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An economic analysis of community preferences for wind farm development in Ireland

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Declaration

I declare that this thesis, submitted to National University of Ireland, Galway for the degree of Doctor in Philosophy (Ph.D) has not been submitted as an exercise for a degree at this or any other University. All research herein is entirely my own.

Date ____

Signature ____

Abstract

The core thesis objectives are: the identification of the key attributes of wind farm development in Ireland and the measurement of community representation and setback distance on wind farm preferences; the establishment of the public's opinion on development for export and the analysis of those who choose to forgo the financial benefits of production and select the status quo of no wind farm development.

The first two chapters of this thesis establish the motivation behind this research and the theoretical frameworks underpinning this work. Chapter 3 presents the core choice modelling results including the community representative and setback attributes. Chapter 4 focusses on attitudes towards wind farm development for export combining developer and community focus groups and survey results and chapter 5 analyses those respondents who serially selected the status quo of no new wind farm development using survey results and a binomial logit model, with conclusions in chapter 6. My findings reveal that the majority of respondents are willing to make (monetary) tradeoffs to allow for wind power initiatives and respondents require less compensation if provision is made for a community representative and setback distance is increased. Although the export of renewable energy from Ireland to the UK is currently on hold, my findings suggest that significant investment is required by the state and wind farm operators in better information provision, trust building, effective instruments to internalise wind farm externalities and co-management arrangements before Ireland can fully capture the benefits of wind exports to the UK. Demographic factors and attitudes towards the environment and wind energy in general strongly influence the likelihood of serial opposition and results also indicate an information effect, with

those who are unsure about their opinions on wind farm development being more likely to select the status quo of no new wind farm for each choice set.

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Table of Contents

Declaration I

Abstract II

Acknowledgements IV

List of Tables X

1: Introduction 1

1.1: Wind energy targets: 1

1.2: Irish wind farm policy and regulations: 3

1.3: Valuing wind farm preferences: 8

1.3.1: Public goods and bads: 8

1.3.2: Externalities: 10

1.3.3: Wind farm externalities: 11

1.3.4: Social acceptance of wind farms: 12

1.4: Thesis objectives: 14

1.4.1: Academic objectives: 14

1.4.2: Policy objectives: 14

1.5: Thesis structure: 16

1.6: Thesis outputs: 17

2: Theories of non-market valuation, community consultation and triangulation 20

2.1: Introduction: 20

2.2: The theory of non-market valuation: 21

2.2.1: Preferences, utility and willingness to accept: 23

2.3 Non-market valuation methodologies: Choice experiments: 28

2.3.1: Designing choice experiments: 29

2.3.2: Limitations of choice experiments: 33

2.4: Community engagement: 35

2.4.1: NIMBYism: 35

2.4.2: Arnstein's ladder of citizen participation 38

2.4.3: Distributive and procedural justice: 41

2.4.4: A framework of community engagement: 46

2.5: Mixed methods: Triangulation: 51

2.5.1: Focus groups in mixed methodologies: 53

3: Wind farm externalities and public preferences for community consultation in Ireland: A discrete choice experiments approach 58

3.1: Introduction: 59

3.2: Literature review: ... 62
3.2.1: Choice experiment studies: ... 62
3.3: Methods and data: ... 64
3.3.1: Survey introduction and environmental attitudes: ... 65
3.3.2: Experience with wind energy ... 67
3.3.3: Choice set attribute selection ... 70
3.3.4: Electricity discount: ... 71
3.3.5: Number of turbines and turbine height: ... 75
3.3.6: Community representation ... 76
3.3.7: Setback distance ... 84
3.3.8: The choice task and follow up questions: ... 86
3.3.9: Demographics ... 90
3.3.10: Survey implementation: ... 93
3.4: Empirical specification: ... 94
3.5: Results: ... 98
3.5.1: Descriptive statistics and attitudes to wind farms in general: ... 98
3.5.2: Attitude to wind farms in Ireland: ... 100
3.5.3: Model output: ... 101
3.5.4: Welfare estimates: ... 111
3.5.5: Policy Simulations: ... 113
3.6: Conclusion and policy implications: ... 115
4: Public acceptance of large scale wind energy generation for export from Ireland to the UK: Evidence from Ireland ... 121
4.1: Introduction: ... 122
4.2: Background: ... 125
4.2.1: Irish & UK wind farm electricity export: the midlands project: ... 127
4.2.2: Public concern, externalities & large scale wind farms: ... 129
4.2.3: Public consultation & information: ... 132
4.2.4: Cooperation, ownership and compensation: ... 133
4.2.5: Using deliberative methods to contrast stakeholder and wind farm operator perspectives: ... 134
4.3: Methods and data: ... 139
4.3.1: Participants: ... 139
4.3.2: Procedure: ... 141
4.3.3: Analysis: ... 144
4.4: Results: ... 146

4.4.1: Wind energy exportation: 146
4.4.2: Public concerns and externalities: 152
4.4.3: Information: 157
4.4.4: Cooperation and ownership: 161
4.4.5: Compensation: 166
4.5: Conclusions: 170
5: Determining the local acceptance of wind farms in Ireland: Identifying predictors of the status quo using a choice experiment. 176
5.1: Introduction: 177
5.2: Literature review: 180
5.2.1: Status quo studies: 181
5.2.2: Wind farm preference studies: 183
5.3: Methods: 186
5.3.1: Framing of the SQ alternative: 186
5.3.2: Wind farm issues: Externalities: 187
5.3.3: Wind farm issues: Attitudes towards wind energy: 190
5.3.4: Wind farm issues: Experience and demographics: 190
5.3.5: Survey issues: Choice task complexity & attribute disagreement: 191
5.4: Model Specification: 192
5.5: Results: 193
5.5.1: Demographics: 193
5.5.2: Wind farm externality results: 194
5.5.3: Large wind farm externalities: 195
5.5.4: Small wind farm externalities: 196
5.5.5: Model Output: 198
5.5.6: Beliefs and attitudes: 198
5.5.7: Experience of wind farms: 202
5.5.8: Demographic variables: 203
5.5.9: Choice set difficulty and attribute disagreement 204
5.5.10: Model fit: 205
5.6: Conclusions: 206
6: Conclusions: 210
6.1: Introduction: 210
6.2: Summary of thesis and key findings: 210
6.3: Limitations of the research: 219
6.4: Future work: 223

6.5: Concluding remarks and recommendations: 226
References: 232
Appendix I:..280
Appendix II: 312
Appendix III: 329

List of Figures

Figure 2.1: Composition of total economic value (Pearce and Özdemiroglu, 2002) 22

Figure 2.2: WTP –WTA measure of value given wind farm development (Hanley et al., 1997) 26

Figure 2.3: Arnstein's ladder of citizen participation (Arnstein, 1969) 39

Figure 2.4: Understanding of community renewable energy in relation to project process and outcome dimensions (Walker and Devine-Wright, 2008) 42

Figure 2.5: Consultation stages recommended (Hall et al. 2013) 44

Figure 2.6: The main actors and their interaction (Walker et al., 2011) 46

Figure 2.7: Actors, interactions and expectations (Walker et al., 2011) 47

Figure 2.8: Engagements and feedback (Walker et al., 2011) 48

Figure 2.9: Connections between the expectations of the public, technology design and locational strategy (Walker et al. 2011) 49

Figure 2.10: Full framework (Walker et al., 2011) 50

Figure 2.11: Three major research paradigms, including subtypes of mixed methods research (Johnson et al. 2007) 52

Figure 3.1: The importance of social wind farm characteristics 78

Figure 3.2: Willingness to pay for information and interaction website 80

Figure 4.1: Attitudes towards the construction of wind farms in Ireland specifically for the exportation of wind energy 147

Figure 5.1: Large wind farm 188

Figure 5.2: Small wind farm 189

Figure 5.3: Large wind farm image results 195

Figure 5.4: Small wind farm image results 197

List of Tables

Table 3.1: Attributes and levels used in the choice experiment 70

Table 3.2: Compensation mechanism 72

Table 3.3: Wind farm interaction and information website 79

Table 3.4: Descriptive statistics 100

Table 3.5: Attitudes to wind farm development, standard deviation within parenthesis..... 101

Table 3.6: Parameter estimates, standard errors within parenthesis 105

Table 3.7: Estimated probability of opposite preferences for wind farm attributes 110

Table 3.8: Marginal WTA estimates, standard errors within parenthesis 112

Table 3.9: Policy simulations (standard errors within parenthesis) 114

Table 4.1: Summary of stakeholder perspective literature 136

Table 4.2 Description of focus group participants 141

Table 4.3: Set of community themes identified 145

Table 4.4: Set of developer themes identified 146

Table 4.5: Primary concerns about wind farm development, standard deviation within parenthesis 152

Table 4.6: Trust in wind farm developers, standard deviation within parenthesis 157

Table 5.1: Treatment of SQ in wind farm studies 184

Table 5.2: Attitudes towards wind energy 190

Table 5.3: Attribute disagreement 192

Table 5.4: Demographic information 193

Table 5.5: Binary logit output with average partial effects 200

Chapter 1

Introduction

1.1: Wind energy targets:

Ireland has set ambitious renewable energy targets as required by Directive 2009/28/EC, under which 16% of all energy consumed in the state must come from renewable sources by 2020. The Irish government has also set a goal of achieving 40% renewable electricity generation by 2020 (DCENR, 2012).

The three main national policy drivers underpinning the sustainable use of energy resources are security of supply, environmental protection and cost competitiveness (SEAI, 2006). The 2007 White Paper; "Delivering a sustainable energy future for Ireland" laid out the actions required to achieve these 2020 targets and also pointed to scientific, technical and wider societal and policy objectives including enhancing social acceptability and community engagement and stakeholder consultation in renewable projects. The National Renewable Energy Action Plan (NREAP) was submitted to the EU in 2010 as required by Directive 2009/28/EC, setting out the state's goals in transport, electricity and heating and cooling and the path by which they would achieve the required EU 2020 target. This document established that the significant growth up to 2010 in renewable electricity generation was primarily due to onshore wind farm development. The policies laid out in this document to ensure the increased construction of on and off-shore wind farm developments include, among others, the continuation of the Renewable Energy Feed in Tariff (REFIT), the implementation of Gate 3 renewable generation grid connection offers, investment in the grid, an interconnector between Ireland and the UK to export renewable energy, simplification of grant procedures to allow for quicker development, tax relief schemes, financial support for R&D in renewable energy and the continuation of the Renewable Energy Information Office to provide information to the public and guidelines for planning authorities on wind energy development to ensure consistent outcomes. (DCCAE, 2010)

Following on from this, the Strategy for Renewable Energy 2012-2020 established that these targets would largely be achieved through wind energy. This strategy document outlines the importance of domestic renewable electricity generation in terms of energy security, competitiveness and sustainability and acknowledges that in order to achieve this target significantly more wind farms, both on and offshore, will be required by 2020 not only to meet domestic demand but to satisfy a potential export market. It also pointed to the employment benefits in terms of construction, manufacturing and servicing of on and offshore wind turbines. Due to the importance of wind energy in terms of achieving the specified targets the REFIT 2 scheme was limited to onshore wind in 2012 (DCENR, 2012).

Ireland is approximately half way to achieving its final goals, however between 200MW and 250MW of additional wind energy capacity will be required each year in order to meet the required targets. The average capacity installed over the last five years was 177MW per annum (SEAI, 2016).

