wright, 2013).	their role in individual identity; - subjective judgments of the characteristics and severity of technological risk;
Cultural theory	Application of Mary Douglas' cultural theory approach (West et al., 2010).	- cultural worldviews as attitudinal determinants;
Frameworks and methods driven work	The eclectic energy cultures approach (Stephenson et al., 2010.); actor network theory (Jolivet and Heiskanen, 2010); use of Q-sort to characterise positions (Ellis et al., 2007); use of informed choice questionnaires (Stigka et al., 2014).	- many studies, often in the grey literature, take no explicit theoretical stance, although attitude theory is usually implicit. The examples listed here are conscious of theory, but either seek to avoid strong mono-theoretical subscription or are heavily methods-driven.

2. Conceptual issues

2.1. Introduction

The expansion of wind energy over the last 20 years should be seen as part of a much wider transformation of energy systems representing a shift from those based on centralised, fossil-fuelled infrastructure to a more diverse and more decentralised range of renewable technologies. This process of transition is likely to take many decades and does not only involve changes in energy technologies and supporting infrastructure, but as energy is at the very heart of industrialised societies, it will also entail far reaching reforms in governance, economic organisation and social practices. Indeed, Miller et al. (2013) have noted that this will involve choices that are '… not so much between different fuels but between different forms of social, economic, and political arrangements built in combination with new energy technologies. In other words, the *challenge is not simply what fuel to use but how to organise a new energy system around that fuel*.' (Miller, Iles and Jones, 2013: 139: emphasis added).

There is now a well-developed body of knowledge that has explored the complexity of such transformation and how to conceptualise and steer transitions (for example Markard et al., 2012, Grin et al., 2010, Smith et al., 2005, Geels, 2005). This report will not directly review this research, but it is important to place the widespread adoption of wind energy into a wider social, economic and theoretical context, and this can help explain some of the complex relationships that are confronted when one considers the influences on social acceptance of individual wind energy projects. Indeed, it is now clear that social acceptance cannot simply be understood in terms of the direct relationship between a wind turbine and its individual neighbours (although that is clearly important), but invokes a deeper consideration of society's relationships with different technologies, of the aesthetic values we place on individual landscapes, on a variety of power relationships and our understanding of how best to serve the future needs of communities and wider global society. Therefore, while there has been a tendency to seek isolated technological, policy or procedural 'fixes' to some of the problems created in areas of low social acceptance of wind energy projects, this section attempts to explain some of the key concepts — both beneficial and unhelpful – that have been deployed in research on social acceptance issues.

2.2. Energy as a socio-technical system

A fundamental concept in understanding the broader context for community responses to wind energy projects is that the energy system cannot be simply viewed as a particular assemblage of technologies and related infrastructure, but as being deeply embedded within society, i.e. it is a socio-technical system. As such, this gives rise to particular types of institutions, social practices and economic organisation which in turn relate to specific forms of social relations. This is illustrated by the fact that the shift from steam engine to the internal combustion engine resulted in — and was shaped by — social, political, economic and spatial transformations of society. Indeed, energy technologies and societies continually interact and shape each other (Bijker and Law, 1992). This is relevant to our understanding of social acceptance because it highlights the fact that technological development is contingent on wider social factors and that technologies may fail or thrive as a result of the 'interactive complexity' of societies (Sovacool, 2009). Put more simply, society may need wind energy, but wind energy also needs society.

It is therefore useful to conceptualise the transition to a sustainable energy system as a response to major global challenges (climate change, energy security) but stimulated by

innovation in technologies, policies and social institutions. Together, these create substantial pressures on the conventional energy system and in turn prompt changes in wider social, economic and political structures. For example, the increased deployment of wind energy has resulted in new forms of regulation (such as planning rules), changes to energy markets and incentives (such as Feed in Tariffs), novel manufacturing processes for turbines, demand for new skills and a reconfigured grid system. In addition to these more tangible effects, deployment of wind energy also confronts existing social norms such as who should host or own energy generation, which in turn may be mediated by deep held beliefs on complex issues such as justice, technology and aesthetic value of certain landscapes.

These factors can all become relevant when one considers how an individual community may respond to a proposal for a wind energy project. Indeed, placing social acceptance in this wider socio-technical context tends to make visible important issues of technology deployment that are otherwise left unseen (Miller et al., 2013). The fact that many involved in the wind energy system (including governance agencies and developers of wind energy projects) have seen the deployment of wind energy only as a technological development issue, and neglected the broader social implications, is likely to have been a contributing factor to decreasing levels of social acceptance. The failure to appreciate these wider dimensions may lead to local communities being perceived primarily as 'barriers' to wind energy deployment, rather than emphasising a range of opportunities that public engagement could deliver. Therefore, it can be envisaged that if a wider socio-technical perspective had been more fully reflected in wind energy development, it is possible that the wind energy industry could have taken on a very different structure and mode of working, and may still have to in the future as a result of pressures arising from social acceptance.

From this perspective, it is possible to imagine an individual as having a range of potential relationships with wind energy technology, specific energy projects and the institutions that promote or regulate energy. The way in which wind energy projects are delivered can shape these relationships; for example, they could be primarily developed by public utilities, private energy suppliers, community groups, individual householders or by private companies for their own use (Walker and Cass, 2007). Each of these prompt different roles for members of the 'public', who may be one of more of the following; landowners, protestors, service beneficiaries, co-owners of a project or energy customers. Each of these roles will be shaped by specific settings and processes. Some of these roles may be subject to economic rationality (i.e. as a customer or investor), while others (such as seeking to protect a local landscape) may be based on emotional motivations. This therefore highlights the need for a more sophisticated understanding of how communities relate to individual wind energy schemes, and more generally to wind energy as a technology. An appreciation of this complexity helps shape how we understand the nature of social acceptance.

2.3. Social acceptance

We therefore need to consider carefully how we define the very term 'social acceptance'. This has been a long standing topic in relation to a range of facilities and developments, notably nuclear power infrastructure, waste facilities and hydro-electric schemes, but began to be applied to renewables, particularly wind in the last 1990s, as indicated in Figure 1. In less than two decades, this topic has evolved from '… a marginal and little studied point of discussion to be at the forefront of broader debates in the social sciences' (Fournis and Fortin, 2016), with wind energy being a key area of learning (Szarka et al., 2012). However, it has long been acknowledged that the term 'social acceptance' has faced definitional difficulties (Williams and Mills, 1987), as the validity and normative implications of the concept being questioned. For example, Ricci et al. (2008) have suggested it is too narrow and denies the other dimensions of how people

relate to new technologies, while Batel and Devine-Wright (2014) suggest that by focussing on 'acceptance' it not only perpetuates the normative top-down perspective on people's relations with energy infrastructure but also 'ignores all the other types of responses to those such as support, uncertainty, resistance, apathy amongst others' (p. 2). Indeed, Chataigner and Jobert (2003), have pointed out that it is generally 'unacceptability' rather than 'acceptance' that is actually the focus of interest. Others have suggested that it is not broader ideas of 'acceptance' that has been of interest, but essentially only the success and efficiency of the consenting process, as developers place a premium of securing public buy in at that stage, but then have little incentive to develop long-term relationships with host communities. In this context, it is a minimum level of 'compliance' with ideas of dialogue and mitigation with host communities that is achieved, rather than a deeper or long-term understanding of acceptance (Howard, 2015).

In recognition of these conceptual weaknesses, alternative frameworks have been suggested to overcome some of these constraints. This has included the idea of 'Social License to Operate' (SLO); that has emerged from corporate responsibility initiatives and most extensively applied to the mining industry. This provides a useful iteration of acceptance issues that stresses the need to foster a long-term relationship between a host community and a project, suggesting that the owner or operator needs to be responsive and reflective towards the needs of those living around a facility, involving them from a very early stage (Joyce and Thomson, 2000, Hall et al., 2015). Similarly, 'social sustainability' has been applied to energy infrastructure to stress the wider, long-term impacts and relationships that need to be generated between energy projects and host communities, which can be adopted as a framework and process for implementation (Whitton et al., 2014).

Notwithstanding the criticisms of the term 'social acceptance' and the risk that it oversimplifies a complex social phenomenon, it continues to have a widespread recognition and has heuristic value for which there is presently no adequate alternative. There are a number of definitions of social acceptance made in the literature, including those based on lack of effective opposition to a project or a Pareto optimal trade off where welfare decreasing impacts are balanced by welfare increasing aspects (Cohen et al., 2014). A more general definition of social acceptance, adopted for the purpose of this report, is:

'a favourable or positive response (including attitude, intention, behaviour and — where appropriate — use) relating to proposed or in situ technology or social technical system by members of a given social unit (country or region, community or town and household, organisation)' (Upham, 2015, p. 107).

This is compatible with a more broadly recognised framework for social acceptance of renewable energy technologies offered by Wüstenhagen et al. (2007), who suggests it consists of three different components as shown in Figure 3:

- *market acceptance*: relating to the market adoption of a technology or innovation, including a willingness of financial institutions to invest or lend against the technology, large scale manufacturing of the technology and for consumers to engage in the markets created by the technology.
- *socio-political acceptance:* reflecting the broader issues of acceptance, such as state policies and institutional frameworks that allow or promote the deployment of specific technologies and wider public opinion conducive to the (non-site specific) development of the technology.
- *community acceptance:* this reflects the acceptance of specific siting decisions and energy projects, particularly by residents and local authorities.

Figure 3: The triangle of social acceptance of renewable energy innovation (after Wüstenhagen et al., 2007)

Given the complex financial and industrial arrangements that have built up around wind energy and the centrality of the technology to the achievement of European renewable targets, both *market* acceptance and *socio-political* acceptance are not currently regarded as key limiting factors, but it is increasing levels of *community* acceptance that are becoming the key issue. This is a useful and widely adopted framework (in both academia and policy worlds, e.g. EWEA, 2009, IEA Wind Task 28, 2010) that places community concerns within a wider context and highlights the role of site specific factors including project design, consenting processes and community profile as issues contributing to acceptance difficulties. It also contrasts wider attitudes to wind energy as a technology (i.e. socio-political acceptance) with project specific issues (see 3.1.2 below). It is also important to understand how each of these three elements have an interactive relationship, so that increasingly challenges in the realm of community acceptance could begin to erode the wider social-political acceptance and resulting changes in policy could increase risks, influence investment decisions and thus begin to erode market acceptance. It is also possible that the converse could occur — for example if there are cost increases arising from issues of market acceptance. Social acceptance is therefore a multi-dimensional, context specific and dynamic phenomenon.

This report will primarily focus on issues related to community acceptance. Wüstenhagen et al. (2007) original framework for acceptance has a simplicity that has meant that it has been used as a powerful heuristic tool, but the concept has attracted further debate and elaboration. Both Upham et al. (2015) and Forunis and Fortin (2016) provide useful reviews of how the idea of social acceptance has evolved over the last decade. Following a review of 100 papers that use the concept of social acceptance in the context of wind energy, Forunis and Fortin (2016) highlight how local acceptance of wind energy is influenced by a multitude of factors including scale of analysis, psychological factors, the makeup local communities, governance structures and processes, participation processes and the nature of the market and industrial structure of the wind energy sector, to name

just a few. It is also important to highlight that we should not treat host communities as if they were homogenous, with different individuals having a multitude of roles within them (e.g. home owner, consumer, environmentalist, Walker and Cass, 2007). There is also a very wide diversity of how wind energy is discussed and understood (i.e. the discourses or 'truth claims' around of wind energy, Wolsink, 2011, Mander, 2008, Jessup, 2010) at group, intergroup and societal levels (Batel and Devine-Wright, 2014). This has led some researchers to suggest that it is worth exploring a range of theoretical frames to understand social acceptance, including social representation theory (e.g. Batel and Devine-Wright, 2015) which all tend to focus that acceptance is not about simple, society-technology relationships but about social change, collective action, mobilisation and popular rationalities, all of which may be closely defined by specific contextual factors.

This underlines the fact that social acceptance is not simply a function of host community attitudes, but operates at a range of geographic scales, with multiples actors and is shaped by the myriad of relationships between them. An illustration of the range of actors involved is shown in Table 2. In the light of this, Upham et al. have elaborated Wüstenhagen et al. (2007) concept of social acceptance (see Figure 4) to acknowledge the different scales at which acceptance is produced (or constrained) and how this is mediated through the relationships created between objects, institutions and different social elements.

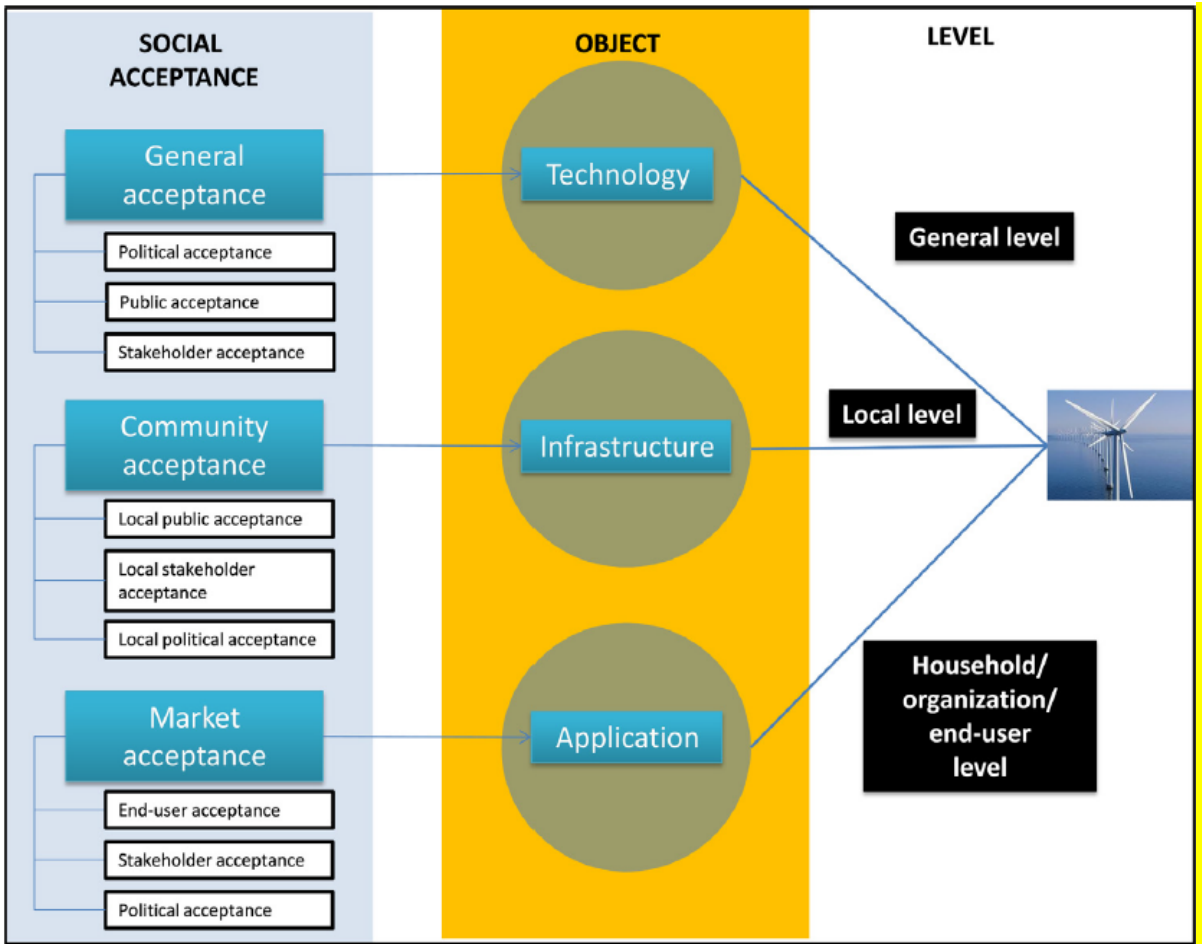


Figure 4: A context-based classification of types of energy technology acceptance (from Upham et al., 2016)