1.2: Irish wind farm policy and regulations:

In Ireland planning permission for wind farm developments is granted by local county councils and the current legal planning requirements for development include: site layout and location maps, drawings of the planned turbines including their height and blade diameter, a site notice and notification in national or local newspapers (IWEA, 2008b). There are currently no legal requirements for minimum setback distance or community consultation in Ireland. In 2012 the Environment and Public Health (wind turbines) Bill was introduced to the Oireachtas. This proposed bill would have limited setback distance to 10 times the turbine height; however it did not pass primarily due to fears that it could hinder the wind industry, leaving just 3% of the state’s land available for development (McDonald, 2013). Similarly, the UK currently has no minimum setback distance regulations however has recently passed stringent community consultation requirements, placing the onus on local planning authorities to prove that the site is appropriate for development, that any impacts on community members have been fully addressed and that the development has the full support of the local community (Smith, 2016). As with Ireland and the UK, Germany has no legally required minimum setback distance, however laws have been enacted including the Federal Emissions Control Act which protect people, animals and the environment from excessive noise, vibrations and shadow flicker. While local German governments can create guidelines for setback distance these must not be overly restrictive to the wind farm industry. Many local authorities have opted for a 1000m setback distance, however setback of as little as 300m can be permitted (Haugen, 2011). The French government requires all turbines over 50m in height to be subject to a public inquiry and assessment of potential landscape, environmental and noise impacts and a minimum mandatory setback distance of 500m from residences

(Haugen, 2011). In Denmark local municipalities determine the appropriate areas for wind farm development and there is a legally required minimum setback distance of 4 times the turbine height. There are also strict limitations on noise levels and shadow flicker (DWIA, 2013).

Irish government planning documents for wind farm developers have suggested that more thorough applications be conducted. Potential wind farm externalities may include impacts on tourism and landscape and so developers are encouraged, though not legally bound, to interact and consult with community members as early as possible, ideally before a planning application is submitted. This recommended consultation should be meaningful and residents should be able to influence the design of the project. Developers should designate a coordinator to liaise with and provide information to the community and residents may be permitted to invest in a share scheme in the development, where possible (DoEHLG, 2006). Revisions to this planning document proposed in 2013 include a minimum setback distance of 500m and maximum noise limits, though this has yet to be implemented (DECLG, 2013).

Industry guidelines also suggest further measures than the minimum legally required. In March 2012 the Irish Wind Energy Association (IWEA), a national lobby group and promoter of wind energy in Ireland, published a best practice document for the wind industry. This document outlines the key potential impacts of wind farm developments and proposes mitigation and impact measurement techniques for developers. The most significant impacts of development outlined are: ecological impacts, carbon losses, landscape and visual impacts, cultural heritage impacts, telecommunication and aviation issues, forestry impacts and human impacts. These human impacts include noise, shadow flicker and socio-economic effects, impacts on recreation, land use, traffic and health and safety. It is suggested that the assessment of noise impacts within a 1km radius of development for a period of at least two weeks should be carried out in order to accurately measure the effect on residents. To avoid issues with shadow flicker, developers could switch off the turbines at relevant times or, where possible, block affected households from the development. This document acknowledges the importance of landscape in terms of cultural and historical heritage and proposes that developers acquire a landscape architect to minimize potential impacts. A chapter in this document is dedicated to the importance of community engagement for acceptance. It acknowledges that community interaction is not a legal requirement at present but that it can increase the likelihood of project success. Several forms of engagement are outlined including face to face interaction with residents in development areas, media notices, information flyers, public meetings and development websites. It is proposed that early engagement can aid in reducing resistance to a development and that this interaction should continue throughout the lifetime of the project.

In 2012, Task 28 on the Social Acceptance of Wind Energy Projects was established as part of the International Energy Agency Implementing Agreement for Co-operation in the Research, Development and Deployment of Wind (IEA Wind). The IEA is an autonomous body within the OECD and exists to exchange information and research and development on energy technology within its 29 member countries, including Ireland. IEA Wind focusses on large scale wind energy developments. In 2013 IEA Wind published a summary of recommended practices for the social acceptance of wind energy projects. On a national level, it recommends the encouragement of community-based projects and funding research to establish potential externalities. Locally, councils should identify appropriate areas for development, create mechanisms to allow for the sharing of community benefits and establish policies to ensure transparent and meaningful stakeholder engagement.

Directive 2009/28/EC allows for the use of energy importation to be counted towards the achievement of renewable energy targets, and in September 2012 the IWEA published an export policy document. It outlined the comparative advantage that Ireland has in terms of wind energy and stated that prior to 2020 there will be an abundant surplus of energy available for export. It emphasises that an export project would not be funded by the Irish taxpayer but instead by the resource purchaser, in this case the UK. This document highlights the potential for job creation in this sector, stating that up to 28,000 new jobs could be achieved assuming the domestic manufacturing of turbines (IWEA, 2012b). In January 2013 Ireland and the UK signed a Memorandum of Understanding (MoU) to allow for the exportation of renewable energy from Ireland to the UK, on the condition that it was mutually beneficial to both nations.

The issue of a lack of mandatory regulations on wind farm development has been used by opposition political parties to criticize Fine Gael, the current joint-incumbent party. In February 2014, Fianna Fáil, the current opposition party in government, published a policy paper on wind energy in Ireland with the key focus centering on the lack of legislative requirements for wind farm developments. This paper states that residents in development areas may have fears over the impact of excessive noise, shadow flicker and the detrimental effect of turbines on the landscape. It also states that the benefits of wind farm development are not fairly shared by communities. It states that as IWEA guidelines are voluntary and industry-led they are insufficient and ineffective in truly dealing with external impacts. Their recommendations include the introduction of wind farm strategy plans in each county that has the potential for development. Community consultation meetings must be held with residents and representatives of the council and developers to establish these plans and appropriate development areas should then be mapped out. This paper also requires a full economic review of the impact of wind energy on energy prices and its potential to sustainably supply the grid as well as new restrictions on noise and shadow flicker incorporating international best practice. This paper focusses on community share ownership as a compensatory mechanism and recommends that 20% of a proposed wind farm development be offered to those residing within a distance of 8 times the turbine height. It also recommends compensation to be paid by wind farm developers for property price losses greater than 1% and the examination of offshore wind farm potential, indicating that offshore developments may avoid many of the issues associated with those onshore. Following on from this publication in March 2014 Sinn Féin, another opposition party, proposed the Wind Turbine Regulation Bill which would enforce community engagement, prioritise meeting national energy targets above exportation and restrict setback distances to 10 times the turbine height. As stated in the explanatory memorandum, this bill came about as a result of the strong negative public reaction to the large scale exportation project proposed for the midlands (Wind Turbines Bill, 2012).

The importance of community engagement outlined in the above documents is echoed in the 2014 paper “Wind energy in Ireland: Building community engagement and social support” by the National Economic and Social Development Office (NESC). This document restates the influence of community consultation in terms of acceptance and recommends compulsory interaction between the developer and local residents. As a result of the consultation process, it suggests that a local energy plan, energy co-operative or other settlement agreements should be established.

There have been several calls nationally for a cost benefit analysis (CBA) for large scale onshore and offshore wind farm development from industry stakeholders (Britton, 2014); anti-wind farm objectors (Wind Aware Ireland, 2014a) and politicians (Boyd Barrett, 2015; Pringle, 2015). Typically, a CBA is undertaken by the Irish government when there is a direct cost to the state of over €20 million (Central Expenditure Evaluation Unit, 2012). Internationally, cost benefit analysis' have been conducted for on shore wind energy in Scotland, incorporating non-use value (Moran and Sherrington, 2007), for offshore wind energy in the US, taking into account ecological impacts (Snyder and Kaiser, 2009) and for multiple renewable energy sources in Greece, including wind (Diakoulaki and Karangelis, 2007). In 2002 Sustainable Energy Ireland published a cost benefit analysis of 3 different funding options for future offshore wind developments in Ireland; a research and development programme; a pilot scheme with small projects and a full scale operation. Though this study did not include human or environmental externalities as costs, they found that the long term viability of such a scheme depends on how the externalities of development are internalized (SEI, 2002).

1.3: Valuing wind farm preferences:

1.3.1: Public goods and bads:

Public goods have two general main features. The first is that the good must be "non rivalrous"- the ability of an individual to enjoy the good does not diminish the ability of others to enjoy it (Samuelson, 1954), the second is "non- excludability"- it is not possible to exclude others from enjoying the good (Head, 1977). Public goods may also be non-optional, that is, an individual cannot abstain from the use of the good or must endure high costs in order to do so (James, 1971). Generally, public goods are not provided by individuals for themselves unless the benefit outweighs the cost of providing it. If an individual did provide a public good, the non- excludability attribute would result in many "free-riders" who benefit without enduring any of the cost of provision. Free riding is a form of market failure. In order to correct for this failure, government intervention is usually required. Public goods such as these which are valued by many individuals are known as "collective goods" and are generally provided by government, e.g. public roads, street lighting. However, not all public goods have to be provided by government, some small-scale public goods can be provided by a collection of individuals who finance the public good for exclusive use by the group. These are known as "club goods" (Buchanan, 1965).

Environmental resources such as air quality and biodiversity can be considered as a "pure" public good as they satisfy the two main features of non-rivalry and non-exclusivity (Wills, 2006; Arriagada and Perrings, 2011).

Similarly, a public "bad" holds the same properties of a public good, including non-rivalry and non-excludability but affects welfare in a negative way, and tends to be overprovided in the market e.g. pollution (Ingham, 2015). In terms of wind farm development, distance is a crucial factor determining if a resident is impacted by any associated public bad. Noise, shadow flicker and landscape degradation may be seen as public bads for those living nearby as residents cannot easily be excluded from these elements and the scale of the impact is not influenced by the number of residents enduring it. These public bads can be particularly damaging in areas of natural beauty or for residents with strong place attachment (Devine-Wright and Howes, 2010). However, those living further away from the development may not experience these negative elements and so can be excluded. Generally, if the negative effects of a development are restricted to a defined group of individuals as opposed to a large proportion of society, these effects are known as externalities (Callan and Thomas, 2013).

1.3.2: Externalities:

Joint production or non-separability in production suggests that a single production process can provide many distinct goods and services which may include both private and public goods (or bads). The public goods that result from this process are known as "externalities", and these can be positive or negative (Whitten and Bennett, 1999). A factory that pollutes water imposes a cost on society. The inputs used in the production of goods, like steel and labour, are carefully measured and used efficiently because these are costly to the factory. The cost to society of the depletion of its labour and steel resources is internalized by the factory through payment for these resources, however the factory does not have an incentive to pay for the societal cost of pollution (Jaffe et al. 2005). These externalities are an unintended byproduct of production and impact on an individual's utility in a way that is uncompensated for. Due to the existence of negative externalities (e.g. pollution) the private cost of production can often be lower than the societal cost. (OECD, 1997). The general solution to the issue of externalities is to set a Pigovian tax equal to the value of the victim's willingness to pay to avoid (or willingness to accept) the negative outcome (Cropper and Oates, 1992). In order to analyse if the societal benefits of environmental goods or protection exceed the costs, non-market valuation techniques are used. These can range from asking individuals their willingness to pay or willingness to accept for changes in the good in question or through inferring value from other markets. Stated preference techniques can use survey methods, contingent valuation and conjoint analysis whereas revealed preference techniques can use the travel cost method and hedonic models to derive value (Kotchen, 2012).

1.3.3: Wind farm externalities:

The externalities associated with wind farm development range from physical and environmental degradation to more institutional and social impacts. Wind turbines can impact the health and wellbeing of local residents who may experience irritability and problems sleeping (Onakpoya et al. 2015) as well as reductions in self-reported quality of life (Walker et al. 2015). These negative health effects can derive from the noise associated with the operation of the turbines (Pedersen and Waye, 2015) and shadow flicker (Harding et al. 2008). Shadow flicker is caused by the moving turbine blade casting shadows on the ground. Intermittent flashes of light can also be created by the reflection of the sun on the blades. As a result, shadows can occur across homes or land and be a source of irritation for residents (Saidur et al. 2011). Various studies have also found that wind turbines can reduce property price values in the surrounding area of the development, placing economic costs on local residents (Gibbons, 2015; Heintzelman and Tuttle, 2012). Though wind energy is generally associated with positive environmental impacts, it can also negatively affect local soil, water and livestock as well as global air quality through the mining of steel and concrete required in construction (Wang et al. 2015). Increases in bird and bat mortality can occur due to blade strikes (de Lucas et al. 2012; Ferreira et al. 2015; May et al. 2015). Offshore turbine construction can also negatively impact marine biodiversity through noise, vibration, shadow flicker and increased fire risk (Lovich and Ennen, 2013; Punt et al. 2009).

Studies have shown that the presence of wind turbines can negatively affect tourism demand. In general, tourists will avoid a preferred area if it contains large turbines and the surrounding areas are less exposed to development (Broekel and Alfken, 2015). Tourists can also express a preference for offshore turbines located at greater distances from the shore (Westerberg et al. 2013). Many studies have analysed the public perceptions of turbines on the landscape and the overall visual impact of a wind farm. Results suggest that opinions are based on a host of factors including whether or not the development area is one used for recreation, the ownership structure and local involvement in the development and respondent demographics such as age and gender and experience with turbines (Ek and Persson, 2014; Mariel et al. 2015; Ladenburg and Lutzeyer, 2012).

1.3.4: Social acceptance of wind farms:

The societal and community acceptance of wind farm development is a crucial factor in determining the success or otherwise of a project (Agterbosch et al. 2009) and this has been analysed in the field of sociology (Aaen et al. 2016; Bidwell, 2013; Firestone et al, 2015; Gross, 2007; Groth and Vogt, 2014; Langer et al. 2016; Maruyama et al. 2007), psychology (Huijts et al. 2012; Thøgersen and Noblet, 2012; Walter, 2014; Devine-Wright and Howes, 2010; Zoellner et al. 2008), behavioural science (Jung et al. 2016) and from an economic perspective (Caporale and De Lucia, 2015; D'Souza and Yiridoe, 2014; Liu et al. 2013; Van Rijnsoever et al. 2015; Strazzera et al. 2012; Westerberg et al. 2015; Dimitropoulos and Kontoleon, 2009; Ek and Persson, 2014; Koundouri et al. 2009; Ladenburg and Dubgaard, 2007; Mirasgedis et al. 2014).

Community acceptance may be increased by the belief that a project will provide benefits, either through financial gains, community development or increased employment in the local area (Bidwell, 2013; Chen et al. 2015; Caporale and De Lucia, 2015; Guo et al. 2015). Residents may also be more accepting of wind farm developments if the planning procedure is perceived as being open, transparent and trustworthy (Hall et al. 2013; Gross, 2007; Cohen et al. 2014) and if local residents are involved in the project (Hammami et al. 2016; Khorsand et al. 2015). Gross (2007) conducted an interview based study into local perceptions of a wind farm development and found that the vast majority of respondents were unhappy with the amount of information provided, the decision making process and the inequitable distribution of benefits. Hammami et al. (2016) suggests that community involvement and meaningful consultation processes from the outset can increase the acceptance of wind farm projects. Local communities are likely to be less accepting of wind farm developments if the associated externalities are perceived to be significant (Firestone et al. 2015; D'Souza and Yiridoe, 2014; Kontogianni et al. 2014). Firestone et al. (2015) find that 43% of respondents who viewed a wind farm negatively do not believe that community wind farms should be implemented. Langer et al. (2016) suggests that the crucial factors affecting the acceptance of a wind farm development are the hub height, number of turbines and the setback distance. Community ownership of the project can also increase local acceptance of the development (Enevoldsen and Sovacool, 2016; Musall and Kuik, 2011; Maruyama et al. 2007). Musall and Kuik (2011) find that residents living near a community owned wind farm are more positive towards the development and wind energy in general and find the externalities of development, such as shadow flicker and noise pollution, less troublesome than those who live near a similar commercial development. The location of a wind farm can also influence its likelihood of acceptance, with the visibility of a project being a crucial determinant (Jobert, 2007). Many economic studies that have analysed public values for wind farm developments have utilized stated preference techniques. These primarily tend to use either a contingent valuation (Georgiou and Areal, 2015; Koundouri et al. 2009; Mirasgedis et al. 2014) or choice modelling framework (Dimitropoulos and Kontoleon, 2009; Ek and Persson, 2014; Ladenburg and Dubgaard, 2007; Strazzera et al. 2012; Westerberg et al. 2015).

1.4: Thesis objectives:

1.4.1: Academic objectives:

Status quo analysis has been conducted in the environmental economic literature for forestry (Boxall et al. 2009; Meyerhoff and Liebe, 2009) and water quality (Marsh et al. 2011; Lanz and Provins, 2015) but not in the field of wind farm preferences. The literature suggests that respondents may have a preference for the status quo due to choice task complexity (Boxall et al. 2009; Meyerhoff and Liebe, 2009), personal objections to the project (Meyerhoff and Liebe, 2009) and demographic factors (Meyerhoff and Liebe, 2009) This academic objective analyses why a respondent may choose to forgo any benefits associated with a wind farm development and select the status quo option of no new wind farm. This is achieved through the use of choice experiments and by comparing the survey responses and demographic variables of all those who selected the status quo in each choice set with those who selected at least one wind farm option.

1.4.2: Policy objectives:

The impact of wind farm development on local communities can be significant in terms of visual impact (Ladenburg, 2009b; Saidur et al, 2011; Möller, 2006), potential property price (Heintzelman and Tuttle, 2012; Gibbons, 2015) and health impacts (Shepherd et al. 2011; Pedersen and Waye, 2007) and can also lead to social divisions amongst those opposed to and in favour of development (Gross, 2007; Hall et al.

2013). The crucial attributes determining the possible externalities associated with development may include the size of the wind farm (Dimitropoulos and Kontoleon, 2009), setback distance (Ladenburg and Dubgaard, 2007), likely environmental impact (Álvarez-Farizo and Hanley, 2002) and the political and institutional framework (Ek and Persson, 2014). The first policy objective is to identify the key attributes associated with wind farm development in Ireland. This will aid in informing wind farm developers, planners and policy makers of likely areas of conflict for new development. The identification of the attributes is achieved through focus groups and pilot surveys in important development areas in Ireland.

The second policy objective is to evaluate the impact of community interaction and information provision on wind farm externalities. Previous studies have indicated that increased information and community consultation could increase the acceptance of wind farm development (Gross, 2007; Beddoe and Chamberlin, 2003; Dimitropoulos and Kontoleon, 2009; Swofford and Slattery, 2010) and could therefore aid in reducing objections to future wind farm developments. This evaluation is conducted through the inclusion of community representation as an attribute in a choice modelling framework in order to measure its value to local residents.

Several studies have indicated that residents have positive preferences for increased setback distances from wind farm developments (Ladenburg and Dubgaard, 2007; Westerberg et al. 2013; Mariel et al. 2015) and there have been many calls in Ireland for regulatory intervention in this area from planning agencies (DECLG, 2013) and political parties (Fianna Fáil, 2014; Sinn Féin, 2014) including the Environment and Public Health (wind turbines) Bill (2012) which would have set a mandatory distance of 10 times the turbine height. The third policy objective, therefore, is to evaluate the impact of increased setback distance on the acceptance of wind farms in Ireland. This is achieved through the inclusion of setback distance as a choice set attribute.

The fourth policy objective is to establish the Irish public's opinion on wind farm development for export. Ireland and the UK have signed a MoU with the aim of exploring the possibility of wind farm exports from Ireland to the UK. Planned developments for export have been cancelled with some commentators blaming local community backlash for the failure of the project (O'Doherty, 2014; McGreevy, 2013). It is crucial for policy makers and developers to establish if the public are in favour of development for export, and if not, to identify the reasons behind this perspective to avoid objections to future projects. This objective will be answered through survey techniques and focus groups with residents in development areas.

1.5: Thesis structure:

The theoretical framework for this thesis is outlined in chapter 2. This chapter presents the key theories underlying non-market valuation as well as the theoretical frameworks which define the concept of community engagement and the use of mixed methodologies in academic research.

The choice set results are presented in chapter 3. This chapter outlines the survey design and key attribute and survey area selection. This work analyses if the public have positive preferences for the introduction of a community representative as an attribute of wind farm development along with other important attributes such as wind farm size and setback distance. Willingness to Accept values are derived and different wind farm sizes and setback distances are combined in simulations, providing important recommendations for planners, developers and policy makers.

Chapter 4 provides a novel analysis of community and developer attitudes towards wind farm development for export. This chapter discusses the literature surrounding the exportation of renewable energy and provides a case study for a failed Irish wind energy exportation project. Detailed developer and focus group discussions are analysed along with survey responses on the issue of exportation. Areas of conflict between developers and community members are highlighted and policy recommendations are provided.

Chapter 5 is dedicated to the attitudes of status quo respondents; that is; those who selected the status quo option of "no new wind farm" for each choice set. Responses to graphical representations of wind farms are analysed to clarify if status quo respondents view wind farm externalities differently than those willing to accept development. Attitudes towards wind energy, trust in developers, choice task complexity, attribute disagreement and respondent demographics are all analysed econometrically to clarify the key drivers of a status quo response. These results are important from a policy perspective as they provide developers and pro-wind policy makers with a guide to potential conflict areas and inform of the characteristics which increase or decrease the likelihood of wind farm acceptance.

Finally, chapter 6 summarises the major findings from this research and provides a final discussion on their implications.

1.6: Thesis outputs:

The work contained in chapter 3 has been published as a paper in *Energy Policy*:

Brennan, N. & van Rensburg, T. (2016). Wind farm externalities and public preferences for community consultation in Ireland: A discrete choice experiments approach. *Energy Policy*, 94, 355-365.

The work contained in chapter 4 has also been published as a paper in the *Journal of Environmental Planning and Management:*

Brennan, N., van Rensburg, T. & Morris, C. (2017). Public acceptance of large-scale wind energy generation for export from Ireland to the UK: Evidence from Ireland. *Journal of Environmental Planning and Management*, DOI: 10.1080/09640568.2016.1268109.

As well as presentations to the economics department and others in NUI Galway, this work has been disseminated to audiences at the following conferences:

Brennan, N., van Rensburg, T. & Morris, C. (2013). *An economic analysis of community renewable energy initiatives in Ireland using discrete choice experiments*. Paper presented at the Atlantic Power Cluster Stakeholder Engagement Conference, Galway. 29th January.

Brennan, N. (2014). *An economic analysis of renewable electricity generation from community wind farms in Ireland.* Poster presented at the Science and Solutions for a Sustainable Environment Conference, Dublin. 11th December.

Brennan, N. (2015). *Measuring the community impact of wind farms in Ireland*. Poster presented at the MERIKA Exchange workshop, University of Highlands and Islands, Oban, Scotland. 21st May.

Brennan, N. (2015). *Wind farm externalities and public preferences for community consultation in Ireland*. Paper presented at the Atlantic Stakeholder Conference, Brest, France. 29th October.

Brennan, N. (2016). *Wind farm externalities and public preferences for community consultation in Ireland: A discrete choice experiments approach.* Paper presented to Irish Economic Association Conference, Galway. 5th May.

Brennan, N. (2016). *Wind farm externalities and public preferences for community consultation in Ireland: A discrete choice experiments approach*. Paper presented to the European Association of Environmental and Resource Economists 22nd Annual Conference, Zurich, Switzerland. 25th June.