Table 2: Actor groups and social acceptance at different geographic scales (from Upham et al., 2015)

		Level		
		General/policy	Local/community	Household/organisation
Actor group	Political	National acceptance (by national, formally instituted decision-makers)	Local political acceptance (by local, formally instituted decision-makers)	User acceptance (by individual citizens with views on energy policy)
	Stakeholder	Stakeholder acceptance (by other nationally active market and nonmarket policy groups)	Local stakeholder acceptance (by other locally active market and nonmarket policy groups)	Stakeholder acceptance (by commercial and other organised users)
	Public	Public acceptance (by the general population as citizens with views on national policy)	Local public acceptance (by the local population as citizens with views on national policy)	End-user acceptance (by household, organisation and individual end-users)

To conclude the review of social acceptance as a concept, while there are concise frameworks for understanding the issue, they do face definitional and normative difficulties and implicitly engage deeper assumptions on the relationship between energy, society and the agency of citizens in social change. The concept has undergone theoretical development from denoting a bi-lateral, society-technology relationship in a snap shot in time to a multifaceted, dynamic concept denoting complex and changing relationships within and between a large number of stakeholders and infrastructure that can be understood through a wide range of disciplinary perspectives and theoretical frameworks. Despite some conceptual weaknesses, social acceptance continues to have a strong resonance amongst researchers, regulators and developers and thus creates an important space in which the wider social and political dimensions of wind energy can be confronted and debated. As noted above, while we should see acceptance operating at a range of scales, the emphasis has been on the specifics of community acceptance and for this reason, this will be a key focus for the rest of this report.

There are a number of ways in which the community responses to specific projects can be understood and Fast and Mabee (2015) usefully divide these into place-based explanations and trust-based explanations, both strongly recurring themes in case studies of wind energy projects (e.g. Hall et al., 2013). The next two sections briefly explain the conceptual issues that fall under these two key categories.

2.4. Place attachment and place identity

Some researchers have attributed the strongest response to wind energy projects arising from the changes to local landscapes and fears of the resulting visual disruption (e.g. Pasqueletti (2011) and see section 3.2.2). However, the way in which an individual expresses an affinity to a particular place is mediated by a more complex and deeper relationship than just an aesthetic appreciation of a landscape. This relationship has been explained through the concepts of place attachment ([8]) and place identity ([9]), which has been linked to social acceptance of wind energy projects, particularly by Devine-Wright (2009, Devine-Wright and Howes, 2010). This suggests that an individual's reaction to a proposed project may primarily be one of 'place-protection', stimulated as an emotional response to what they see is a disruption of places they have developed a close affinity to (rather than simple 'NIMBYism', see section 3.1.2). Indeed, in their case study from Northern Ireland, Ellis et al. (2007) found that some of those opposing a local wind project did so out of a sense of *duty* to their local area. This has links with other research perspectives, such as Parkhill (2007) who suggested that some of the conflicts over wind energy projects reflect wider territorial struggles or an emotional response to wind turbines and the consenting process (e.g. Maehr et al., 2015), which are difficult to be understood and assimilated within the 'rationality' of developers and regulators (Cass and Walker, 2009). Drawing on Social Representational Theory and social psychology, Devine-Wright (2009) has suggested a framework through which an individual and community would make sense of a locally proposed wind energy project (as shown in Figure 5), potentially being stimulated to act for or against the project.

This provides a way of understanding the way in which communities socially construct the *meaning* (including the perception of threat or opportunity) of a local project through a number of stages (awareness, evaluating etc.). This is further elaborated in Table 3, which shows the different levels at which each of these processes takes place,

([8]) Defined as *'… a positive emotional connection to familial locations such as the home or neighbourhood, correlating with length of dwelling, featuring social and physical sub-dimensions, the relative importance of which may vary and leading to action, both at the individual and collective levels'* (Devine-Wright, 2009, p. 427).

([9]) Defined as *'… the ways in which physical and symbolic attributes of certain locations contribute to an individual's sense of self or identity'* (Devine-Wright, 2009, p. 428).

highlighting the importance of interactions with other individuals and members of the community that further mediate the ways in which an attitude to a wind energy project is developed. This emphasises how trust in other individuals and institutions (see section 2.5) can influence levels of social acceptance, particularly if an individual or community thinks that a decision to consent a wind energy project has been imposed, is inequitable or undertaken in secrecy. This perspective also underlines the relational and communicative dimension to social acceptance — the ways in which people talk about a project, how it is portrayed in the media or by key community figureheads, clearly matters. Devine-Wright (2009) also links this process of understanding with action (the last stage in Figure 5). This is done through the idea of 'place-disruption'; if someone has a strong place attachment and a strong sense that this would be disrupted by something such as a wind energy project, they are more likely to be motivated to take some action, compared to someone that perceives it as less disruptive, has weaker place attachment, or both.

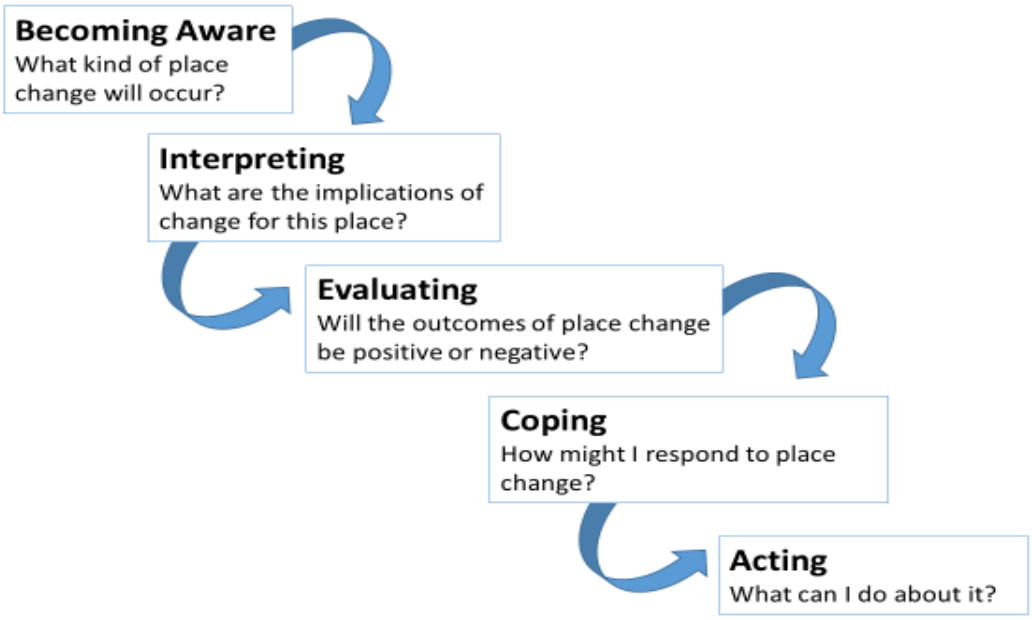


Figure 5: Stages of psychological response over time to place change (from Devine-Wright, 2009)

This provides a useful framework for undersranding how individuals and communities will respond to a wind energy proposal, which is capable of incorporating both the place specific nature of a project, the specific characterisics of a host community and how relationships (i.e. within a community and with key institutuons) can prime the conditions for greater or less social acceptance.

Table 3: Stages of responses to place change at different levels of analysis (from Devine-Wright, 2009)

	Knowing	Interpreting	Evaluating	Coping	Acting
Socio-cultural	Reading, watching or listening to media reports	Reading, watching or listening to media reports	Learning about previous cases of place change	Reading, watching or listening to media reports	Adopting culturally normative forms of action
Collective or group	Hearing from a group source	Attending public meetings or exhibitions	Learning about instigators' or group leaders' views	Joining or forming a protest group	Engaging in collective actions
Inter-personal	Hearing from a friend or neighbour	Discussing with a friend or neighbour	Learning of trusted other's views	Talking to trusted friends	Lobbying key actors
Intra-personal	Direct (sensory) experience	Imagining, anticipating, day-dreaming	Feeling negative or positive affect; evaluative judgements of change	Anticipation, fantasy or denial	Writing letters, signing petitions, detachment from place

2.5. Trust and procedural justice

As noted above in the discussion of place attachment, the issues of trust has a key role in shaping social acceptance, often mediated through perceived procedural justice (Fast and Mabee, 2015). Trust, is of course, also a complex and contested concept of much broader relevance to understanding social engagement with science, technology, institutions and public policy in general (e.g. Greenberg, 2014). Walker et al. (2014) also describe how, in the context of renewable energy, we should consider trust as a multifaceted concept, that belies a wide range of assumptions, particularly when applied to a monolithic notion of 'community', which rarely exists in reality. Drawing on Putnam (1993) and others Walker et al. (2014) note how trust is closely related to, and grows out of levels of social capital, which enables cooperation, communication and civic engagement. A full exploration of the notions of 'trust' and how to build, or even recognise it, is clearly beyond the discussion here, but can be recognised as having a number of dimensions in relation to wind energy projects, including (after Rayner, 2014):

- credibility; the truth value that people assign to claims made by various actors;
- confidence; in the ability of actors (planners, developers, regulators, politicians) to perform in their areas of claimed competence;
- integrity; the honesty decency and fastidiousness of actors performing roles and duties;
- meeting expectations of behaviour; the reliability of behaviour of institutions and individuals, both positive and negative yet appears to be central to social acceptance;
- deference to authorities; the extent to which claims to specialist expertise are subject to public scrutiny and critique.

These issues have been expressed in a range of case studies of wind energy projects, where trust in the siting process and credibility of local and national governments to regulate such a process in the public interest is a recurring theme (Fisher and Brown, 2009, Fast and Mabee, 2015, Wolsink, 2007). This can relate to the credibility individuals may assign to a national (or European) energy policy that promotes renewables (and in turn perhaps linked to a belief in the science behind climate change, Jepson et al., 2012). This may also relate to trust in how well public authorities assess the risk arising from impacts from wind energy projects such as bio-diversity (e.g. Wang and Wang 2015), noise (e.g. Haggett, 2012) or health (Knopper et al., 2015), particularly when authorities appear to prioritise 'expert' opinion over the lay knowledge and evidence presented by local communities (Aitken, 2009, Rydin et al., 2015, Larsson and Emmelin, 2016). Clearly, some minimum level of mutual trust (however defined) between communities, developers and state institutions is a necessary component of any process of civic engagement and for the public to ultimately accept the legitimacy of siting decisions. Indeed, in a much cited study, Gross (2007) has noted how a perceived lack of fairness can be a central factor in conflicts over wind energy projects and suggests that even weak projects can benefit from a 'fair process effect'. Some authors have gone as far as suggesting that participation could even be a 'silver bullet' for social acceptance (Rau et al., 2012). The potential influence of process is shown in

Figure 6, from which the framework shown in Table 4 has been developed. Issues related to the governance of public participation processes are discussed further in section 4.1.2, but it is useful to note here that while Gross (2007) has noted the benefits that could flow from effective and 'fair' engagement process, others (Lee et al., 2012, Aitken et al., 2008) suggest that participation often has little impact on outcome of decisions, or narrowed towards mitigation of impacts rather than decisions in principle (or 'how not whether', Rydin et al., 2015), thus undermining concepts of trust and procedural justice.

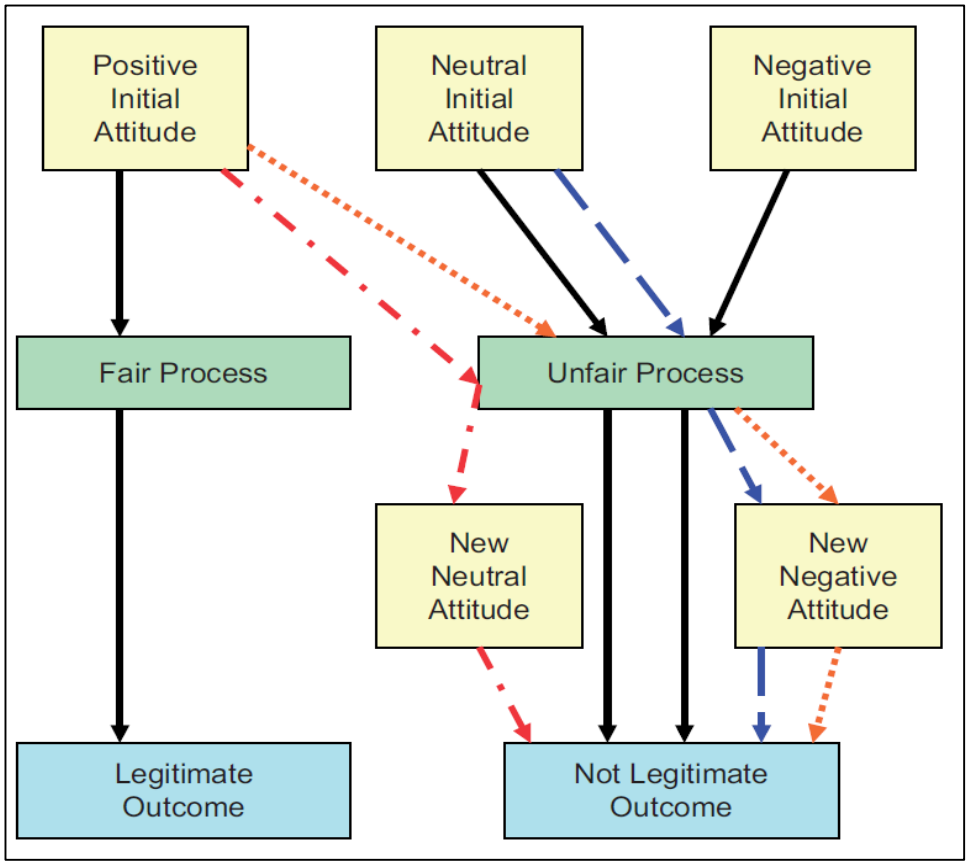


Figure 6: The relationship between attitude, perception or process and outcome legitimacy (from Gross, 2007)

Table 4: Community fairness framework, suggested by Gross, 2007

Group affected	***Fairness perception influenced by ...***	***Primary reason***
'Winners' 'Losers' 'Moral proponents' 'Moral objectors'	Outcome favourability (distributive justice)	Personal benefit from positive outcome/decision Personal loss from positive outcome/decision Overriding belief in outcome Overriding belief in outcome
'Neutrals': no strong belief either way 'Silent majority' Who may or may not have an option	Outcome fairness (distributive justice)	Prefer outcome to be fair for everyone in community in order to maintain social well-being
Whole community where fair outcome desired for health of community	Process fairness (procedural justice)	A fair process is more likely to result in a fair outcome

Therefore, while recognising the difficulties in defining and building 'trust' in the relationships that can influence social acceptance (for example, those highlighted in

Table 2 and Table 3), this brief discussion suggests that it is an essential, if elusive element in overcoming levels of opposition to win energy projects. This further emphasises how improving social acceptance is not simply about better project design, or even a robust participative process but will also rely on wider social and institutional dynamics.