Chapter 2

Theories of non-market valuation, community consultation and triangulation

2.1: Introduction:

Many positive environmental outcomes, such as clean air and biodiversity, or negative environmental consequences like pollution, are public goods possessing the features of non-rivalry and non-excludability outlined in chapter 1. The economic value (or cost) of these goods cannot be obtained from standard market prices. However, in order to compare different outcomes, conservation regimes or prevention schemes, it is crucial to measure any changes in the quality or quantity of these non-marketed goods (Alpizar et al. 2003). For wind farm developments, the societal cost of these non-market externalities could be significant (Álvarez-Farizo and Hanley, 2002; Bergmann et al. 2006) and the only way to assign an economic value to these goods is to apply non-market valuation techniques.

The aims of this chapter are to outline the theories underlying non-market valuation; to introduce the theoretical frameworks underpinning community involvement and interaction in wind energy projects and to provide an academic argument for the use of mixed methodologies to triangulate results in wind farm preference studies.

The first section of this chapter elaborates on the concepts of public goods and externalities established in the previous chapter. Next, the concepts of preferences, utility and willingness to accept are outlined in detail. Following this, the theory of choice experiments is introduced, with key examples from the wind farm literature. The next section deals with NIMBYism, models of citizen engagement, community interaction and distributive and procedural justice with regards to the development and acceptance of wind farm projects. The concept of triangulation in mixed methodological research is then outlined and followed by a discussion of the use of focus groups as a qualitative methodology. Important works from the wind farm literature which incorporate mixed methodologies are outlined. Lastly, chapter conclusions are presented.

2.2: The theory of non-market valuation:

Whereas marketed goods in an economy involve a direct exchange between buyer and seller and a transparent cost, a non-marketed good exists in the absence of a market or in an "incomplete" market. A non-market good, such as biodiversity, results in a positive economic value, whereas in the case of an environmental bad, like pollution, a negative economic value occurs (Bateman et al. 2002). As outlined in chapter 1, for wind farm developments the non-market societal cost may include, among others, shadow flicker, noise disturbances, decreases in property value and impacts on wildlife (Harding et al. 2008; Pedersen and Waye, 2015; Gibbons, 2015; de Lucas et al. 2012). The economic valuation of ecosystem goods and services or environmental degradation provides society with an indication of the importance of these impacts. Failing to accounting for these economic costs can result in incorrect policy decisions, a misallocation of resources (Pascual et al. 2010) and the risk that non-marketed goods will be under-supplied and non-marketed bads over-supplied (Pearce and Özdemiroglu, 2002).

The economic value of a good is classified as the amount of something else individuals would be willing to sacrifice to gain or protect a quantity of the good in question. The values arising from a non-market environmental good or service may be classified as use or non-use value and total economic value is comprised of the sum of the two (Pearce and Özdemiroglu, 2002). The figure below summarises the composition of total economic value.

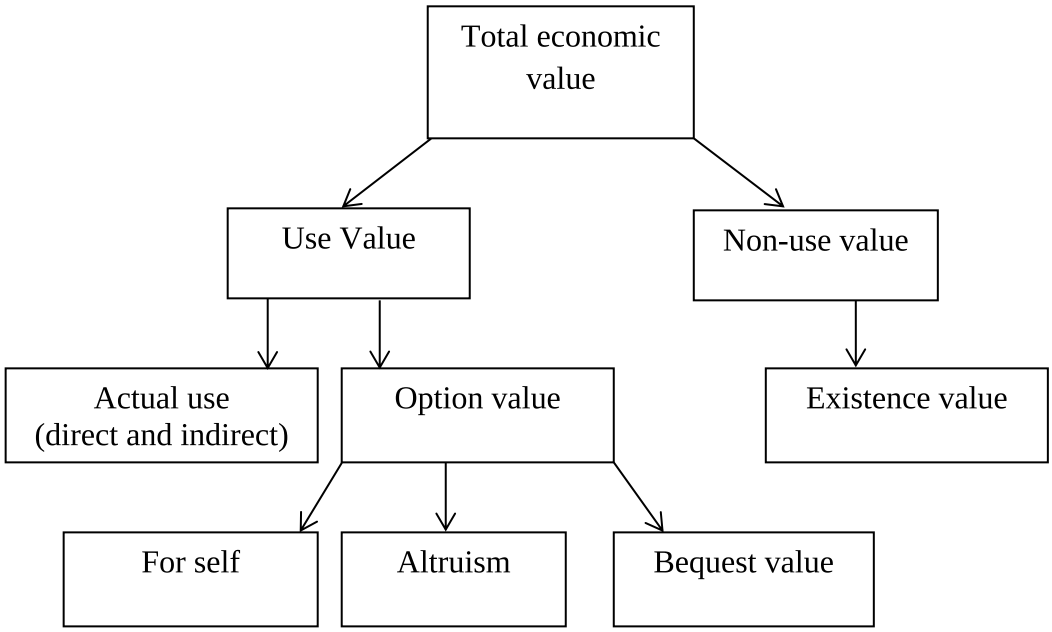


Figure 2.1: Composition of total economic value (Pearce and Özdemiroglu, 2002).

Use value is comprised of two elements; actual use, which is similar to many typical marketed goods where the value lies in its direct or indirect consumption (e.g. recreational use or carbon sequestration) and option value, where the value lies in the possibility of future use either for the individual themselves, for others (altruism) or for future generations (bequest value). Though others have argued that bequest and altruism are components of non-use value due to the fact that their worth lies not in the direct or indirect use of the system, but in the knowledge that others will have access to them (Pascual et al. 2010), this may still be considered a component of use value as it is based on the hope that others will have the opportunity to use the resource at some stage. Existence value on the other hand is a "pure" non-use value, in that the value does not lie in any present or future use by an individual or others but simply in the satisfaction that such resources exist. Large scale projects like wind farm developments can include an element of landscape degradation which may not have an actual use cost to society but can result in a significant non-use impact. The addition of these non-use wind farm values to cost benefit analysis can have a substantial impact on the studies outcome (Moran and Sherrington, 2007). Not all non-market valuation methodologies can capture non-use value, and failure to do so can significantly underestimate the value of an environmental resource (Parsons, 2003; Poor and Smith, 2004; Graves, 2007).

2.2.1: Preferences, utility and willingness to accept:

Economic values, based on human preferences, measure the change in an individual's utility resulting from small or marginal changes in the provision of a good or service (Bateman et al. 2002). The value of a good or service is based on concepts of rationality (the individual knows what he/she wants and needs) and consumer sovereignty (the individual is able to make decisions that impact their welfare). A rational individual makes decisions consistent with his/her personal preferences. This concept of rational choice assumes that individuals can therefore value changes in environmental goods and services, even in the absence of a market (Hanley et al., 1997). Preferences can be established through individuals willingness to pay (WTP) for the good in question or in the case of a bad, willingness to pay to avoid it or a willingness to accept (WTA) compensation to endure it (Pearce and Özdemiroglu, 2002). WTP and WTA form the basis of economic valuation for environmental goods and services.

As outlined in Hanley et al. (1997), an individual has a set of personal preferences which are logical and consistent. The ordering of these preferences limits the extent to which individuals chose between consumption bundles. Four key axiomatic restrictions (reflexivity, completeness, transitivity and continuity) define consistent preference ordering and allow for the modelling of rational choice.

Reflexivity states that each level of a good or service, e.g. environmental quality, is as good as itself: for all $Q_i, Q_i \succcurlyeq Q_i$.

Completeness states that an individual can compare and rank all levels of a provided good or service, that is; for any two levels of environmental quality, Q_i and Q_j, either $Q_i \succcurlyeq Q_j$ or $Q_j \succcurlyeq Q_i$.

Transitivity defines the acyclical nature of preferences; that is; if $Q_i \succcurlyeq Q_j$ and $Q_j \succcurlyeq Q_k$ then $Q_i \succcurlyeq Q_k$.

Finally, continuity suggests that environmental quality can be traded at the margin for another good, or the provision of compensation, and that no level of environmental quality is strictly necessary: for any level of environmental quality Q_i with $A(Q_i)$ representing the 'at least as good' set and $B(Q_i)$ representing the 'no better than' set, then $A(Q_i)$ and $B(Q_i)$ contain their own boundary points (Hanley et al., 1997).

Following from these axioms, individual preferences can then be defined by the utility function, $U(Q_i)$. $U(Q_0)$ represents the utility associated with a certain level of an environmental good (Q_0). The law of diminishing returns indicates that the more we have of a good the less value we place on an additional unit of it, as outlined in Hanley et al. (1997):

$$U_Q \equiv \frac{dU}{dQ_0} > 0 \quad U_{QQ} \equiv \frac{d^2U}{dQ_0^2} < 0$$

One can assume that the individual derives utility from environmental quality, Q_0 and all other goods in the market, $x = (x_1, x_2 \ldots., x_n)$. One might also assume that the consumption of market goods results in positive utility, and that utility increases at a decreasing rate (Hanley et al., 1997):

$$Ux_i \equiv \frac{\partial U}{\partial x_i} > 0 \text{ and } Ux_i x_i \equiv \frac{\partial^2 U}{\partial x_i^2} < 0, \text{ for all } i$$

The individual faces a set of given prices for all of the private goods purchased in the market and is assumed to select the quantities of these goods in a way that maximizes his/ her utility given the constraints of these prices and his/her fixed income, M (Freeman et al., 2014).

The individual therefore wishes to maximize their utility by selecting their appropriate level of consumption of all market goods $x = (x_1, x_2 \ldots., x_n)$ given their fixed income, M, the vector of prices for all other goods and services $p = (p_1, p_2, \ldots., p_n)$ and the level of the environmental good or service Q_0 (Hanley et al., 1997).

In the case of a wind farm development, W, the associated localized impacts such as noise, visual and environmental impacts may be considered as a non-market "bad". In this situation, the development may negatively impact utility, $U(x, W)$:

$$U_w \equiv \frac{\partial U}{\partial W} < 0 \quad U_{ww} \equiv \frac{\partial^2 U}{\partial W^2} > 0$$

The individual's maximization problem is:

$$V(M, p, W_0) \equiv \max_x \ [U\ (x, W_0) | M \geq px;\ W_0\ is\ preassigned]$$

where $V(M, p, W)$ is the indirect utility function representing the maximum possible utility given budgetary constraints and the amount of wind farm development. It is also a function of exogenous parameters, income, prices and the amount of development (Hanley et al., 1997).