2.6. The dynamics of community acceptance

A final concept that is important to consider in terms of social acceptance is the dynamic nature of how people understand and respond to wind energy projects. Here we note that on the one hand we should understand the implementation of wind energy as a process of social change (Batel and Devine-Wright, 2014), yet most research seeks to understand community responses in a snapshot in time, often focussed around siting decisions. As noted in section 2.4, there is a cognitive process through which individuals and communities may make sense of a wind energy proposal and this sits alongside the processes of project design, securing consent and public participation, construction and operation of a project. Therefore, a more holistic concept of acceptance should seek to understand how this may change over time and to question the significance of responses at the consenting stage within the long-term relationships between communities and wind energy projects. Unfortunately, there is a paucity of longitudinal studies of community views and those that exist tend to be small scale, from which it is difficult to derive wider conclusions. There is a suggestion made by a number of researchers (Gipe, 1995, Krohn and Damborg, 1999, Devine-Wright, 2005, Wolsink, 2006, 2007) that community acceptance may experience a U-shaped curve where acceptance is least strong during the proposal stage (due to fears and perceived negative impacts) and then recovers following implementation (due to familiarity and unfounded fears). Figure 7 shows the results from Wolsink's (2007) research from the Netherlands that highlights this changing profile.

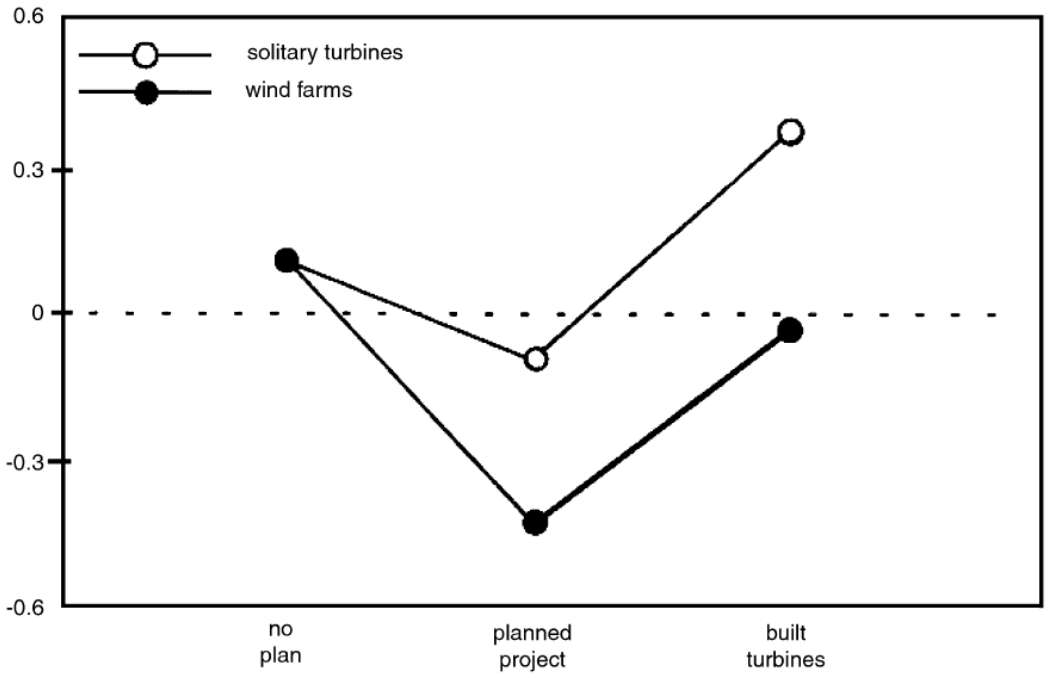


Figure 7: Development of public attitudes towards wind power dependent on near-by project (from Wolsink, 2007)
NB: Y axis indicates group averages in standard units (z-scores). Overall average is zero, representing a clear majority in favour of large scale application of wind energy.

Such pre/post-implementation views have not been found in all cases (e.g. Eltham et al., 2008), but more recently, Wilson and Dyke (2016), based on a relatively small scale study from England also found the U-shaped curve before and after (5 years) wind energy project implementation, noting that there were different 'acceptance curves' according to the area of concern, with attitudes on visual intrusion reflecting a return to post-installation levels, but issues such as property price, noise and other environmental impacts showing a 'flattening post-installation', where support did not reach pre-project levels. This appears to suggest that familiarity helps overcome initial fears but does not support the idea that a community will become highly positive as they live with wind energy projects.

The consideration of the dynamic of acceptance highlights a number of key issues. First, it suggests that experience, proximity and familiarity (Landeburg, 2009) have a role in shaping community responses. It also draws attention to the fact that public opinion towards wind energy will continue to change, stimulated not just from direct experience, but also from wider social and political forces and the cumulative impacts of implemented projects. The fact that most studies focus on community responses around the time of the consenting process and the wider lack of longitudinal studies or robust 'natural experiments' in before/after experiences, is a significant gap in current knowledge of acceptance of wind energy projects. This suggests that we need to learn about the dynamics of the long-term relationships between communities and wind energy projects and to use insights from this in shaping strategies for social acceptance.

3. Host community concerns in relation to wind energy projects

Section 2 has outlined some of the challenging conceptual issues that confront an understanding of the social acceptance of wind energy projects and outlined some of the key factors that appear to have influenced the way researchers have investigated the issue. This section moves on to look at some of the evidence of what actually shapes community responses, notwithstanding the comments above that emphasise the complexity, dynamic and relational influences that can come into play here. The section is structured into three parts. The first provides a short review of some of the studies that have attempted to measure host community attitudes, using a variety of different methodologies and disciplinary perspectives (see Table 1), as well as the wide range of variables that have been tested through such studies. Section 3.2 then goes on to examine the perceived impacts of wind energy projects on a host community covering issues such as landscape, property values and the health of the local community, fears over which have been seen to stimulate local opposition. Section 4 reviews research that has investigated the role of broader governance on wind energy, including issues around how the perceived distributional impacts and the role of government policy in regulating and mediating the drivers of social acceptance.

3.1. Host community attitudes to wind energy projects

3.1.1. Introduction

Many of the earliest studies into issues around social acceptance of wind energy projects were focused on measuring the expressed attitudes of host communities, in an attempt to identify stimulants to opposition and the perception of key impacts of local projects. These have generally followed two approaches. The first has been in the form of opinion-polls of how predisposed the public are towards wind energy projects and the second have come in the form of detailed cases studies, sometimes also adopting opinion polling or a richer blend of other methodologies.

Opinion-poll based studies, often undertaken by state agencies (e.g. Sustainable Energy Ireland (SEI), 2003), trade bodies (e.g. Danish Wind Energy Association ([10])) or individual companies (e.g. Viking Energy Ltd ([11])) have been administered at a variety of geographic scales (Whitmarsh et al., 2011). Such studies are reliant on positivist-quantitative methods and as such have tended to frame the 'problem' of social acceptance in particular terms with little opportunity for qualifying support/opposition to wind energy projects, nor always confronted issues of funder-bias (Ellis et al., 2007). This has produced what has been seen as an enigma, the so called 'attitude-behaviour gap' (Bell et al., 2005, 2012) which highlights the apparent contradiction between generally high levels of society wide support for the idea of wind energy (i.e. socio-political support) with the (often) more negative views of the host community surrounding proposed wind energy projects. The research questions adopted by such early studies (for example Ek, 2005 and Krohn and Damborg, 1999), led to specific interpretations that suggested a deficit of understanding or 'deviancy' amongst host communities, reinforcing unhelpful claims of developers and some other stakeholders that acceptance is driven by 'NIMBYism' (see section 3.1.2 for a fuller discussion of this).

([10]) http://windpower.org/da/fakta_og_analyser/danskerne_mener.html
([11]) https://www.ipsos-mori.com/researchpublications/researcharchive/402/Attitudes-Towards-The-Construction-Of-A-Windfarm-In-Shetland.aspx

The appropriateness of relatively simple positivist studies of a complex social phenomenon such as community acceptance has been progressively questioned, noting that unilateral analysis does not reflect the intricacy of context, community profiles and motivations (Ellis et al., 2007). There has been significant questioning of the value of approaches such as opinion polling as this tends to overlook the 'diverse structural variables' and tend to record 'abstract' opinions often devoid of context and social meaning (Fournis and Fortin, 2016). As a result, over the last decade most (but not all) studies have tended adopt increasing methodological and conceptual sophistication, focussing on richer understanding of specific case studies, or comparative analysis of a number of case studies (Huber, Hobarty and Ellis, 2012). While these have certainly enriched our understanding of the way in which social acceptance issues are shaped, they have varied in the way they measure acceptance (Batel and Devine-Wright, 2013), examined a very wide range of variables and addressed very different research questions. There has also been a rise of useful studies that have examined how impacts and benefits of wind energy projects are portrayed in the media (e.g. Barry et al., 2008, Lennon and Scott, 2015) which can be an important influence on how people frame the challenges of social acceptance. The great range of approaches has given rise to a problem of compatibility of these studies, that has hampered the emergence of a clear and distinct picture of universally applicable motivations of local opposition to wind energy projects and obscured potential solutions, although it is possible to draw out some broad principles and parameters. In order to explain what these may be, the next section first critically examines the concept of Not In My Backyard (NIMBY) that has unfortunately primed many policy approaches and developer practice in this field, before providing a selective overview of some of the studies that have generated some useful evidence on how communities have responded to wind energy projects in a European context.

3.1.2. NIMBYism

As noted above, the concept of 'NIMBY' has provided an unhelpful, and perhaps erroneous, distraction through which many stakeholders still make sense of community opposition to wind energy projects. Although often used loosely to pejoratively describe any opposition, Wolsink (2000, p. 5) has defined the label as referring to '… people that combine a positive attitude and resistance motivated by calculated personal costs and benefits'. This has been deployed as a way of explaining the attitude-behaviour gap. From this perspective, a community, or specific individuals within a community, will oppose a wind energy project out of a selfish protection of their 'backyard'. The clear implication from this is that it is those opposing a wind energy project are somehow irrational, obstructive and against the common good. This can distract from a more reflective approach to the possibility of deficiencies arising from the project design, its location, consenting process or wider political economy. This has therefore been closely linked to the 'public-deficit' perspectives where opposition could be explained by ignorance of science or technology and thus remedied simply by providing more information or knowledge (Burningham et al., 2015, Sturgis and Allum, 2004). The concept of NIMBY has attracted a wide range of criticism focussing on its conceptual weakness, inaccuracy and counter-productive way of describing opposition to wind energy projects has attracted a substantial body of criticism, particularly from researchers working in the field of wind energy (Aitken, 2010a, Burningham et al., 2015, Devine-Wright, 2005, 2009, Wolsink, 2000, 2006, 2012, Ellis et al., 2007, Van der Horst, 2007, Rygg, 2012 to name just a few ([12])). Although there are some researchers that continue to recognise in the value of using NIMBY as an operationally concept (e.g. Cohen et al., 2014), there is a strong and broad consensus that social reality of local

([12]) Indeed, Kemp (1990) goes so far as to suggest that NIMBYism is '*an oversimplification of strongly held environmental, political, and moral views of deceptively fecund breadth and depth*' (p. 1247).

opposition does not align with how local opposition is framed through the NIMBY concept.

Despite this, the term continues to be used, particularly in the mass media (Slack, 2012, Fröhlingsdorf, 2011) and in political discourse, as a way of explaining what is a complex phenomenon — the fact that Google identifies ([13]) over 1 220 000 references to the term (not all related to wind energy), indicates its widespread use. Therefore, despite the academic protests highlighted above, the term continues to be durable and indeed, Wolsink (2012) suggests that the term is so embedded that it is often regarded as a 'self-evident truth'. This has very real implications for the acceptance of wind energy projects as it can shape the way in which some developers and regulatory agencies have address community concerns, so that consultation responses may be seen as 'irrational' and thus dismissed. In turn this can influence the dynamics of how other actors respond (Burningham et al., 2015), fostering increased levels of conflict. Thus, the NIMBY term frames local opposition as lacking credibility, against the public interest and in some ways 'deviant', leading to the conclusion that it should be supressed and avoided. This has consequences for transparency and openness of the project design and consenting process (see section 4.1.2), which then may have more often becoming counter-productive and further intensifying the adversarial nature of the dispute. Therefore, the framing concepts used by all actors in the context of a wind energy project can have profound implications on a point to a great emphasis on some form of deliberative process that has potential to develop at least some basis for mutual understanding (see section 4.1.2).

3.1.3. Attitude studies

Studies that have examined public attitudes to wind energy projects have been key to developing our understanding of acceptance — both in terms of society wide views and particularly, those in host communities. This has given rise to a complex range of case studies, deploying different variables and measurements (Upham et al., 2015), making it difficult to derive an overview (see Batel and Devine-Wright, 2015). As noted in section 3.1.1, research on people's attitudes to wind energy and wind energy projects has expanded over the last 15 years. A search via Scopus indicated that there are at least 93 studies on attitudes to wind energy and a sample of European studies on this is shown in Table 5 to indicate the diversity of methods, geographic context and findings of this type of research.

This field of study has evolved from the first studies in the late 1990s (e.g. Krohn and Damborg, 1999), which tended to focus on understanding general attitudes to wind power (e.g. Ek et al., 2005), which has been elaborated through an increasing number of illustrative case studies (e.g. Warren and McFayden, 2009). Some of these case studies explored specific drivers of public attitudes, such as personal attributes (e.g. Bidwell, 2013, Devine-Wright, 2007) or variables such as proximity to wind energy projects (e.g. Jones and Eiser, 2010). The majority of such studies have deployed standard quantitative surveys with open and/or closed questions, although there have been no standard protocols for ensuring core concepts have a shared definition (e.g. understanding of 'visibility', standard thresholds for proximity studies or socio-demographic data, or even the definition of 'acceptance' itself). Some authors have also used choice models to tease out individual preferences of different aspects of wind energy projects (e.g. Meyerhoff et al., 2010, Ladenburg et al., 2015). Case studies have been undertaken all over the world, providing a substantial body of evidence for which

([13]) Searched on 12/09/16 under the simple term of 'NIMBY', which did not distinguish between critical discussions of the term and its rhetorical application to specific development disputes.

there is, as yet, a lack of comprehensive and systematic review to identify common findings and outstanding research questions.

As an awareness of the complexity and inter-related nature of social acceptance emerged, research also took a 'discursive turn' (Fisher and Brown, 2009) that included changes in methodological techniques to include discourse analysis (e.g. Barry et al., 2008), Q-Methodology (e.g. Ellis et al., 2007, Fisher and Brown, 2009) and a range of other qualitative methods (e.g. Langer, 2016).

Table 5: Examples of European studies of host community attitudes to wind energy projects

Study	Location	Method and sample size	Issue	Key findings
Ek (2005)	Sweden	Quantitative postal survey 547 responses	Attitude of electricity consumers towards wind power.	Majority of electricity consumers are generally positive towards wind power, but this declines with age and income. People with an interest in environmental issues are more positive.
Landenburg et al., 2013	Denmark	Quantitative survey as part of wider study. Randomised sample of 1 050 participants from a nationwide internet panel	Explores whether attitudes towards wind energy projects is influenced by familiarity.	Attitudes to increasing the wind capacity is significantly influenced by how many turbines people see on a daily basis, if a turbine can be seen from place of residence and with a preference for smaller turbines.
Jobert et al., 2007	France and Germany	Five case studies with 11-15 interviews with local actors per case study, supplemented by planning documents and local media	Examines how local policy framework influences local acceptance.	Acceptance influenced by visual impact, availability of information and ownership. The way projects are implemented in terms of networks and local integration of developers also significant.
Jones and Eiser (2009, 2010)	Sheffield, England	Quantitative survey on 417 valid responses across five different communities four of which were around identified sites for wind projects.	Comparison of affected and not affected groups (2009 paper), impact of visibility on attitudes (2010 paper).	Opposition related to anticipated visibility rather than proximity to a wind energy project. Important predictors of negative attitudes to wind energy projects include fear of changes and the unknown, lack of trust in local municipality and uncertainty over wider support in the community.
Eltham et al., 2008	Cornwall, England	Repeated door-to-door interview, with closed and open questions asking for retrospective views about the wind energy project.	Pre- and post-attitudes to a single wind energy project.	The study found no statistically reliable change in opinion on the acceptance of the project pre- and post-construction. There was a decrease in in number of residents that could identify a positive impact of the project, but an increase in the number finding the turbines visually attractive and regarding wind as a

				valuable energy source.
Warren and McFayden (2009)	Scotland	Quantitative survey 106 participants, supplemented with semi-structured interviews with five key stakeholders.	Compares public attitudes between community owned wind energy project with a conventional commercial project.	Public attitudes are more positive towards windfarm developments in areas where local communities have a direct involvement compared to where they do not.
Meyerhoff et al. (2010)	Germany	Telephone-based choice experiment involving 708 participants.	Measures extent of landscape externalities of wind projects, particularly the impact of repowering — replacing old projects with newer ones with larger but fewer turbines.	Suggests that repowering will lead to an increase in negative landscape externalities. However, the study also identified at least three different groups who perceived wind energy projects in different ways.
Betacova et al. (2015)	Czech Republic	Visual preferences for three different landscape types recorded using quantitative assessment scale. Sample of 169 students.	Impact of number of turbines, visibility and distance on acceptance.	Significant impact of number of turbines, distance and aesthetic quality of a landscape on acceptance.
Lindén, A., Rapeli, L., Brutemark, A. (2015)	Finland	Quantitative survey and municipal level data. 3 459 respondents.	Testing whether negative attitudes to wind energy projects are related to either degree of community attachment or local economic conditions.	Females and older people more positive about wind energy projects. Communities with weaker economies are more supportive. People who live in smaller communities are less supportive.
Katharina Langer, Decker, et al. (2016)	Bavaria	Open-ended semi-structured interviews with nine leaders of wind energy supporter and opponent groups.	Identifying the most relevant factors that influence acceptance in Bavaria.	Most significant factors identified were distance to place of living, trust and transparency in political process and the perception of distributive justice arising from wind energy projects.
Musall and Kuik (2011)	South east Germany	Comparative case study using questionnaire-based survey, administered via door-to- door interview. 200 participants.	Examining whether active engagement and ownership of renewable energy through a local administration has an impact on acceptance.	Community co-ownership of wind energy leads to higher level of local acceptance of local wind energy projects, compare to commercial projects. Community co-ownership also leads to a more positive attitude to wind energy in general.
Molnarova, K., Sklenicka, P., Stiborek, J.,	Central region, Czech Republic	Rating of three types of landscape using quantitative survey with accompanying photographs. 337 respondents.	Visual impact as a driver for opposition to wind energy projects.	There is higher sensitivity to wind projects in landscapes of high aesthetic quality and greater levels of acceptance in unattractive landscapes,

Svobodova, K., Salek, M., Brabec, E. (2012)				if number of turbines are limited and if these are located away from observation points. Individual's attitudes to wind power as technology as also significant.
Fisher and Brown (2009)	Isle of Lewis, Scotland	Q-Methodology, interviews. 20 participants.	Nature of support and opposition to a specific wind farm proposal.	Highlighted five distinct discourses aligned around the project proposal, each offered different rationalities and valuing environmental, economic, social and landscape criteria differently.
Zoellner, J., Schweizer-Ries, P. and Wemheuer, C., 2008	Four regions in Germany	Environmental-psychological approach using multi-modal research design combining a standardised questionnaire and qualitative Interviews. Total of 349 participants, 189 focusing on wind energy.	Investigation of the social factors that inform acceptance of different renewable energies.	Found that there was good general acceptance of renewable energy technologies. For the acceptance of specific local projects, the perception of economic impacts and involvement of communities in decision-making were most significant.
Wilson and Dyke (2016)	Cornwall, England	Semi-structured interview with 58 participants.	Community perceptions of operational wind energy project to test pre- and post-construction acceptance.	Fears of living next to a wind energy project decline with time and community members are more positive post-implementation compared to pre-installation. Supports U-shaped dynamic of social acceptance.

The consequence of this body of research is that there is a rich diversity of perspectives on what influences individual attitudes towards wind energy projects, which can be grouped into three key themes: personal attributes; perception of the fairness of procedural justice; and perceived impacts of the project, including site location proximity and project characteristic. The issues of procedural justice and project impacts are covered in later sections of the report (sections 2.5 and 3.2 respectively) while Table 6 indicates the range of personal attributes that have been identified as influencing acceptance (from Langer et al., 2016).

In addition to the personal characteristics of those living in host communities, other factors that have been identified as having a key influence on individual attitudes have been: visibility and proximity to a wind energy project although is very much dependent on wider contextual factors (e.g. Van Horst, 2007, Jones and Eiser, 2009), the size and scale of the project (Jones et al., 2011, Ladenburg and Dahlgaard (2012), the local policy context (Jobert et al., 2007) and the decision-making process (e.g. Gross, 2007). Many of these issues are further explored elsewhere in this report. Despite being able to identify some very general drivers of attitudes, research has also highlighted how there is likely to be a substantive variety of opinion within any host community, with different individuals having different specific factors shaping their opinion of a project (e.g. Ellis et al., 2007), which is often lost through large scale quantitative surveys. Indeed, when this range of opinion is combined with the complexity of factors related to specific locations (for example taking into account the issues of place discussed above), one can appreciate that each project needs to be evaluated on its own terms. This has led Jones and Eiser (2009) to note that it is important that 'developers and policymakers focus on clearly establishing the specific reasons why *specific* members of specific communities are opposed to specific developments' (p. 4613, original emphasis).

In an attempt to provide a way of understanding how the combination of personal traits (values, worldviews and socio-demographic variables) and contextual factors (proposed location of the technology, media attention, oil prices, etc.) have influenced attitudes, Huijts et al. (2012) have drawn on existing empirical studies and wider psychological theory to provide a framework for understanding the construction of people's acceptance shown in Figure 8. This notes how the attitude towards wind energy projects (and other technologies) will be influenced by perceived costs, risks and benefits, positive and negative feelings in response to the technology, trust, procedural fairness and distributive fairness. It is then suggested that any intention to act in opposition (or support) of a technology will be influenced not only by attitudes, but also by social norms, perceived behavioural control and personal norm.

Despite the well-developed body of research in this area, there are still many issues that remain under-explored in terms of attitude formation towards wind energy projects. Some of the key gaps include our limited understanding of how attitudes may change over time (including the cumulative impact of ongoing wind energy developments, Jones et al., 2014) and the key stimulants for any change in attitude. Further research is also needed on the interplay of different discourses (such as both support and opposition) and how this could shape overall levels of acceptance (Ellis et al., 2007). Indeed, most research on attitudes has, implicitly or explicitly, focused on those opposed to wind energy projects while neglecting the drivers for support, or how developers frame social acceptance (Barry et al., 2008). This underlines the fact that the very notion of 'attitude' studies tends to constrain the understanding of the social, dynamic and geographic complexity that shapes acceptance. There is still a poorly developed understanding of the attitude-action relationship in social acceptance (Bell et al., 2012) and the links between attitudes, social acceptance and the wider structural elements of the energy regime and socioeconomic organisation of western societies.

Table 6: Personal attributes influencing acceptance of wind energy projects (after Langer et al., 2016)

Factor	Relevant studies	Key findings
Environmental attitude	Wolsink (2007), Ek (2005), Devine-Wright (2007), Demski et al. (2014), Greenberg (2009), Hobman and Ashworth (2013), Ertör-Akyazı et al. (2012), Viklund (2004).	Studies indicate high levels of acceptance for energy policymaking which strengthen the goal of environmental protection.
Socio-demographic status	Ek (2005), Devine-Wright (2007), Greenberg et al. (2009), Hobman and Ashworth (2013), Komarek and Kaplowitz (2011)	On the individual level, socio-demographic characteristics such as gender, age and social status can have an influence on the acceptance towards renewable energies.
Place attachment	Van der Horst (2007), Devine-Wright and Howe (2010), Ladenburg 2008, Waldo (2012), Swofford and Slattery (2010), Jones and Eiser 2009), Firestone et al. (2015)	Emotional attachments to places can influence the acceptance of the population.
Experience with renewable energy	Ribeiro et al. (2011), Devine-Wright (2007), Devine-Wright (2007), Mallet (2007), Aitken (2010), Ladenburg and Möller (2011), Borchers et al. (2007), Cica et al. (2012), Ladenburg (2010), Krohn and Damborg (1999)	Direct experience, such as having personally seen or visited wind farms may have influence on the acceptance towards wind energy.
Knowledge of renewable energy	Ellis et al. (2007), Aitken (2010), Luz (2000)	The higher the information level of the person about renewable energy, the more likely the person accepts them.
Normative beliefs	Hobman and Ashworth (2013), Huijts et al. (2012)	Studies suggest normative beliefs to be a strong, positive predictor.
Emotions	Hobman and Ashworth (2013), Cass and Walker (2009)	Positive emotions are associated with technology acceptance.
Political beliefs	Devine-Wright (2007), Karlstrøm and Ryghaug (2014)	Empirical findings suggest that political beliefs are correlated with acceptance of different low carbon technologies.
Attitude to traditional energy	Frantál (2009)	Acceptance of renewable energy can be related to opposition to nuclear energy.
Conservative attitude	Bidwell (2013), Eltham et al. (2008)	A conservative attitude has been considered to be a relevant factor with respect to theory of adoption of technology innovation.

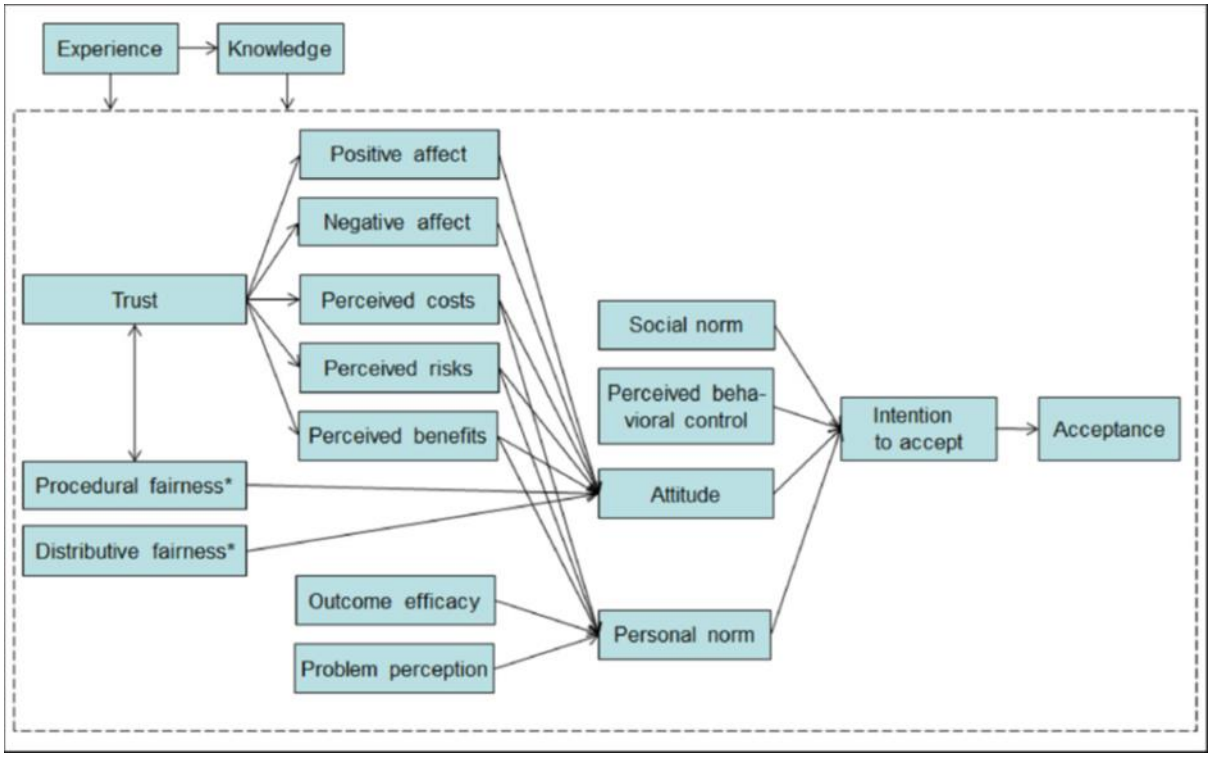


Figure 8: A schematic representation of the community acceptance framework (from Huijts et al., 2012)

This review has therefore suggested that it would be productive to develop a more rigorous, comprehensive and systematic review of existing research to synthesise the existing body of evidence and to then better relate this to the specific contexts and wider structural issues that may frame and mediate social acceptance. Although there have been attempts at drawing together frameworks for how wider factors can come together to shape acceptance (for example that of Huijts et al., 2012, Devine-Wright, 2009 and Upham et al., 2016), these have not been entirely successful and there is some potential for developing a wider social-ecological model for understanding the complex influences that can shape attitudes and the social acceptance of wind energy projects.