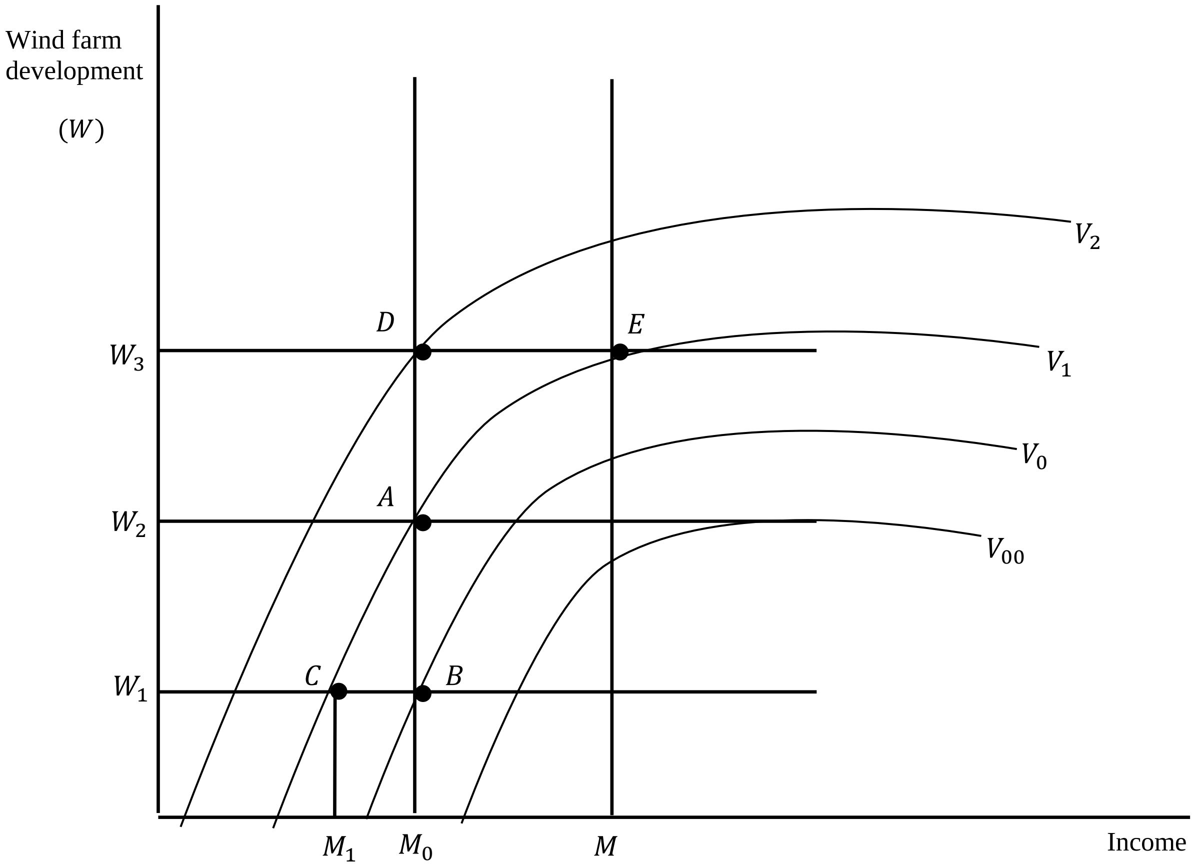


Figure 2.2: WTP –WTA measure of value given wind farm development (Hanley et al., 1997)

Typically WTP is appropriate in situations when the individual is acquiring a good and WTA is used in cases when the respondent is forgoing a good. Deciding whether WTP or WTA is the correct measure depends on the assumed property rights associated with the good in question (Pascual et al. 2010).

Figure 2.2 indicates the relationship between WTP and WTA. The vertical axis indicates the amount of wind farm development (W) and the horizontal axis represents the individual's income(M). The curved lines signify the set of indirect utility functions, the individuals preferences for income and the avoidance of wind farm development. Each point along the utility function results in a combination of wind farm development and income which leaves the individual with the same level of satisfaction. The slopes of these curves indicate the individual's willingness to trade-off between development and income- the marginal rate of substitution. Moving to the right results in increased utility: $V_{00} > V_0 > V_1 > V_2$ for a given amount of wind farm development W (Hanley et al., 1997).

In Figure 2.2, point A represents the original wind farm level (W_0), income level (M_0) and utility level (V_1). If the amount of wind farm development decreased to W_1, then the individual's utility would increase to V_0 at point B. The maximum that the individual would be WTP to reduce the amount of wind farm development is the amount of money that would bring them back to their original utility function V_1: WTP= $M_0 - M_1$, point C.

If on the other hand, the amount of wind farm development increased to W_2, then given M_0, the individuals utility level decreases to V_2 at point D. The minimum amount that the individual is WTA in compensation is $M_2 - M_0$, point E. The individual would not accept less than this amount because it would not restore them to their original utility level. Although he/she may prefer more compensation than the minimum WTA, this would not reflect the true value of the negative impact resulting from increased wind farm development (Hanley et al., 1997).

In order to establish this minimum WTA or maximum WTP value, researchers use non-market valuation techniques. These can incorporate a range of disciplines, can use quantitative as well as qualitative methodologies, may infer WTA or WTP from stated or revealed preference techniques, and may involve many stages including focus groups, pilot testing, interviews and surveys.

While revealed preference techniques, such as the hedonic method, have been used to establish the impact of wind farm externalities on property prices (Gibbons, 2015; Hoen et al. 2014; Heintzelman and Tuttle, 2012), this methodology cannot be used to evaluate non-use value, which may significantly underestimate the value of a resource (Arrow et al. 1993).

The following section outlines a stated preference technique utilised by researchers to establish individuals WTA or WTP values for a change in a hypothetical situation, which can be used to evaluate non-use value.

2.3 Non-market valuation methodologies: Choice experiments:

Stated preference studies allow researchers to assess the demand for environmental protection or ecosystem services through the use of surveys by analysing consumer preferences for a hypothetical situation offering a change in these services. These techniques differ to revealed preference studies in that both use and non- use values can be captured. The two main types of stated preference techniques are contingent valuation which asks consumers their willingness to pay or willingness to accept for a change in an environmental good or service and choice modelling in which respondents choose between two or more situations with shared attributes of the good in question but with different levels of these attributes (Pascual et al. 2010).

While contingent valuation studies have analysed the WTA and WTP for wind farm developments (Georgiou and Areal, 2015; Du Preez et al. 2012; Groothuis et al. 2008), the methodology can suffer from biases whereby respondents often answer the valuation question in a way they believe would please the interviewer, not reflecting their own true values (Carson et al. 2000).

Choice experiments fall under the umbrella term “choice modelling”, which includes techniques such as contingent ranking, within which respondents rank alternative outcomes in order of preference; contingent rating, where options are not compared to each other but independently scored on a predetermined scale; and paired comparison, whereby the respondent selects the preferred option and scores it on a predetermined scale (Alriksson and Öberg, 2008). In general, it is more difficult for respondents to answer strategically in a study with choice experiments than it is in a contingent valuation situation because of the difficulty involved in such deception due to the changing attribute levels in each choice set (Alpizar et al. 2003). The theoretical framework underlying choice experiments is outlined in further detail in chapter 3.

2.3.1: Designing choice experiments:

The selection of choice set attributes is a crucial stage in the methodology and a thorough literature review and pilot study including focus groups is recommended. One of the attributes selected should be a monetary value to act as a payment vehicle. As a general rule, no more than four or five attributes should be selected, including the cost attribute (Pearce and Özdemiroglu, 2002). Next, the levels associated with these attributes are decided. These levels should represent the policy and research goals within realistic bounds. More levels can result in a greater understanding of the relationship between an attribute and marginal utility but can increase the complexity and size of the design, leading to the requirement for a much larger sample size. In general 3 to 4 levels are sufficient (Bateman et al. 2002). A status quo opt-out option can be included to add realism, especially in willingness to pay situations where a consumer cannot be forced to purchase, however, if the changes provided by the choice options are inevitable an opt-out may not be suitable (Adamowicz and Boxall, 2001). A full factorial design is then implemented which contains all of the possible combinations of attribute levels for each option. This usually results in a large and unwieldy number of choice sets. An optimal experimental design is then chosen in order to combine the various attributes and possible levels without requiring huge numbers of choice sets, the most frequently used of which is the fractional factorial design. This uses a section of the full factorial design while still retaining as much of the statistical properties of the full design as possible (Louviere et al. 2000). Generally this takes an orthogonal form, where changes in the attributes in each option are uncorrelated in each choice set (Alpizar et al, 2003). The choice sets are then constructed and may be split into blocks in order to reduce the cognitive burden on each respondent. In general, about 8 choice sets per individual is considered reasonable, however as few as 1 and as many as 16 have been successfully conducted (Adamowicz et al. 1998).

Once a survey has been designed, including the choice sets, focus groups are generally conducted in order to test for clarity and methodological issues, followed by pilot surveys (Pearce and Özdemiroglu, 2002). The main survey should include a section providing context to the study at hand, and the choice set section should be preceded by instructions for respondents with thorough explanations of the attributes and levels (Adamowicz et al. 1998). Debriefing questions can provide insight into the motives behind respondent’s choices and are particularly useful for capturing lexicographic preferences, cognitive bias and protest motives (Alpizar et al. 2003).

Several studies have applied choice experiment techniques to establish respondents perceptions of both on and offshore wind farm developments.

Álvarez-Farizo and Hanley (2002) combined contingent ranking and choice experiments to describe the public perception of the environmental impact of wind farm development in Spain. This exercise availed of focus group, pilot surveys, contingent valuation and expert interviews in order to establish the attributes and appropriate levels. The attributes selected were the impacts on cliffs (a local natural resource), flora and fauna and landscape, as well as a cost attribute, in the form of a tax. The choice sets were introduced with a statement which emphasised the clean energy aspects of wind farm development but with the disclaimer that development would likely result in a loss of natural features, visual and wildlife impacts. In the contingent ranking exercise respondents ranked each option from least to most preferred and in the choice experiment respondents selected from 3 options, including a status quo. Manipulated photographs were included to describe the different scenarios. Both stated preference techniques suggest that the impacts on flora and fauna are valued more than impacts on landscape or on the cliffs. The choice experiments provided higher WTP estimates to minimise the environmental impact of development than contingent ranking, suggesting that respondents were not as responsive to the price attribute in the choice experiment study.

Dimitropoulos and Kontoleon (2009) used choice experiments to analyse the factors which affected local acceptability of wind farm development in two small islands off the coast of Greece. An extensive literature review, focus groups and pilot testing provided the attributes and their corresponding levels. The chosen attributes included wind farm size, turbine height, whether or not the development would be located in an environmentally protected area and the amount of consultation with local authorities. Due to the perceived property rights of the proposed municipal land upon which the development would be constructed and the fact that respondents would likely view the process of payment for a development with negative local impacts as unfair, a WTA framework was used in the form of an annual household subsidy. The choice sets provided three scenarios including a status quo option of "no new wind turbine". 212 face-to-face interviews were completed between the two islands. The results suggest that the placement decision (i.e. in a protected area or not) and the degree of consultation were crucial factors for respondents, more so than the physical attributes of the wind farm.

A study in 2014 by Ek and Persson used choice experiments to establish the effect of ownership and local consultation on the acceptance of wind farm developments in Sweden. In their survey respondents were asked their opinions on wind power, followed by the choice experiments and socio-demographic questions. As with the previous studies, focus groups were used to establish the attributes, levels and final survey design. The attributes chosen were landscape, which provided different options for the wind farm placement, including offshore; ownership, which could take the form of a state owned, local authority owned, private or cooperative project; consultation, which was either the minimum legally required or more extensive cooperation and community benefits in the form of annual revenue to the local authority. The WTP framework was chosen using an electricity bill fee as a cost attribute. Respondents chose between two wind farm options in six choice sets which excluded a status quo opt-out option as the policy decision to set targets for renewable energy had already been made. The results suggest that respondents preferred offshore developments and projects operated by cooperatives or local authorities. Respondents were more likely to accept the higher cost of renewable energy if the development was not placed in recreational areas, if the project was owned or partially owned by the local community and if the community was involved in the planning process.

Ladenburg and Dubgaard (2007) incorporated choice experiments in their study into attitudes towards the visual impact of offshore wind farm development in Denmark. The valuation scenario was based on an offshore wind farm development plan from the Danish authority. The attributes included the turbine setback distance from shore and the number of wind turbines, with representative photographs included. Focus groups established that an annual surcharge on electricity bills was the most appropriate payment vehicle. As with Ek and Persson, (2014), a status quo option was not included as the decision to develop offshore wind farms had already been taken. The results show that respondents had strong preferences for reducing the visual impact of offshore wind farms, with WTP amounts of €46, €96 and €122 per household per year to increase the setback distance from 8km to 12, 18 and 50km respectively. Younger respondents appeared less affected by the visual impact of development with those under 30 having effectively zero WTP to locate wind farms further out to sea.