3.2. Impacts

3.2.1. Introduction

As noted above, the challenges facing the social acceptance of wind energy projects stem from complex issues related to a wide range of communicative, social and political factors. It should be clear however, that the actual, potential or perceived impacts that such projects have on a local area can also be the source of conflicts. The main concerns that have been raised by communities are reviewed here. However, many of these issues are complex, variable and in some cases, still not fully understood, so only a brief overview of the key issues will be provided here, on the basis that these can be the source of potential mitigation strategies.

3.2.2. Landscape

The visual impact of wind energy projects is often noted as being one of the primary drivers of community concern (and links with issues of place attachment — see section 2.4), with Pasqueletti (2011) suggesting that the impact on landscapes can induce a 'loss of balance', induced by the notion that the landscapes we cherish or are most familiar with should not change (i.e. immutability) and a sense of solidarity that reflects close ties between communities and the land. Indeed, the link between visual/landscape impacts and 'acceptability' is perhaps one of the most complex to understand (Wolsink, 2007), with a wide range of perspectives on the issue. This can relate to the wider landscape impacts and more localised issues, related to turbine design, size and immediate impacts such as shadow flicker. There is a diverse body of research that has examined these issues, drawing on psychology, interviews, participant surveys and econometric analyses. From this it appears that individuals' attitudes to wind energy projects may be influenced by factors such as turbine design, size and colour/contrast (e.g. Maffei, 2013). Some studies have suggested that smaller turbines have less impact than larger ones (Tsoutos et al., 2009, Dimitropolous and Kontoleon, 2009), while other studies have either found mixed results (Meyerhoff et al., 2010) or that increasing height has no negative effect on preferences (Ek, 2006, Wolsink, 2007) and Bishop and Miller (2005) found that visual effects were less when turbines were moving. Although there is an increasing literature that relates turbine appearance to degrees of visual impact, these have neither been effectively synthesised nor been linked comprehensively to acceptance or even oppositional activity.

Wind energy projects also have wider landscape impacts, given that even relatively small turbines can be visible up to 30 km away (Bishop 2002), but typically between 5-10 km (Betakova et al., 2015). The wider landscape context is clearly crucial in how these impacts are perceived, with the most sensitive and protected landscapes inducing the most negative responses (Betakova et al., 2015) and as such the impact on tourism has been examined with mixed results (Frantal and Kunc, 2011, de Sousa and Kastenholz, 2015). Conversely, it has been suggested that turbines can actually have a positive impact on low quality landscapes (Lothian, 2008) and siting in 'stigmatised places', including roads, railways and industrial areas could increase their acceptability (Van Der Horst, 2007), particularly when located away from observation points such as settlements of transport interchanges (Molnarova et al., 2012).

Research has also highlighted that landscape impacts are perceived differently according to a range of individual characteristics, which include general attitude to wind energy (Molnarova et al., 2012, Jones et al., 2011) and social or class differences some social groups making different landscape claims (Zografos and Martinez-Alier, 2009, Fisher and Brown, 2009), such as seeing rural areas as an aesthetic landscape in its own right while others see it as a productive space in which turbines may have a place (Woods, 2003,

Phadke, 2011). This highlights the need to engage psychological and cultural rationalities in understanding visual impacts, rather than simply technical analysis often undertaken during the consenting process, despite its sophistication and proficiency (e.g. Wróżyński et al., 2016).

Such impacts do not just relate to the design and siting of single wind energy projects, but to how people respond to cumulative visual intrusion. The understanding of this is relatively undeveloped, but, for example, Möller (2006, 2010) has mapped the visual impact in Northern Jutland, Denmark showing how even by 2007 turbines were visible from almost the entire area, that over 50 % of the population lived with 5 km of a turbine and that the process of decommissioning and repowering with fewer, but larger turbines that took place in the early 2000s did not reduce overall visible intrusion. A number of researchers have sought to understand the impact of increasing the numbers of turbines in the landscape, Sibille et al. (2009) suggesting that the visual impact is seen as being progressively disruptive until turbines occupy approximately 15 % of the view and then no other impacts seem to accumulate, while Ladenburg and Dahlgaard (2012) have suggested that people who see more than 5 turbines every day have a more negative attitude towards wind energy projects. This tends to be in tension with other research that suggests 'familiarly' with wind turbines may increase support towards wind energy projects (Krohn and Damborg, 1999, Meyerhoff et al., 2010 and see section 2.6). Building on this, Jones et al. (2011) developed a multi-regression model to analyse the numbers of turbines survey participants would reasonably support, based on research in the east of England. This suggested that, perhaps predictably, people were most favourable to small numbers of clusters of turbines and while most participants would accept some local wind energy projects, the upper capacity limits varied substantially. In this case, key influencing factors appeared to be knowledge of wind power, degree of community attachment and perceived fairness and equity.

3.2.3. Bio-diversity

The potential impact of wind energy projects on certain species has also been articulated as a driver of opposition from some ecology interests, or integrated into more general arguments against specific projects. Again, there is a diverse and complex body of research on this issue, making it difficult to generalise. However, the greatest concerns have been related to the impacts on birds and bats. It has been suggested that turbines kill hundreds of thousands of birds each year (Panarella, 2014), with some authors keen to highlight how this is smaller than that caused by other types of energy generation, human infrastructure and cats (Sovacool, 2013). The rate of bird collisions is subject to a wide range of factors that include weather and seasonality, species, turbine and array design and site characteristics (e.g. Drewitt and Langston, 2006). A recent review provided by Wang and Wang (2015) provides a useful picture of the state of the science on bird fatalities, noting that such studies are 'sparse and unsystematic', with a need for much more accurate monitoring experiments and more cooperation required from the wind energy industry. Indeed, while they highlight a number of clear hypotheses (e.g. related to flying conditions, lighting of turbines, or the location of projects), they emphasise that far more information is needed about how and why birds are killed at such facilities which would allow the development of more effective mitigation strategies.

Similarly, bats are also killed at wind energy sites in high numbers by both impact with turbines and also due to sudden pressure drops near the turbine edges (so called barotrauma) (Rollins et al., 2012, Rydell et al., 2010). This could be caused by bats being attracted by the lighting or ultrasound created by turbines, by regarding turbines as trees and therefore roosting sites, or even in search of the insects that may be attracted by the heat of the turbine nacelles (Arnett et al., 2013, Dai et al., 2015).

The effects on species such as birds and bats are of course a significant issue in evaluating overall environmental impacts of wind energy and worthy of consideration on this basis alone. However, this report has a focus on social acceptance of wind energy and the ecological impacts do have consequences for this. As noted in previous sections, acceptance draws on wider discourses of wind energy and clearly the risks to bats and birds, particularly in symbolically important species such as eagles or swans, inevitably forms part of the overall discourse of 'wind energy'. Solli (2010) has also shown how this can create opportunities for those opposed to wind energy to portray it as being 'anti-nature' and thus integrated into rhetorical and narrative strategies for mobilising and rationalising resistance to wind energy projects and in recruiting diverse interests into opposition.

3.2.4. Health, noise and well-being

There has been a substantial interest in whether wind turbines have any impacts on the health of people who live or work near wind energy projects, with emerging evidence deployed by both the supporters and those opposed to such projects. It has been suggested that turbines result in effects such as shadow flicker, audible noise, low frequency noise, electromagnetic fields (EMF) and infrasound, which may impact on health (Knopper et al., 2015). It has also been suggested that such effects have cumulatively contributed to 'wind turbine syndrome' (Pierpoint, 2009), although this has not been substantiated in subsequent studies. Indeed, there is a complex body of research in this field that cannot be comprehensively covered here, but has been subject to a number of recent reviews, including that by Knopper et al. (2015) and Onakpoya et al. (2015). Knopper et al. (2015) note that there were around 60 peer reviewed articles on the health impacts of turbines up to 2014, and there are at least 20 papers published since this date. Although the rigour, sample size and methodologies deployed vary, there is a now a significant body of evidence related to each of the main direct environmental impacts of wind energy projects including EMF (Israel et al., 2011, McCallum et al., 2014), shadow flicker (e.g. Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Department of Public Health (MDPH), 2012, UK Department of Entergy and Climate Change (DECC), 2011), low frequency noise (e.g. Möller and Pedersen, 2011, Bolin et al., 2011) and infrasound (e.g. Turnbull et al., 2011, Bolin et al., 2011). The general conclusions from most of these studies, as reported by Knopper et al. (2015) is that they are all unlikely to result in impacts to human health. However, it has also been noted that the attribution of symptoms arising from exposure to wind turbines may arise from a 'nocebo' effect where an expectation or worry of health effects prompted by media discussion of the phenomena, or from opposition campaigns groups that have raised health as a potential impact of a proposed project (Chapman et al., 2013, Crichton and Petrie, 2015). Indeed, Deignan et al. (2013) have noted how almost all articles about wind turbines in Ontario included 'fright factors' and emphasised how health impacts were poorly understood by science. It has been suggested that the evidence of health impacts that appears in the popular media contrasts to that in the scientific literature, or from government sources (Knopper and Ollson, 2001).

The issue of audible noise has been shown to have tangible (but not objectively measured) effects (e.g. Shepherd et al., 2011, Maffei et al., 2013), such as self-reported symptoms including headaches and sleep disruption which some people attribute to the proximity of turbines. Although turbines are not loud enough to cause hearing impairment nor causally linked to adverse effects, it is clear that turbine noise can result in *annoyance* to those who live near wind energy projects, in the same way as noise from road, rail and air traffic. It is feasible that wind energy projects are linked to health effects through the stress and annoyance that people may feel towards the turbine, rather than the direct environmental consequences. In turn, greater levels of annoyance have been linked to visibility of turbines, an individual's age and individual attitudes —

for example Shepherd et al. (2011) suggested that in some cases annoyance may not be linked to noise itself but to other causes of conflict between the community and the developers of wind energy projects. Other researchers have found that the degree of annoyance decreases with the level of economic benefit people receive from the project (Pedersen et al., 2009, Janssen et al., 2011), thus linking community benefits with social acceptance (see section 4.1.3).

In recent years, a number of governments have sponsored reviews of the potential health impacts of wind turbines. These have tended to broadly align with the conclusions of the review by Knopper et al. (2015) above. Most prominent amongst these has been the epidemiological *Wind Turbine Noise and Health Study* ([14]) ([15]) conducted by Health Canada and Statistics Canada between 2012 and 2014. This involved a sample of 1 238 households within 10 km of wind energy projects in Ontario and Prince Edward Island, which have concentrations of wind developments. The research used both self-reported and objectively measured health outcomes to derive exposure-response relationships and investigate the contribution of low frequency noise as a factor in issues of social acceptance (Michaud et al., 2013). The key findings have been published in peer reviewed papers, (Michaud et al., 2015, 2016) and available on the Health Canada website[9], which reports

- self-reported sleep, illness, chronic health conditions and perceived stress and quality of life were not associated with wind turbine noise;
- annoyance towards turbine features such as appearance, noise, shadow flicker etc. was statistically associated with increasing levels of noise produced by wind turbines. Indeed, the relationship between annoyance and noise is stronger than any other self-reported measure. This is particularly true when noise levels exceeded 35 dB(A), in the summer, outdoors and during evening and night time;
- levels of annoyance appeared to fall away between 1-2 km, but there were differences in the study sites;
- annoyance was linked to self-reported effects including blood pressure, migraines, tinnitus, dizziness, scores on the PSQI, and perceived stress;
- annoyance appears to be significantly lower amongst those who have received indirect benefits from the wind energy project in the form of rent, community schemes etc.;
- the associations for self-reported and measured health effects were not dependent on the level of noise experienced and were also observed in many cases for road traffic noise annoyance;
- it was found that sleep disturbance was related to a wide range of factors (age, marital status, BMI, physical pain, etc.) but not the outdoor noise levels of noise from wind turbines.

Other official studies have also been conducted, including ongoing studies in Australia ([16]) and Denmark, with the latter being undertaken by the Danish Cancer Society (Kræftens Bekæmpelse) ([17]). Results of the latter study are due on 2017 and it has been reported that a number of municipalities have postponed decisions on wind energy projects subject to the outcome of the study ([18]).

Therefore, while heath impacts have been a concern of host communities and in some cases a driver of local opposition to wind energy projects, most studies have failed to

([14]) http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php
([15]) http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5201
([16]) https://www.nhmrc.gov.au/health-topics/wind-farms-and-human-health
([17]) https://www.cancer.dk/research/research/
http://www.ft.dk/samling/20131/aktstykke/aktstk.70/pqf/16/spm/4/svar/1112805/1335739.pdf
([18]) http://www.windpowermonthly.com/article/1340365/market-status-denmark-municipalities-await-health-study-results

find direct links between health and exposure to wind turbines, but noise and other factors linked to annoyance and stress. For this reason, it is likely that this will continue to be a key issue in disputes and prompted Knopper et al. to conclude their review of the health impact literature by noting that this could be mitigated by measures such as establishing sound-based setback distances (rather than distance based), limiting impacts to ≤ 40 dB(A) measured outside dwelling and regular post-construction monitoring.

3.2.5. Property values

It has also been suggested that the development of wind energy projects may also result in a reduction of nearby residential real estate values, particularly when the turbines are visible from the property. Many different forms of development, including housing, commercial uses and infrastructure such as transmission lines (e.g. Wilde et al., 2013, Brandt and Maenning, 2012) also result in impacts to property value and such impacts should be viewed in this context. This is significant for understanding social acceptance, because if communities believe that they will suffer a reduction in their property value, they are more likely to oppose a project. Furthermore, if there is robust evidence that property values do decrease as a consequence of the development of wind energy projects, it could be taken as a wider economic indicator of public concerns related to such projects and potentially, while attracting claims for compensation.

Some hypothesised studies (e.g. Bond, 2010, Ladenburg and Dubgaard, 2007, Meyerhoff et al., 2010) suggest people would pay less for properties near wind energy projects. There are also studies that have attempted to discover whether actual property transactions reflect this, although there are difficulties in isolating this effect from a wide range of factors influencing property value. A number of researchers have attempted to draw out whether proximity to wind energy projects is discernible in actual property transactions, using a variety of methods and in very different geographic contexts. Hoen et al. (2011) have examined property transactions in the US using 7 500 sales around 24 wind farms in the US and repeated this with a larger sample of 50 000 sales (although only 1 198 within 1 mile of a turbine, Hoen et al., 2013). Both these studies concluded that there was no statistical evidence that house prices are affected by proximity or visibility to wind turbines. Similarly, McCarthy and Balli (2014) examined a sample of 945 house sales in New Zealand to construct a hedonic regression model to suggest that there was no significant impact on properties located between 2.5-6 km from visible turbines. Lang et al. examined 48 554 housing transactions within 8 km (5 miles) of single wind turbines on Rhode Island in the USA, finding no statistically significant negative impacts. Vyn and McCullough (2014) sampled 5 000 residential sales and 1 500 farm sales in Canada to conclude, little tentatively, that there was 'a general lack of significantly negative effects' of turbine proximity on property prices.

However, property ownership, density and landscape attributes do vary significantly across the world and there are fewer studies undertaken in a European context. Sims and Dent (2007) and Sims et al. (2008) analysed the impact of wind energy projects on house prices in Cornwall England also finding no significant impacts. The first study was based on 1 052 transactions and found some correlation between distance from a wind farm and value, but noted that the data were insufficiently detailed to draw any sound conclusions. Sims et al. (2008) examined 201 sales finding '…no causal link was established between the presence of the wind farm and house price, there was some evidence to suggest that both noise and flicker from the turbine blades could blight certain property and that the view of countryside enjoyed by the occupier had some value which may be affected by a wind farm' (p. 251).

Gibbons (2008) used 38 000 postcode specific housing price observations over 12 years in areas of England and Wales (UK) to find that where turbines are visible, there is a

reduction of 5-6 % of house prices within 2 km of a wind energy project, 2 % between 2-4 km and 0 % between 8-14 km. From these observations, Gibbons suggested that this implied that households were willing to pay up to € 1 100 (£ 1 000) per year to avoid a wind farm being visible within 2 km of their house in the UK. Sunak and Madlener (2016) undertook a study of 2 141 house sales in North Rhine-Westphalia in Germany, finding that those properties with views that were strongly affected by the construction of turbines there was a reduction of value of between 9-14 % and no impact on those properties with marginal or minimal views of turbines.

It is again difficult to draw any solid conclusions from the research on the siting of wind turbines on property prices. The majority of studies have indicated that there is no significant impact, but most of these studies have been undertaken outside Europe and there has been a wide variety of methods, data sources and sample sizes for calculating value changes, as well as for how 'visibility' is assessed from individual properties. Despite this, concerns arising from potential property value impacts will continue to act as a factor in social acceptance, just as it does in many other types of proposed development. While there may be a case for undertaking a more systematic and comprehensive study of such impacts in a European context, it is difficult to foresee how this could have an impact on acceptability strategies, unless followed through with a generous compensation scheme. As noted below, Denmark has been running such as scheme since 2008 and a comprehensive evaluation of this may initially be a more productive use of research resources before undertaken a wider review of price impacts across Europe.

3.2.6. Other impacts

The above review has noted some of the main impacts that have been mentioned as drivers of opposition to local wind energy projects, but this is clearly not an exhaustive list and individual siting decisions can give raise to specific concerns such as the impact on built or cultural heritage (Jerpåsen and Larsen, 2011), difficulties during the construction or decommission phase, interference with communication systems (e.g. Angulo et al., 2014), issues related to its efficiency (Devine-Wright and Devine-Wright, 2006) or impact on the electricity grid (Shafiullah et al., 2013). Although none of these other impacts appear to raise particularly acute challenges for the deployment of wind energy projects, it is important to consider that all the types of impacts discussed here have the potential to act as a specific trigger for opposition for specific individual or stakeholders or act as a particular issue in relation to a specific project. Furthermore, collectively communities may become aware of these impacts to create a broader discourse or framing of wind energy projects as being something that should not be welcomed to an area. Clearly the media has a role in framing and articulating the accurate of potential impacts, and it has been noted above in section 3.2.4 that this often does not align with the scientific literature. In any case, where it is established that a wind energy project can have a range of impacts on a local area and local community, it is prudent that every effort is made to mitigate these wherever possible and this can lead to better designed projects, and better relationships with the local community. Indeed, in considering the broader challenges and implications of social acceptance, it is important to reflect on whether in the past enough attention has been paid to such impacts and the overall balance of between addressing community concerns weighed against the imperative to develop wind energy projects.

4. Governance of wind energy projects

4.1. Introduction

Following from the last section and linking to the discussion of relationships of trust (section 2.5) above, it is clear that the way wind projects are regulated and the perceived distribution of power, costs and benefits that arise from this is an important issue in the social acceptance of wind energy. This is a complex and potentially expansive area for review, but the brief discussion here will focus on the role of public participation, the impact of community benefit schemes and wider role of public policy.

4.2. Public participation

Research into social acceptance of wind energy projects has consistently highlighted a frustration amongst communities regarding their involvement in consenting decisions, design of benefits packages and, more broadly, participation related to the deployment of wind energy. Indeed, Ellis et al. (2007) noted that in some cases dissatisfaction with decision-making processes can be the prime reason for opposing a wind energy project, while Gross (2007) has highlighted the positive benefits to acceptance when this is perceived as being fair and transparent. The effectiveness of participative processes related to wind energy projects also has a key role in developing broader relationships of trust, the importance of which is highlighted in section 2.5, with some developers recognising that more effective community engagement can be secured through the use of intermediaries, given how local communities may perceive the motives of a developer (Devine-Wright, 2012) and this appears to be an undeveloped area. It is not surprising therefore that participation has been highlighted in many of the case studies of social acceptance (e.g. Aitken et al., 2008, Anderson, 2013, Pepermans and Loots, 2013, Fast and Mabee, 2015). There are also a number of studies that have specifically examined participation in the context of wind energy projects (e.g. Ottinger et al., 2014, Rydin et al., 2015, Howard, 2015).

Public participation is a central tenet of land use and development decisions in most European countries, informed by the strong normative idea that members of the public should have some involvement in the decisions that shape the places in which they live. However, this deceptively simple idea faces a host of challenges for many stakeholders involved raising deep issues about rationale and design of participative processes (e.g. Campbell and Marshall, 2000, Bryson et al., 2013, Brownill and Parker, 2010). Government agencies and developers have tended to focus on addressing operational difficulties rather than the deeper issues related to scope and purpose of participation. In response to this, Barry and Ellis (2011) have questioned the conventional wisdom that the purpose of participation in relation to wind energy is to engender consensus, which they see as unrealistic and unachievable. Instead, they suggest this should be seen more as an agnostic practice (see also Mouat et al., 2013, Pløger, 2004) through which alternative pathways for renewable energy development can be explored. This underlines a common theme in the wider literature on public participation highlighting that the practice rarely lives up to its normative aspirations and failing the expectations of those involved. This appears also to be common in the studies related to wind energy projects. For example, Aitken et al. (2016) evaluated six case studies of wind energy projects from across the UK to evaluate the practices and rationales of community engagement involved. They identified a rich diversity in methods used to interact with local communities including those related to: awareness raising (newsletters, exhibitions); consultation (meetings, surveys, feedback forms); and some community empowerment (job creation, establishment of local energy organisation), with some innovation, particularly in using social media and e-planning methods. However, they did

uncover an emphasis on awareness raising or one-way consultation methods, which tend to limit the publics' ability to more effectively engage and shape development proposals. Furthermore, Aitken et al. (2016) and Jobert et al. (2007) have highlighted how the participative process was largely developer-led and controlled, focussed on meeting statutory minimum requirements with the consequence that motives were often questioned and instances of poor practice resulted in industry wide implications.

Lee et al. (2011) highlight how there can be a mistrust of the role of participation, particularly in high-level policy debates, meaning that it is often seen by those guiding the policy process as primarily a bureaucratic hurdle that must be overcome, resulting in deep frustration for all involved. Indeed, in this is emphasised by Rydin et al. (2015) consideration of how major wind projects were consented in the UK, where national policy allows little scope for dissenting voice to be given much weight and where those making decisions aim to facilitate developments, while acknowledging opposition voices through mitigation measures, rather than the principle of development. This is sometimes exacerbated by a 'announce and defend' approach to policy (Pepermans and Loots, 2013), which challenges how individuals and communities are able to effectively influence policy and development decisions, even when they are given the opportunity to participate. Similarly, the case studies of Aitken et al. (2008, in Scotland) and Larsson and Emmelin (2016, in Sweden) highlight how participative processes are infused with intricate distribution of power in favour of development and an emphasis is placed on 'expert' rather than 'lay' knowledge (i.e. 'calculating' rather than 'communicative' rationalities). Often the perception of objectors is that the state and its regulatory bodies are not therefore neutral facilitators of consenting decisions, which can further deepen mistrust and scepticism of the balance and distribution of cost and benefits arising from the development of wind energy projects. These difficulties reflect the tension between on the one hand to maintain and increase the democratic basis of the planning process, but on the other to maximise efficiency of the regulatory process, particularly in a sector as critically important as energy. Liljenfeldt (2015) examined this tension in the case of Finland, Norway and Sweden, finding that in each of these countries, the emphasis has been on speeding up the decision-making process, which can lead to a suppression of conflict, breed resentment and undermine long-term legitimacy of the wind sector.

As participation is an area of facing acknowledged difficulties and trade-offs in relation to social acceptance, academics (e.g. Howard, 2013, Anderson, 2015, Ottinger et al., 2014), trade associations and regulatory bodies have sort to develop 'good practice' through different types of guidance and toolkits. This includes the Code of Conduct ([19]) signed by a range of stakeholders in the Netherlands, including the Nederlandse Wind Energie Associatie (Netherlands Wind Energy Association), Stichting De Natuur- en Milieufederaties (The Nature and Environment Federations Foundation), Stichting Natuur en Milieu (Foundation for Nature Conservation and Environmental Protection) and Greenpeace Nederland (Greenpeace Netherlands). This sets out the expectations, range of stakeholders and key processes that should be involved in public participation for wind energy projects in the Netherlands. Similarly, UKRenewables, the trade body for the wind industry in the UK has set out its commitments for community engagement (UKRenewables, 2013) In Ireland, the Sustainable Energy Authority Ireland (SEAI) has also set out some of the principles that can guide community engagement in wind energy (SEAI, 2012), which highlights existing good practice in Ireland, defines key principles and sets out an agenda for implementing these. There have also been a number of European projects that have sought to develop resources for improving community engagement (as noted in section 1 above) including a *Wind Europe Engage Toolkit* ([20]), which includes examples of good practice, data and methods from countries

([19]) See http://www.nwea.nl/over-nwea with English translation available here: http://ponderaconsult.com/UK/wp-content/uploads/2013/06/Dutch-code-of-Conduct-on-acceptance-and-participation-onshore-windenergy-3-Sept.-2014.pdf (accessed 10/10/16)

([20]) http://www.we-engage.eu/

across Europe. While these resources provide a valuable framework for considering public participation strategies and processes, it is unclear how effectively they have been taken up by municipalities and developers and if so, whether these have had a positive impact on social acceptance.

This last point echoes the point made a number of times in this report (e.g. in sections 2.3 and 2.4) that issues of social acceptance tend to be reflective of very complex and contextualised drivers, so that a simple 'participation fix' is unlikely to secure community buy-in on its own. Indeed, the effectiveness and perception of any participative process will depend on very specific nature of the local community, including inter alia, levels and types of social capital present (Anderson 2013), the social networks involved (e.g. Jolivet and Heiskanen, 2010, Agterbosch et al., 2009) and the nature of place attachment (Cass and Walker, 2009). Therefore, while the normative principles that underpin effective public participation are well understood, and these are assumed to be a necessary (if not sufficient) factor in social acceptance. However, we still are unclear on how best these principles can be operationalised in specific and diverse settings and ultimately there is a weak evidence base to show the impact this can have on social acceptance.

4.3. The role of community benefits and co-ownership

As noted in section 3.2.4, annoyance with local wind turbines has been shown to reduce in line with increases in the level of economic benefit an individual has from a project. This links to the idea that social acceptability of wind energy projects can be improved by enhancing the benefits to a host community via mechanisms such as promoting local ownership (literal or symbolic), providing direct benefits or reducing perceived dis-benefits (Cass et al., 2010). This is also intricately linked to nurturing trust (see section 2.5). There is some evidence that those energy projects that are locally-owned are seen more positively (Warren and McFayden, 2010, Rogers et al., 2008, Musall et al., 2011, Jobert et al., 2007), leading Strachan et al. (2015) to suggest that there may be an inverse relationship between project scale/ownership and acceptability to the local community (see Figure 9).

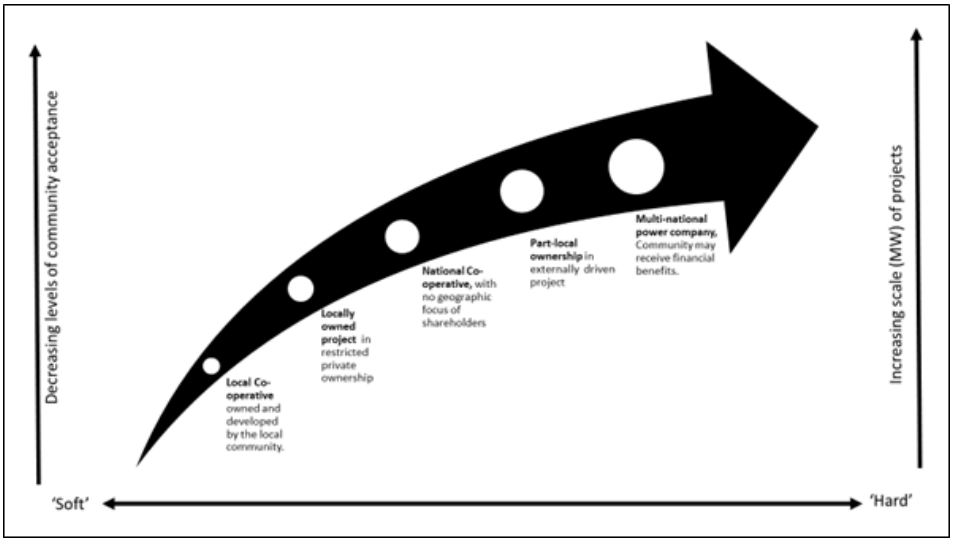


Figure 9: Scale-engagement trade-offs in community energy (from Strachan et al., 2015)

Although the benefits of community-based projects are recognised in many countries, there is also pressure to secure large scale investment to maximise exploitation of wind resources and help meet renewable energy targets. Therefore, the key challenge lies in trying to ensure that the communities that host larger, externally owned projects receive lasting benefits, particularly because they are often located in areas of economic, social and environmental disadvantage (Cowell et al., 2012).