2.3.2: Limitations of choice experiments:

Choice experiments can suffer from many of the same biases and issues that affect contingent valuation studies but most of these issues can be accounted for through rigorous design and testing. Hypothetical and strategic bias can occur when respondents do not believe the choice set scenario presented to them or believe that their WTP amounts won't really be collected. This can be prevented with thorough pilot testing in order to ensure that the scenario is plausible (Pearce and Özdemiroglu, 2002). Heterogeneity is difficult to analyse using Standard Random Utility Models (RUM) and so researchers can avail of interaction techniques or mixed logit models, such as the RPL model which allows model parameters to vary over individuals (Adamowicz and Boxall, 2001). Framing affects can occur when the choice scenario is presented in an overly positive or negative light. This can be prevented by describing the scenario in a neutral way and testing for effects with focus groups (Pearce and Özdemiroglu, 2002). Payment vehicle bias occurs when the WTP or WTA for a good depends on the method of payment, e.g. tax, electricity bill discount. Focus groups can be used to establish the appropriate payment vehicle, which should be the one most likely to be used in reality (Pearce and Özdemiroglu, 2002). The omission of a status quo option can cause inaccurate welfare results for non-marginal changes (Alpizar et al. 2003), however the decision to include an opt-out alternative must be guided by the reality of the situation and it may not always be suitable to include it (Adamowicz and Boxall, 2001). Choice task complexity and respondent fatigue can also be an issue (Adamowicz and Boxall, 2001) but with minimal design of no more than 5 attributes and about 8 choice sets, these issues can be avoided (Bateman et al. 2002; Adamowicz et al. 1998). Respondents can also be asked to think out loud when completing the choice sets in order to engage the individual with the task and test their understanding (Alpizar et al. 2003). As with contingent valuation, choice experiment studies can suffer from embedding and scope insensitivity issues, where the WTP/WTA does not change with different amounts of the good in question. In this sense, WTP may represent the “warm glow” associated with payment for the good and not the true WTP for the good itself. There is debate about whether this is a problematic issue at all (Hanemann, 1994), however follow up questions can be used to establish respondents motives (Pearce and Özdemiroglu, 2002). Similarly, protest responses, whereby respondents refuse to engage with the choice task can be tested for through appropriate follow up questions to elicit motives, and protesters can be removed from the analysis (Pearce and Özdemiroglu, 2002).

2.4: Community engagement:

As outlined in the previous section, wind energy developments can result in a significant non-market cost on those in the surrounding area of the project. This may take the form of, among others, noise, negative property price impacts and concerns over health effects. These fears about a planned development may lead to local residents forming negative expectations and in turn engaging in anti-wind farm processes such as protests or planning objections.

However, depending on the degree of community engagement, involvement and the distribution of benefits; locals can form positive expectations and in turn engage in processes which can lead to favourable planning outcomes from the perspective of the developer. Whether or not this happens can depend on the actions and expectations of both the developer and the local residents. The following section highlights the importance of developer's assumptions about residents and the degree of community involvement and distributive and procedural justice in determining project outcomes.

2.4.1: NIMBYism:

The "Not-In-My-Back-Yard" or "NIMBY" effect in relation to wind farm acceptance has been the subject of considerable discussion in the literature over the last 25 years (Krohn and Dambourg, 1999; Kahn, 2000; Wolsink, 2000; Bell et al., 2005; Devine-Wright, 2005a; Wolsink, 2005; Van der Horst, 2007; Devine-Wright, 2009; Petrova, 2016). Generally, NIMBYism is defined by those residents who are aware of the need for a development, such as a wind farm, *somewhere*; but oppose such a project in their own neighborhood. It is assumed that the motives of these individuals are selfish and parochial in nature (Dear, 1992). This view has frequently been reflected in media coverage of wind farm opposition, with commentators arguing that NIMBYs are halting the development of wind energy and that they are selfish and uninformed (The Irish Times, 2017; Toynbee, 2015; Clarke, 2014; Keller, 2010).

In Ireland, the SEAI investigated the strength of "NIMBY" attitudes towards wind farms vs other controversial developments such as mobile phone masts, electricity pylons, power stations and wooden electricity poles. This work asked individuals to rank their agreement with statements including:

"It would be very controversial (if one were nearby"; "I would be very unhappy if one were built nearby" and "I would campaign against having it built nearby."

For each of these statements the construction of wind turbines is considered second-least objectionable, with wooden electricity poles as least controversial (SEI, 2003).

Contrary to this report, much of the literature finds the labelling of those who oppose development in their area as NIMBYs too simplistic and argues for more in depth analysis into the motives and opinions of local residents.

McClymont and O'Hare (2008) argue that those considered NIMBYs are often attempting to protect their sense of community. They are also taking part in active participation; even though detractors may view this as "bad participation". This vilification of protests and opposition as the wrong type of participation negates any possible positive contribution from this cohort. The authors argue that there is a need for more detailed consideration of the motivations, actions and outcomes of oppositional groups. Similarly Devine-Wright (2009) argues that what many view as NIMBYism is in actual fact "place-protective action"; the need or desire to protect the emotional, cultural and social sense of belonging to a place when a new development appears to threaten this. The author concludes that if developers engage with communities in such a way that a new project enhanced local's sense of place rather than threaten it, opposition may be lessened.

Wolsink (2000) argues that NIMBYism is a lazy trope used to condemn all opposition to development. He also argues that it is difficult to find examples of individuals who are in favour of renewable energy in general but who oppose the construction of such project nearby for calculating and selfish reasons. Instead of labelling residents, he argues that developers should work on solidifying the institutional capital required to develop wind energy, incorporating open planning processes which include community consultation and participation.

Petrova (2016) advises that developers follow the "ENUF" framework, arguing that community acceptance will not be achieved unless developers *Engage* with residents from start to finish; *Never use nimby* as it is insufficient in describing the motivations of local residents; *Understand community perceptions and concerns* and *Facilitate* ongoing discussions and interaction with residents to allow them to implement their own energy choices.

Burningham et al. (2015) find that though developers are aware of the negative connotations associated with labelling all concerns as NIMBYism, their attitudes towards opposition still retain elements of this perspective. Opposing residents were assumed to hold incorrect knowledge and education was viewed as key to remedying this. Opponents were also seen as irrational or overly emotional in their opinions and developers also suggested that many community concerns over a development were disingenuous. Similarly Barnett et al. (2012) find that developers assume that residents will have concerns about a new development and that they lack the required knowledge or hold incorrect knowledge.

Instead of viewing negative reactions to development as NIMBYism, a more robust framework by which community perspectives and actions can be understood is required. The following sections highlight the role of citizen engagement and community and developer expectations, interaction and reactions in determining the acceptance of renewable energy projects.

2.4.2: Arnstein's ladder of citizen participation

Arnstein's 1969 work on social programs in the US highlights a broad spectrum of community participation, and provides a framework by which true meaningful engagement can be classified. She identifies citizen participation as the redistribution of power from the "haves" (the wealthy, those in power) to the "have nots" (the poor, minorities, those lacking power). Participation allows the "have nots" to make decisions about how planning decisions are undertaken, the information provided and the distribution of benefits. In this work, she provides 8 stages or "rungs" on a ladder of citizen participation.

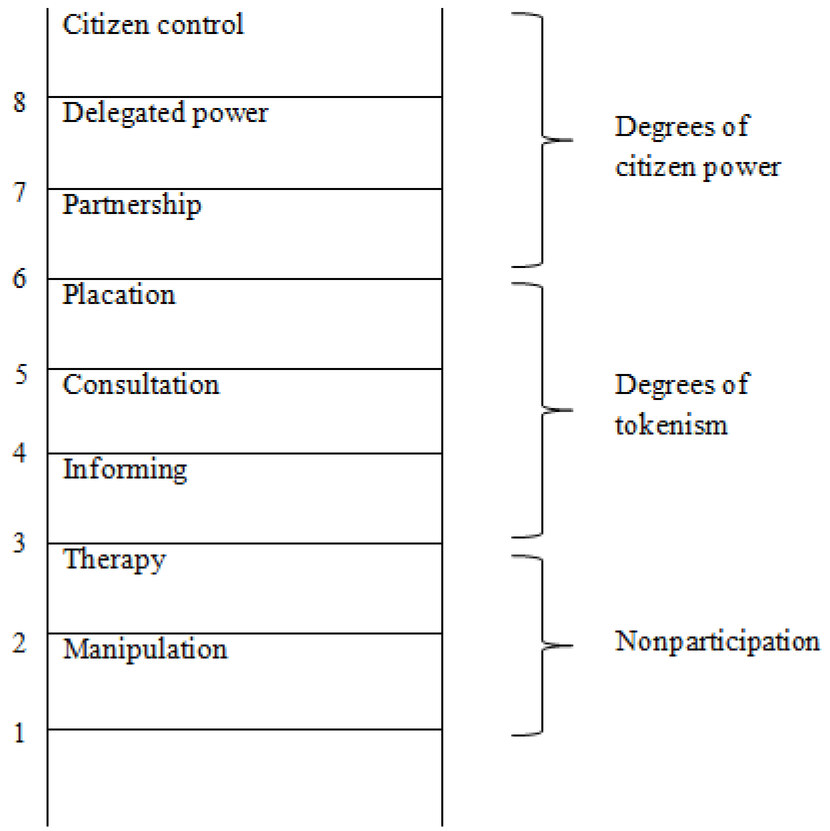


Figure 2.3: Arnstein's ladder of citizen participation (Arnstein, 1969)

This framework can be used to classify the type of community engagement carried out by wind farm developers. The bottom rungs of the ladder are manipulation and therapy. These types of engagement are regarded as "non-participation" as their goal is not to provide the public with control over the process but rather to "educate" or "cure" them of their beliefs. This could occur in wind farm developments where members of the public in the surrounding area are not informed about the full scale of the project or where advisory meetings are really exercises in support gathering.

The next three rungs are considered "tokenism". They allow members of the public to have their say but the "haves" retain the final decision-making power. Informing residents is regarded as the first true stage towards citizen participation. This stage does not allow for resident feedback. In wind farm developments, this stage may involve the provision of newspaper articles, flyers and posters about the project and basic responses to inquiries. Public meetings may be one-way if they provide basic information and discourage questions.

The next rung, consultation still does not guarantee that the public's opinion will be taken into account. This stage in a wind farm development may involve attitudinal surveys, local meetings and public forums. Residents who engage in consultation achieve nothing more than "participation in participation" and developers have performed a box-ticking exercise.

The first stage that allows citizens some influence is placation, though this is still regarded as tokenism. At this stage, a select resident may be chosen to act on a public board or in a decision making position, though he/she can easily be outvoted or bullied into submission by the power holders.

Rungs 6-8 signify levels of citizen power. At the partnership stage, power is redistributed through negotiation. This can occur in wind farm developments where the developer and community actively engage and negotiate over the planned project. This occurs best when the community is organised and has the financial capabilities and time to organise its own experts and leaders.

Rung 7 represents the stage at which the residents have more decision making power than the traditional "haves". When this occurs, the "haves" must bargain with the citizens rather than only engaging once under pressure from residents. In this situation, a wind farm developer may approach a community with a proposed development prior to the planning stage and open to negotiation, rather than announce a project post-planning as a fait accompli.

The final rung on the ladder of citizen participation is citizen control. At this stage, residents have the power to govern a program or development, are in charge of policy and managerial characteristics and can negotiate fully with any "haves" involved. In wind farm development, this level of participation may take the form of a community wind farm. This may still involve development and construction by private wind farm developers but residents can engage meaningfully with the private developers throughout the planning, construction and operational phases of the project. Residents have the final say over the scale and location of the project, how it is run and to whom the benefits are distributed (Arnstein, 1969).