It has become conventional wisdom that in such contexts social acceptance can be promoted through the provision of community benefits. Substantial effort has been made to explore the best ways to localise benefits from wind energy projects, although the evidence of the actual impact on acceptance is rather weak. As noted by Cowell et al., 2011, using such benefits to promote acceptability is based on a number of assumptions, including: that communities will acknowledge the benefits as being adequate compensation for perceived impacts (such as landscape disruption or a lack of trust in the decision-making process); that the process of establishing community benefits packages will bring enhanced levels of control to the community; and that it is possible to identify a meaningful 'community' that can receive the benefit (Bristow et al., 2012). From their review Cowell et al. (2011) concluded that it is unreasonable to expect community benefits to result in consensus on the merits of a proposed wind energy scheme, but they may still have a role in wind energy development, particularly if taken forward in a wider discussion of their purpose, scale and role. The discussion here will not aim to comprehensively cover all the issues linked to community benefits, including the challenges of definition, governance, and impact (e.g. see Cass et al., 2010, Aitken, 2010b, Markantoni and Aitken, 2016, Cowell et al., 2012, Munday et al., 2011), but to briefly highlight the range of benefits and their potential link to acceptance strategies.

The wide range of institutional arrangements, mix of actors involved in wind energy provision and degree of formality of community schemes means that there is substantial variety in the approach and drivers of community benefits across Europe. Some European countries have more explicitly addressed the issue of community benefits than others and it has been a particularly strong theme in the UK, with most research and policy debate emerging from here. In reviewing international practices, Cowell et al. (2010) characterises community benefits in Germany arising mostly from cooperatives and local ownership of turbines (Breukers and Wolsink, 2007), in France from local tax revenues (Nadai, 2007), in Spain from commercial investments in the regional economy (Zografos and Martinez-Alier, 2009) and in the UK and Ireland through a largely voluntary scheme operated under government guidelines and industry codes of practice (e.g. Aitken, 2010b, Irish Wind Energy Association (IWEA), 2013, UK DECC, 2014). Denmark has been seen as a leader in this area because of the historically high levels of community ownership of wind energy projects (Toke, 2002), coupled with an innovative package of community schemes introduced by the 2008 Renewable Energy Act 2008 (Anker and Jørgensen, 2015). This act introduced a range of measures for ensuring local communities gained benefits from wind energy projects, including: compensation measures for owners of land that has lost value due to a neighbouring wind energy project; a compulsory offer of 20 % of ownership of a project to the local community; local funds ('green scheme') for projects that enhance landscape, recreation or promoting cultural and educational activities; and support for local community energy projects (Anker and Jørgensen, 2015). Unfortunately, there is not yet a comprehensive evaluation of the impact of these measures, although this may emerge from the Wind2050 research project ([21]).

Despite this variety of approaches, it is possible to draw out a number of categories of the types of benefits that have been offered to local communities, as summarised in Table 7. Although there is very limited evidence on the actual impact such schemes can

([21]) http://www.wind2050.dk/

have on the attitudes of the local population (and that which does exist is often hypothetical, e.g. Terwel et al., 2014), it is still clear that such schemes are now an accepted, and expected, element of wind energy project developments in many European countries. Indeed, it is clear to most host communities that without some form of overt benefit sharing package, the local economic benefits can be very modest (Ejdemo and Söderholm, 2015). Munday et al. (2011) have also noted that even with such schemes, the economic benefits flowing to rural communities from conventional wind energy projects are very minor when compared to the potential revenues from actual ownership of wind energy projects. Because of this, there has been increasing interest in how communities can become more involved in either promoting their own schemes, or through share purchase of local commercially promoted projects. Thus, the Republic of Ireland has recently published an Energy White Paper that seeks to promote 'Energy Citizenship' (through ownership, participation and debate, see DCENER Ireland, 2015) and England has promoted shared ownership along the lines of the Danish scheme, but based on the voluntary engagement of the wind industry rather than through statutory provision (see Shared Ownership Taskforce ([22]), Slee, 2015), which is not without difficulties, particularly related to a lack of trust between developers and community interests (Goedkoop and Devine-Wright, 2016).

Table 7: Categories of community benefit (from Munday et al., 2011)

Categories of community benefit
Conventional economic benefits: - the use of locally manufactured the use of locally manufactured content, and local contractors for construction, operation and maintenance; - land rental income to landowners and any royalties; - local business rates and/or taxes.
Flows of financial benefits to local communities: - some form of ownership/investment in the project among local people, either as equity or a form of profit share; - some form of community fund, with lump sum and/or annual payments ([23]), either focused on specific purposes (such as energy efficiency) or more open-ended; - cheaper electricity; - sponsorship of local events.
Contribution in kind to local assets and facilities: - to landscape and ecological enhancement measures, perhaps that mitigate or compensate for any environmental costs caused by the wind farm; - to tourism/visitor facilities.
Provision of other local services: - educational visits or other educational programmes.
Involvement in the development process: - various forms of liaison activity.

Community owned energy has been subject to extensive research, which has examined its role, challenges, required support and governance arrangements of energy projects that are owned partly or wholly owned by community interests (e.g. Frantzeskaki et al., 2013, Walker and Devine-Wright, 2009, Seyfang et al., 2014, Ruggiero et al., 2014, Strachan et al., 2015, Lasse and Lehtonen, 2016, Bauwens et al., 2016). This literature notes a range of benefits that can accrue from the greater proportion of community-owned energy infrastructure, including the economic benefits to rural communities,

([22]) https://www.gov.uk/government/groups/shared-ownership-taskforce

([23]) In the UK annual payments to community funds are generally between £ 1 000-£ 5 000 (€ 1 110-5 550) per MW generated per annum (Munday et al., 2011), in Denmark, the 'Green Scheme' specifies a one-off payment of DKK 88 000 per installed MW (€ 11 800, Anker and Jørgensen, 2015).

wider engagement in energy projects and behavioural change related to other types of climate action (Slee, 2015), as well as greater understanding of the benefits and opportunities of wind energy.

Therefore, while the development of community benefit packages has been an element of broader attempts at fostering social acceptance in some countries (such as Denmark and the UK , but through different mechanisms), the evidence is not very conclusive that it actually has a significant impact on community attitudes, particularly if the motives of the developers are under question and benefits are then seen as a 'bribe' (Cass et al., 2010). There does however appear to be some potential in encouraging wider ownership of wind energy projects, although this then tends to create tension with the need to attract large scale investment in order to meet ambitious deployment targets.

4.4. Role of policy and regulatory responses

This final section briefly reviews the role of policy and regulatory regime in addressing the challenges of social acceptance. This touches on many of the issues discussed previously in the report, but focusses specifically on the role of the state (in national, regional and municipal forms) in framing the 'rules' by which wind energy projects are promoted, evaluated and consented, from which many of the impacts discussed in section 3 can be mitigated or accentuated. These rules also define the types of locations that will be deemed suitable for hosting wind energy projects and determine any regimes for compensation and/or community benefits. This clearly implies that the state is not a neutral bystander in the deployment of wind as an energy source, is likely to be implicated in social acceptance issues and highlights that if desired, has the potential to use a variety of policy and regulatory levers to address such issues.

Although high-level political choices related to the energy mix, energy security and financial incentives form part of the regulatory regime for wind energy (e.g. Meyer 2007, Menz and Vachon, 2006), the focus here is the regulation of the specific sites for wind energy projects, which inevitably places the emphasis on the planning system. The important role of planning in social acceptance has been highlighted by a range of authors (e.g. Cowell, 2010, Toke, 2005, Ellis et al., 2009, Pepermans and Loots, 2013, Aitken et al., 2008, Van der Horst and Toke, 2010). Fournis and Fortin (2016) note that it is the planning system that translates instrumental top-down energy targets and policies into specific site-based decisions and as such makes these 'real' for affected, or potentially affected, communities (Power and Cowell, 2012, Cowell, 2007, Strachan and Lal, 2004, Pettersson et al., 2010). Indeed, the spatial consequences of high-level energy policy targets for wind are rarely made explicit until they are translated into planning policy (González et al., 2016, Möller, 2010). There is therefore great emphasis on the local planning process for host communities to voice their concerns (and thus for the issues of participation noted in section 4.1.2) over a range of policy issues, and it follows therefore if local siting decisions do not recognise such concerns, it will exacerbate issues of social acceptance.

Because of its crucial role in mediating between national and local scales, development and conservation, public and private interests, and expert and lay knowledge, planning has been viewed by some as a 'problem' in many European countries (for example in The Netherlands, Sweden and the UK, Bergek, 2010). This 'problem' can be defined along several dimensions, including in terms of: procedural–performance (i.e. 'too slow'); providing opportunities for 'disruptive' communities (and from their point of view, not enough input); and as an arena for making crucial trade-offs between development and environment costs (Ellis et al., 2009). Indeed, from their analysis of five wind energy projects in Canada, Fast and Mabee (2015) highlight how important the role of policy, is in framing and stimulating the community response by showing how it can support or erode trust-building and place-making strategies.

A good example of how planning can help set some of the parameters for evaluating potential impacts of wind energy projects and in turn become implicated in the political debates over acceptance is the issue of setback distances — the minimal threshold for proposals between turbines and other developments, particularly residential sites. This is a relatively simple and effective way for guaranteeing an appropriate buffer between turbines and host communities. Although these are often based on technical assessments of safe distances for safeguarding against blade fragments and ice throw (Rogers et al., 2012) or mitigating against unacceptable noise and shadow flicker, the basis of actual thresholds is often arbitrarily defined in the political process and subject to controversial debate (Hill et al., 2010, Watson et al., 2012). Indeed, those opposed to wind energy projects have attempted to enlarge the setback distances based on implied health, visual and property price impacts, but whose implication could be to squeeze out high proportions of viable sites, particularly in densely or scattered populated countries, with examples of such debates occurring in Victoria in Australia where a 2 km setback distance established under the 'VC82' law effectively made the state a no go area for wind developments ([24]) — this law has subsequently been rescinded. Similar proposals have been put forward in a number of European countries ([25]).

Therefore, while the planning process is often regarded as a medium for the technical evaluation of wind projects, it does have a far more significant role in mediating between different geographic scales, different interests, different framings of what is in the best interests of a community and therefore inevitably heavily politicised. There is a range of good case studies that highlight the intricacies of the planning process and the consequences for different interests, yet very few examine how this process could better incorporate both an assessment of the technical potential of different sites and a deeper consideration of the socio-environmental contexts in which wind energy projects are deployed (Cowell, 2007). As a result of this, there is still an unclear picture of the key attributes, processes and outcomes of a social-acceptance-sensitive planning system.

([24]) 'Welcome to Victoria, no wind farms allowed', *The Guardian*, 29/05/13 https://www.theguardian.com/environment/southern-crossroads/2013/may/29/1

([25]) 'Council to debate 1.7 km distance from turbines', *The Irish Times*, 26/04/15, http://www.irishtimes.com/news/environment/council-to-debate-1-7km-distance-for-wind-turbines-from-homes-1.2189934 (ccessed 20/09/16); 'Bavarian Constitutional Court clears 10H minimum distance requirement for wind power plants', *German Energy Blog*, 10/05/16, http://www.germanenergyblog.de/?p=19852 (accessed 10/10/16).

5. Implications for research, policy and practice

5.1. Introduction

This report has shown how our understanding of social acceptance has evolved over the last 15-20 years to provide rich insights on *why* wind energy projects have faced problems of social acceptance, even if its complex influences are still not fully understood. Some of the key factors are summarised in Table 8. Researchers continue to develop useful insights into the relationships between individuals, communities, specific projects and wind energy as a technology. From this it is clear that social acceptance cannot be achieved through isolated 'fixes' such as community benefits or just more consultation, but must be a more fundamental change to the relationships between citizens, communities, the energy system and the institutions that define it. For this reason, there appears to have been less success in exploring *how* the insights produced from social acceptance research can be translated and applied into practice. This is reflective of both the complexity of the issue, and the wider relationships between academia and those involved in policy and practice related to energy policy. This represents a significant barrier to further developing our understanding of how to most effectively address social acceptance of wind by stimulating evidence-based-innovative practice and being able to evaluate the consequences of this.
This section provides some reflection on the implications of this review of social acceptance. The section is structured in two parts. The first relates specifically to the research community and as such primarily addresses questions linked to 'discovery' research, covering questions about what we still do not understand about social acceptance and how this research activity can be made more effective. The second section focuses attention on the implications of this review for policy and practice related to wind energy development.

5.2. Implications for future research

Implications for future research arising from this review include:

1. While there is a sophisticated body of research on social acceptance and the term is used widely with a broad common understanding of its meaning, the core concept of 'acceptance' remains contested. A number of researchers have questioned how the use of this term places the focus on host communities, rather than the practices of the developers of wind projects or on regulatory bodies. It also raises issues in terms of outcomes; what is sufficient 'acceptance' and how we can understand when this has been achieved? Indeed, there are also questions over how we should frame acceptance; should we even view it as a 'problem' to be addressed, or regard it as a natural outcome of people's attachment to place and reflective of our wider economic, social and political systems? This therefore relates to additional research and debate on the conceptual framing of social acceptance.

2. If we accept that the concept of 'social acceptance' may have potential flaws, it is useful to explore alternatives that could better frame the relationships between host communities and wind energy projects. It has been suggested that concepts such as 'social sustainability' or a 'SLO' may have some advantages in how to frame the responsibilities and goals of project-community relationships and how these relate to wider issues of trust, justice and long-term arrangements. This suggests that there is scope for a wider review of alternative frames that could be applied to how we understand 'acceptance', potentially drawing on concepts used in other sectors, or develop new terms based on the findings of research noted in the previous point.