2.4.3: Distributive and procedural justice:

The previous section highlights the importance of justice and fairness in the planning and outcomes of a wind farm development. These elements of justice which are particularly important in the context of renewable energy development are known as: distributive justice, which relates to the equitable distribution of benefits; and procedural justice, which concerns whether or not the process of development is viewed as being fair (Gross, 2007; Agterbosch et al. 2009; Hall et al. 2013).

Walker and Devine-Wright (2008) outline these aspects of fairness in planning and outcomes by indicating a space within which a commercial or community wind farm might operate:

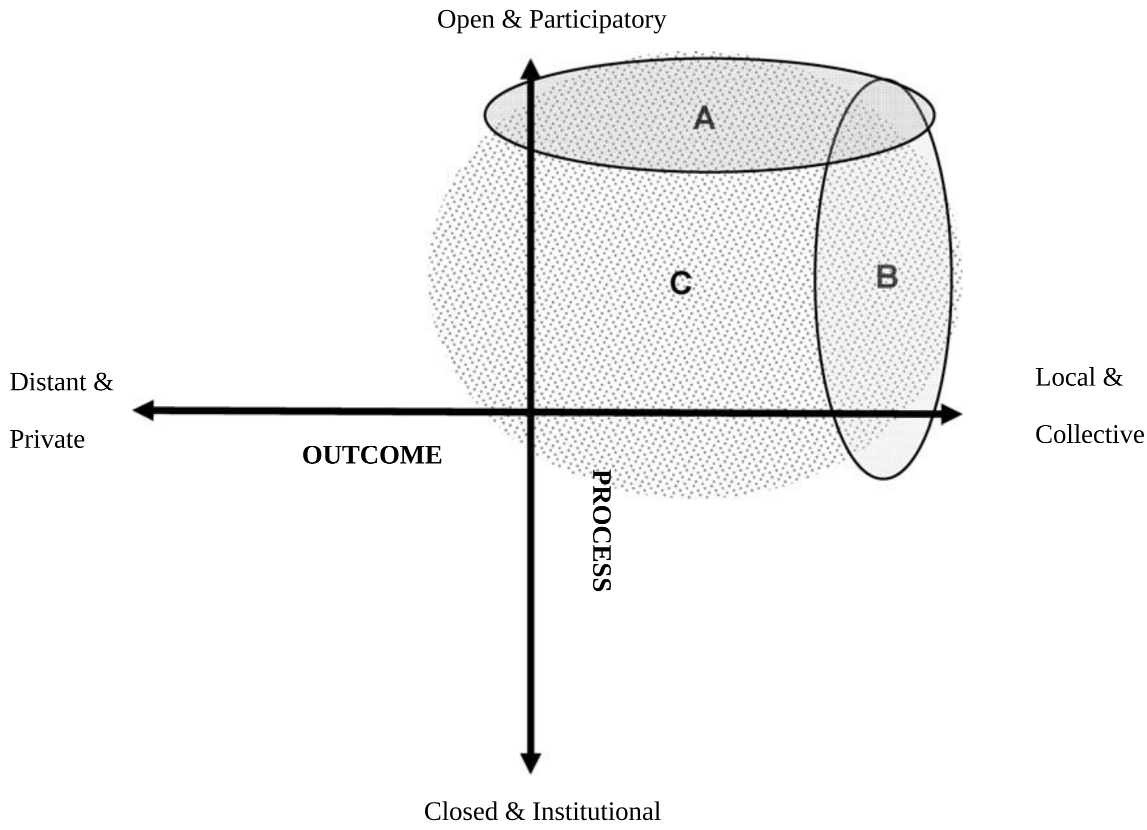


Figure 2.4: Understanding of community renewable energy in relation to project process and outcome dimensions (Walker and Devine-Wright, 2008).

In Figure 2.4, the vertical *process* element focuses on who develops and operates the wind farm and who can make decisions and have influence over the project. The process can range from one which is *open and participatory*, representing a wind farm that is transparent in its implementation and planning processes, incorporating the opinions and influences of a wide range of stakeholders; to one which is *closed and institutional*, with only the private operators having influence over the wind farm's operation.

The horizontal *outcome* element relates to the beneficiaries of the project, economically or socially. These benefits can range from those which are *local and collective,* with the majority of the benefits accruing to those in the vicinity of the wind farm to those which are *distant and private* at the other extreme, with most of the benefits being received by operators or owners who do not have any connection to the area within which the wind farm is located. A traditional privately operated wind farm would be located in the bottom left of the space whereas a “community” wind farm would be located on the top right. Community projects could be those which have high levels of involvement from local residents in the establishment and running of the project (A) or those which place the majority of the benefits of the project primarily in the surrounding area of the wind farm (B). A project which leads to some productive outcome for the locality, regardless of the extent of these benefits or the degree of involvement from residents, could also be considered a community project (C).

Cowell et al. (2012) indicate that wind energy developments create impacts on those around them that are considered to be negative. They also note that the distribution of these negative externalities are not shared equally by those in society and instead are focussed primarily on those closest to the turbines. These areas tend to be places that have experience in environmentally damaging activities such as coal mining, oil and gas exploitation. Many of these rural areas are also economically disadvantaged, with higher levels of isolation, deprivation and aging populations. While the provision of benefits could therefore be seen to engender social acceptance and demonstrate “good neighbourliness”, the authors recommend that the provision of benefits should be viewed instead as a method of increasing justice for those in the surrounding area of a development who disproportionally bear the costs of the project.

Hall et al. (2013) also note the importance of distributive justice, with respondents in their study suggesting methods for a more equitable distribution of project benefits for residents in the wider community. If the method of benefit provision is viewed as unjust then this can lead to social divisions. This study also highlights the importance of procedural justice, with respondents having strong preferences for planning processes that include open, participatory and transparent elements. Figure 2.5 outlines the forms of engagement community respondents requested in this study, from the pre-proposal stage to the finished project.

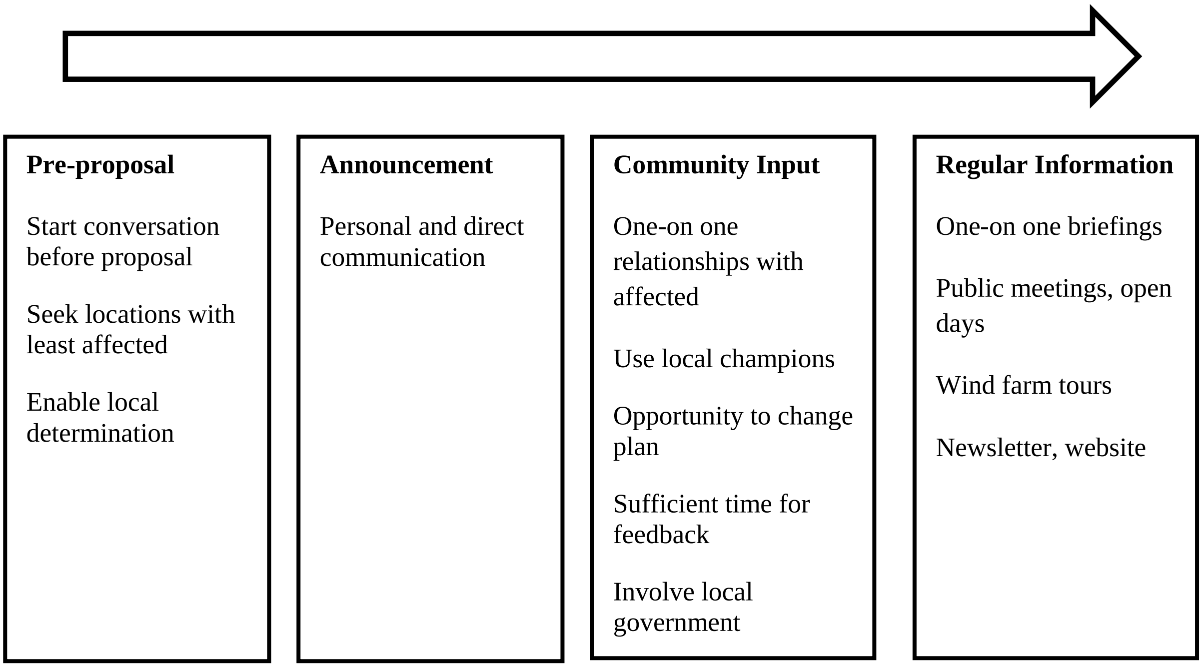


Figure 2.5: Consultation stages recommended (Hall et al. 2013)

In order to achieve procedural justice, local residents need to be involved actively in engagement processes and have real and significant influence over the decision making process (Hall et al. 2013).

Due to perceived injustice in wind farm planning procedures, Ottinger et al. (2014) propose a collaborative governance (CG) model, within which stakeholders construct the governance characteristics of the deliberative process. This could involve professionally conducted meetings with a wide range of stakeholders including residents, developers, local official etc. The developer’s plans would be inputs into the deliberation process and would not be set in stone. Instead, developers would be expected to revise these plans subject to the concerns of residents. This process would represent rung 7 (delegated power) on Arnstein's ladder of citizen engagement outlined in the previous section.

Gross (2007) outlines a community fairness framework which aims to increase the societal acceptance of wind energy. Respondents in her study were dissatisfied with the level of information provision, the degree of real engagement and the quality of interaction from wind farm developers. This work suggests that there are three types of fairness that matter: outcome favourability; outcome fairness and process fairness. Outcome favourability relates to the distribution of benefits and project outcomes, this affects the "winners", "losers" and those morally in favour or opposed to the development. These individuals either receive a personal benefit/ loss with the project outcome or have a strongly held belief in the project outcome. Outcome fairness also relates to distributive justice but impacts the "neutrals" and the "silent majority" who may not have an opinion but prefer that the outcome is fair in order to maintain social wellbeing. Lastly, process fairness relates to procedural justice and impacts the entire community as a fair process is more likely to lead to a just outcome (Gross, 2007).

These studies highlight the importance of distributive and procedural justice in terms of the community acceptance of wind energy. A key component of this perception of a fair process is engagement and interaction between local residents and wind farm developers. The following section outlines a framework for this process.

2.4.4: A framework of community engagement:

Walker et al (2011) provides a framework for understanding public engagement with renewable energy technologies. This framework begins by establishing the two way flow of engagement: the public's engagement with the technologies and the renewable energy agent's engagement with the public. These flows can occur in various ways and to various degrees. The framework describes the elements and processes which guide the interactions between the renewable energy agents and local residents.

This work acknowledges the role that interaction plays in influencing perspectives on a development. It criticises simplistic NIMBY explanations for negative attitudes towards development, which do not account for the role of developers, and instead focus wholly on the perceived "selfish" attitudes of residents.

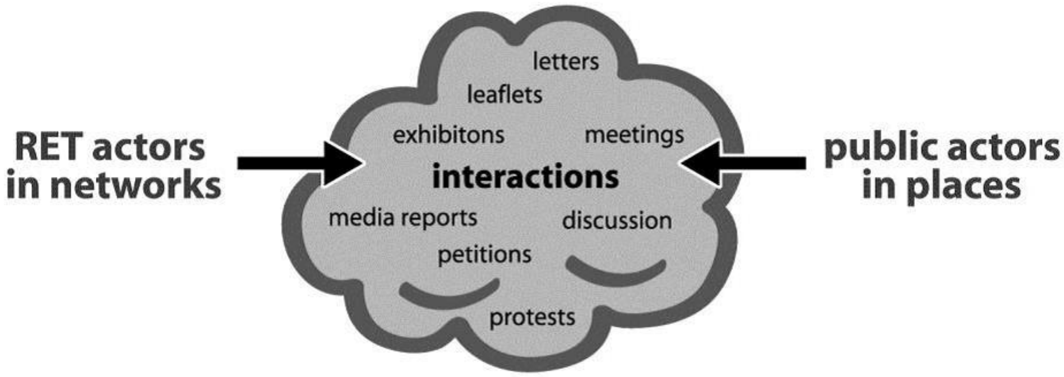


Figure 2.6: The main actors and their interaction (Walker et al., 2011)

Figure 2.6 indicates the key stakeholders involved and the interactions between them. "Public actors" in the context of a wind energy development represent local residents, individuals or groups in the surrounding area of a project. The wind energy actors include developers, consultants, PR companies and all other agents involved in the development of the project. These actors exchange information and experience across networks. The centre "cloud" in Figure 2.6 indicates the interactions that take place between the wind energy actors and the public actors through brochures, meetings, protests, discussions etc. The quantity and type of interaction can vary from project to project from minimal interaction to significant engagement.