Table 8: Summary of influences on social acceptance of wind energy projects

Issue	***Key influences***
Individual attitudes	Age, gender etc. Strength of place attachment Political beliefs and voting preferences Emotional response Prior experience of wind turbines Attitudes to environmental issues Psychological factors including perception of social norms Individual roles (consumer, landowner etc.) Familiarity with wind energy
Relationships	Type and level of social capital Trust in government other public agencies and developers Proximity to, and visibility of, turbines Technology-society relationships Time, reflecting the dynamic nature of social acceptance National-local policy Regulator-developer links Discourses within and between communities
Contextual issues	Policy regimes Project design — turbine height, colour number and massing Place attachment Range and mix of actors Ownership of proposed project Specific siting issues Cumulative impacts
Perceived impacts	Noise Landscape Shadow flicker Property values Level of economic benefit Bio-diversity: bats, birds Infrasound Navigation lights Health concerns Levels of economic benefits Disruption of 'place' Efficiency of turbines and wind energy Distributive justice
Process-related issues	Trust in institutions involved Transparency and openness Procedural justice Expectations and aspirations of public participation Availability and quality of information Power in the participation process Value places on lay and expert knowledge Timing Discourses of community, developer, regulatory bodies Fait accompli

3. Although there has been useful research focussed on conceptual development, most research on social acceptance has been undertaken through discrete case studies of how communities relate to specific wind energy projects. This has produced a rich and varied body of evidence on numerous aspects of social acceptance, particularly related to context-specific factors. However, this has offered challenges in pulling together general insights and evidence-based principles for policy and practice. While a number of studies have attempted to synthesis the insights from this research, there is a need for a rigorous, comprehensive and systematic review of existing studies following established procedures (Petticrew and Roberts, 2008) from which more substantive conclusions can be drawn.

4. As noted above, there have been many case studies that examine the social acceptance of specific wind energy projects. This has created useful evidence, but has tended to adopt a wide variety of methods, definitions, sample sizes, sampling strategies and each study examining different sets of variables. While such diversity creates rich and varied insights, it has hampered the comparison and synthesis of evidence. There is now substantial experience in conducting such case studies and therefore there exists the potential to develop protocols to enable the combining data of emerging studies.

5. While recognising the value of case studies, there is also scope for developing other modes of research design for exploring individual community and developer attitudes and the wider implications of social acceptance. There are opportunities for cross sectional, longitudinal and comparative research. Robust studies examining 'natural experiments' of pre- and post-experiences of wind energy projects would be particularly useful. Each of these approaches has the potential to complement existing case studies to produce new insights. For example, more comprehensive cross sectional studies will enable a more rigorous analysis of personal attributes, attitudes and action related to social acceptance. Longitudinal research will enable the dynamics of social acceptance to be better understood. A more structured approach to comparative research will enable an examination of the influence of different locations, project types, ownership models and consenting processes etc.

6. There is also a need to develop new methodological approaches for studies nested within these wider formats for research design. There are advantages and disadvantages of qualitative, quantitative and mixed methods, but specific research questions, including those relating to the longitudinal monitoring of levels of social acceptance, or the objective and self-reported consequences of living near energy projects call for continuous methodological innovation and a wider discussion of the implications of these. There are particular challenges in evaluating whether overall levels of social acceptance are increasing or decreasing which is essential to evaluate the impacts of adopted policies and practices.

7. One key message emerging from this report is that the factors that determine levels of social acceptance in particular communities is complex, dynamic, diverse and place specific. This can make it very difficult for researchers, developers, regulatory bodies and other stakeholders to assimilate the critical factors in relation to driving social acceptance. While there have been attempts to provide a holistic framework for conceptualising the variety of factors, relationships, processes and structures that combine to influence social acceptance, none have been entirely successful in capturing the breadth and complexity of the situation, nor widely adopted. There is therefore scope for the development of a sophisticated socio-ecological model, which if effective, could facilitate identifying new relationships and causal factors behind social acceptance.

8. The next section will discuss the need for a greater application of research findings to practice, which implies a more reflexive model of research-practice knowledge exchange and the development of new mechanisms for the co-production of research. This could

be facilitated by new approaches to commissioning studies by research funders across the European Union (EU) and the development of new partnerships between academics, governments, industry interests and other stakeholders.

9. Several of the points mentioned above imply the need for a more coherent community of researchers working on the social acceptance of wind energy. It has also highlighted that researchers from a very wide range of disciplines have engaged in this field, creating further challenges and opportunities. There are examples of diverse interests coming together to work on these issues (for example on EU funded projects or under the aegis of the IEA), but there is scope for developing a wider and more sustainable network of researchers to advise on the strategic direction of research in this field, including the development of the protocols etc. noted above.

10. In addition to these broader issues related to the coherence and effectiveness of research effort, there is also a large number of specific research questions that could be usefully addressed, with priority areas being:

- ✓ some of the fundamental principles shaping social acceptance are the financial and regulatory arrangements around wind energy that necessitate the close involvement of specific group of actors (landowners, planners, etc.), yet are often seen to marginalise other interests (neighbours, community interests etc.). This is reflective of how wind energy is viewed in terms of asset ownership; it is generally 'free' to exploit once a suitable site has been secured. A useful strand of research can be conducted of other models of asset ownership for wind (such as it being 'owned' by the local community and therefore royalties need to be paid, or it is sold off by auction) and the potential implications this may have on the ability to exploit wind resources as well on how we understand social acceptance;

- ✓ a more effective assessment of the 'fair process effect' to identify the tangible benefits of more open decision-making processes and the benefits that can accrue, for developers and communities, from such an approach;

- ✓ it is unclear what factors are most important drivers of 'trust' in relationships around the development of wind energy projects and trust-based approaches require further exploration. This could include, for example the benefits of using intermediaries to facilitate relationships between otherwise adversarial parties in wind energy debates;

- ✓ there is a small and effective body of work on the role of community benefit packages of wind energy projects, yet emerging findings suggest that this has little direct impact on social acceptance, although may be worthwhile establishing for other reasons. This seems to be counter to conventional thinking and therefore deserves more critical examination;

- ✓ the majority of studies on social acceptance have focussed on host communities, particularly where these have articulated opposition to wind energy projects, but tended to overlook other voices in debates over local wind energy projects. There is therefore a need to develop better understanding of the dynamics of support for wind energy projects, while also understanding the drivers and perception of project developers and how they view the issue of social acceptance;

- ✓ there is some emerging work on the role of the media in reporting and framing the costs and benefits of wind energy and this is seen to be at odds with the emerging findings from the research community. This research is providing useful insights into how attitudes are mediated by particular forms of media

and can be used to better shape communication strategies on policies or specific project level;

- ✓ many of the challenges of social acceptance of wind are also faced by other forms of infrastructure development (e.g. fears over impact on property values, health concerns) and there has been some useful comparative analysis of the strategies used in other sectors to draw out the specific challenges for the wind industry and identify potential areas of good practice, which deserves further elaboration.

5.3. Implications for policy and practice

This report has also indicated a number of implications for research relating to the application and translation of evidence and opportunities for knowledge exchange with those involved in the policy and practice of wind energy, which include:

1. The most important implication for policy and practice is to highlight that social acceptance does not stem from just the bi-lateral relationship between a host community and a wind energy project, but engages a much wider set of social norms, social and political structures and dominant framings of energy. This means that while some positive initiatives can be made in regard to improving arrangements around specific projects, the long-term prospects for social acceptance rely on the much wider transformation of the energy system, and should be seen as part of this.

2. This has substantial implications for the strategic management of both social acceptance and the wider energy system, implying a more holistic approach to policy that integrates the economic, technical and social aspects of energy transition and wind energy development. This in turn requires new institutions, ownership arrangements and innovative processes for engaging with citizens. This also points to the key role of state agencies in shaping future conditions for social acceptance and through its responsibilities for legislation, financial incentives for energy and regulation functions, it holds many of the key levers for changing the conditions through which communities engage with energy.

3. The review above has also shown that as a result of the particular locations, place characteristics, policy regime and actors involved, each project will face its own specific social acceptance challenges that have to be carefully evaluated on their own terms. There are a number of toolkits and good practice guides available to help address social acceptance and while these may provide a sound statement of general principles, developers must place an emphasis on understanding the specific needs and challenges of each project.

4. In parallel to some of the recommendations made above in respect to research, there is a need to explore how those directly involved in policymaking and deployment of wind energy can become much closer involved in knowledge exchange and co-production of evidence that could improve our understanding of social acceptance. This suggests the development of partnerships, networks of other forums through which a wider range of parties with an interest in social acceptance can interact to exchange knowledge and experience and help define future priorities for research.

5. The review above has highlighted the diminishing levels of trust between the different actors involved in wind energy deployment and any measures aimed at fostering this will make a significant contribution to addressing social acceptance. This does not lend itself to simple policy responses, but should be a strategic principles guiding interactions and discussions relating to wind energy.

6. An example of this relates to the way opposition to wind energy projects is often framed, with 'NIMBY' being a common part of the discourse. This is a durable and unhelpful term that has accentuated conflict around wind energy projects, whose logic leads to ineffective strategies for social acceptance such as disingenuous participation processes, or 'awareness-raising' exercises that have little impact.

7. The NIMBY frame also tends to perpetuate the idea that opposition arises from a difficulty with the community, rather than a problem with an individual project. This report has shown that the wind energy project can result in a significant range of impacts for the local area and in many cases, these can be mitigated through project design and siting strategies.

8. This has consequences for transparency and openness of project design and consenting process, with many conventional approaches sometimes intensifying the adversarial nature of the dispute. A more deliberative approach based on respect, integrity and transparency, although difficult to achieve, can help foster trust, mutual understanding and acceptance. There is a particular need for developers, regulators and researchers to engage with those that are sceptical of wind energy as their voices tend to be marginalised from discussions related to social acceptance.

9. There is a commonly held view that municipalities and other state agencies act as 'neutral' party in the deployment of wind as an energy source, but is often seen by those opposed to specific projects as being development-supportive, so there is scope for exploring the potential of using a range of intermediary organisations to facilitate discussions on policy or project specific discussions.

10. In policy terms there is a need to translate the implications of national energy targets in a way that local communities can understand the consequences for their localities. It appears common across Europe that energy targets have been set based on technical and economic assessment of viability, but with no understanding of spatial or cumulative implications, so that it is only when these are translated into specific projects through the planning system that communities can understand the implications of technological choices.

11. This also emphasises the importance of Europe's planning systems for mediating social acceptance of wind energy. This currently acts as the key arena for host communities to engage with wind energy proposals, yet they often find a process that is poor in supporting them to voice their concerns. Indeed, it tends to prioritise 'expert' opinions over lay views and speed of decisions over opportunities for deliberative exchange. Planning systems may be effective in terms of managing development, but are poorly suited to fostering a greater level of social acceptance. A useful initiative would therefore be to review planning systems from the point of view of making them supportive of social acceptance, as a means of identifying the reforms needed to align this with the objectives of energy transition. In relation to this, Denmark introduced a variety of innovative measures in its 2008 Renewable Energy Act, including a scheme for compensating neighbouring land owners and a compulsory co-ownership scheme. As yet there is no formal evaluation of the impact of such initiatives, a valuable opportunity to explore the potential for policy transfer.

12. While there is scope for improving the regulatory environment for wind energy, it is also important to recognise the scope for developers to further contribute to social acceptance. It was noted in the report that developers tend to be the dominant voice in designing community engagement processes and many aim to achieve the minimum threshold, with poor results. However, developers also tend to be constrained in what they feel they can offer the local community and it could be important to encourage further innovation and risk taking amongst more progressive companies to test

innovative approaches to fostering social acceptance (for example testing the SLO concept), supported by municipalities where necessary.

13. Finally, the review indicated that those projects that were regarded as community assets enjoyed much higher levels of acceptance. Community ownership of wind energy projects can come in a variety of forms, has important variations according to national context and can be stimulated in a variety of ways. This is a key area for both supporting the broader aims of energy transition and social acceptance, not only through encouraging more community ownership but also for how wind is conceived as an asset for local communities to exploit.

6. Conclusion

This report has reviewed the diverse literature related to the social acceptance of wind energy, which has been identified as an increasing issue of concern and a potential barrier to the further expansion of the renewable energy sector. While this has been particularly associated with wind energy, many other forms of infrastructure development also face local opposition, which should be seen as being as much reflective of wider social, political and economic structure as the specific nature of wind energy. Neither should the challenges of social acceptance be seen as a wholly negative issue (and thus suppressed); it is somewhat inevitable that such communities will question projects that they fear may change their localities and the challenges of acceptance emerge from their ability to express such concerns in the context of a democratic system. In some cases, pressure from local communities has also stimulated more progressive approaches by regulators and developers of wind energy projects. Nevertheless, community concerns about the consequences of wind energy projects do appear to be increasing and with this, appear to make the continued expansion of the wind energy sector more challenging.

The report has shown that a very wide range of disciplines have produced research that is relevant to understanding social acceptance, including epidemiology, geography, sociology, political science, engineering, planning and psychology. Social acceptance lies at the intersection of all these disciplines and draws on each of them to help understand its complex nature. This has inevitably produced an eclectic and rather disparate mix of research that varies in terms of its scope, conceptual frameworks, methods and nature of the findings. This has also given rise to a more fundamental debate on the nature of acceptance and assumptions underlying this research. This makes it more difficult to draw consistent and general conclusions, but Table 8 lists some of the key factors that are seen to influence social acceptance of wind energy projects and around which future actions in research, policy and practice should focus. This shows how social acceptance is driven by a combination of the attributes of the individuals that make up a host community, the relationships within the community and with other actors, as well as physical features such as the size and proximity of the turbines and the perceived fairness of both the decision-making process and its distributive outcomes.

There has already been significant and sophisticated research undertaken on many aspects of social acceptance, but this report has also highlighted some of the questions that still need to be addressed, while highlighted potential ways in which existing research can be further exploited. This needs to begin with a more rigorous and systematic review of the literature than given here, to be followed by a more structured approach to research in this area, including the adoption of common protocols and definitions that will allow a more effective synthesis, comparison and development of evidence in this field. However, perhaps more difficult is the need to translate and apply the findings of academic research to policy and practice, which is currently rather undeveloped. This will require new forums and mechanisms for effective knowledge exchange and dialogue between all those with a stake in the social acceptance of wind energy, including those with concerns about the sector. This also calls for a more open, reflexive approach of those involved in research, policymaking and development related to wind energy that can promote closer working on tackling the complex challenges facing the wind energy sector, and that of other renewable technologies.

This complexity underlines one of the key message of this report; although there is some potential for improving the arrangements around specific projects, social acceptance cannot be sufficiently addressed through simple 'fixes' such as one-off consultation events or community benefit packages. The review of social acceptance has highlighted that it is informed by structural issues related to trust in state institutions, political cultures and citizen relationships with the energy system. Earlier in the report, it was

noted that the transition to a low carbon economy is challenging a wide range of aspects of society and the tensions arising from the social acceptance of wind is just one of these. Therefore, addressing the long-term challenge of social acceptance, and the prospects for the wider energy transition will rely on more fundamental transformation of the institutions, regulation and ways of engaging with communities around energy.

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List of abbreviations and definitions

DECC	Department of Entergy and Climate Change (UK)
EU	European Union
EWEA	European Wind Energy Association
GW	Gigawatts
IEA	International Energy Authority
IWEA	Irish Wind Energy Association
MassDEP	Massachusetts Department of Environmental Protection
MDPH	Massachusetts Department of Public Health
MS	Member State
NIMBY	Not In My Backyard
SEAI	Sustainable Energy Authority Ireland
UK	United Kingdom

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