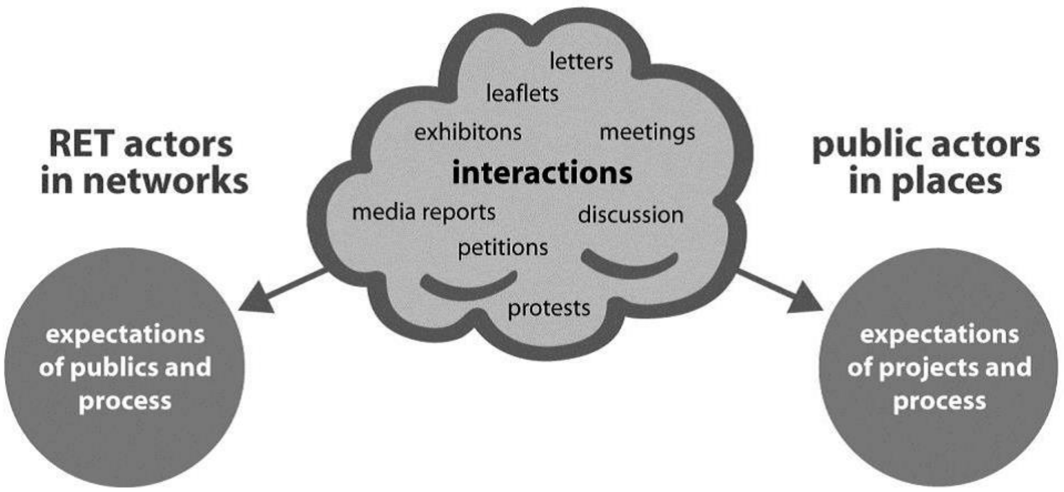


Figure 2.7: Actors, interactions and expectations (Walker et al., 2011)

Figure 2.7 provides the next stage in the framework to explain how these different stakeholders think and form opinions or expectations about a project. For residents in the surrounding area of a planned wind farm, these may include expectations about local benefits, what the farm will look like and what the potential negative externalities will be. These expectations may be influenced by many factors such as local media coverage and previous experience with wind energy developments.

There may also be expectations about the wind farm developer, which may be influenced by the "type" of developer they are (local, international, large scale developer etc.) as well as expectations about the planning process; what is fair, how locals should be included and informed. They may also have expectations about the fair distribution of project benefits.

Wind energy actors may also have expectations about the "public". The authors describe expectations which arose frequently from the wide ranging case studies they conducted. These include the presumption of hostility to a new development and the view that residents are behaving as "NIMBY's". Wind energy actors also have expectations, formed from experience, about how the project should be run and how developers should interact with the community.

The expectations of both wind energy actors and renewable energy actors may be formed prior to the announcement of a project but are influenced by the interactions that take place.

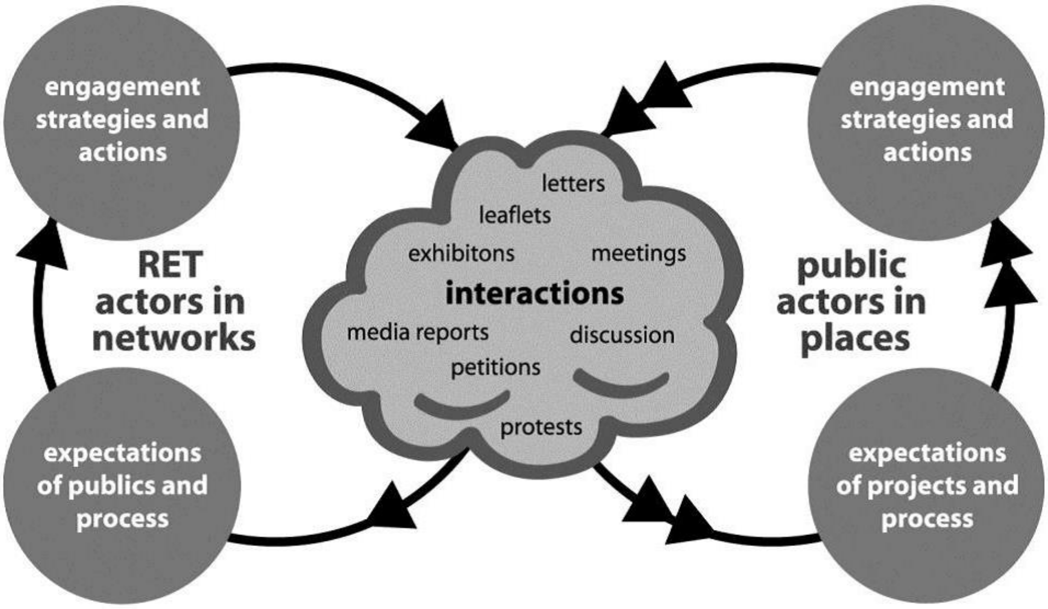


Figure 2.8: Engagements and feedback (Walker et al., 2011)

Next, Figure 2.8 adds in "engagement strategies and actions" which represent how each stakeholder group decides to engage (or not) with the interaction space. The link between these strategies and engagements imply that expectations about a project influence how and to what extent stakeholders will seek information, attend meetings, protest etc. This in turn shapes expectations which influence engagement strategies and so on. This process highlights how an initial negative perspective about a development could lead to the decision to attend a protest which could strengthen negative expectations, leading to further engagement actions etc.

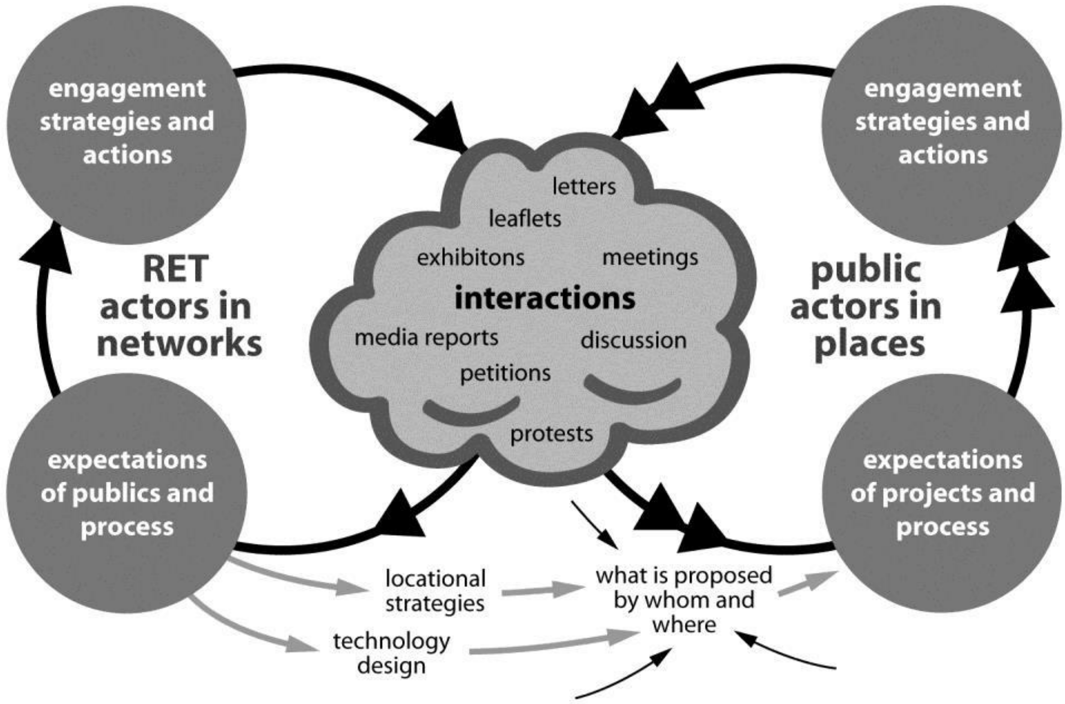


Figure 2.9: Connections between the expectations of the public, technology design and locational strategy (Walker et al. 2011).

Figure 2.9 provides the next stage in the framework by firstly highlighting how these expectations and interactions influence the design and location of the project from the perspective of the developer. For wind energy developments this may mean the decision to move to offshore wind, to construct fewer turbines, or to involve locals in the project due to expectations of public reactions. In this way public expectations may indirectly play a role in deciding the type and design of project proposed, where the project is developed and by whom. This proposed project then feeds into public expectations about the project.

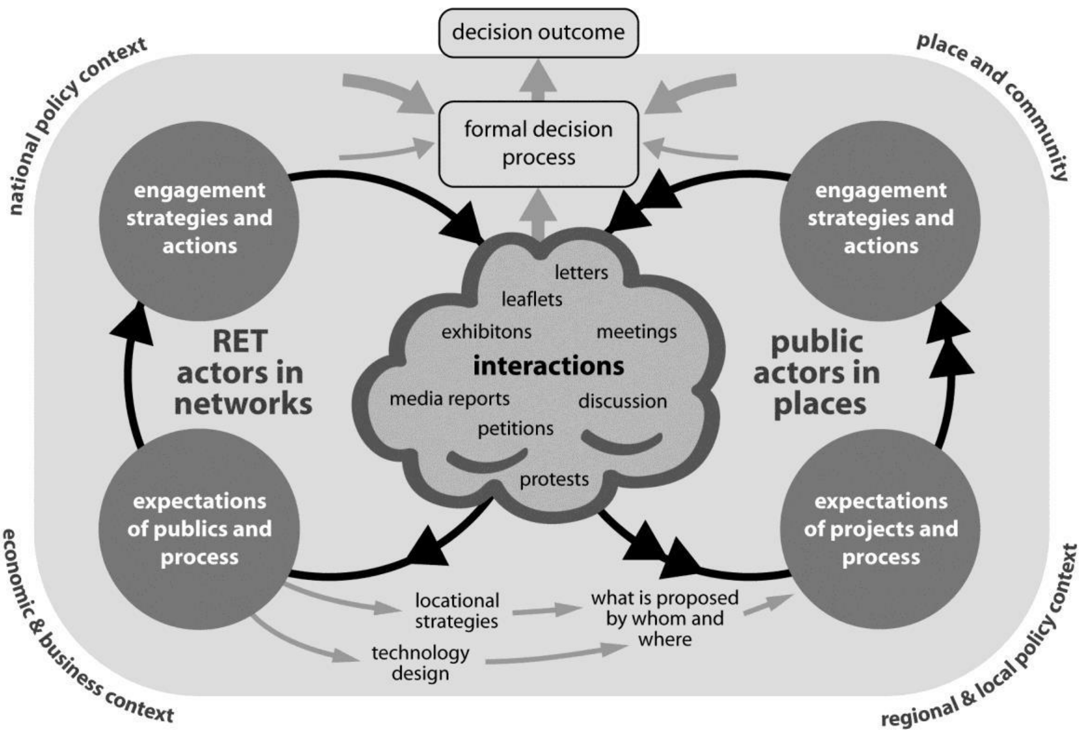


Figure 2.10: Full framework (Walker et al., 2011)

Finally, Figure 2.10 presents the full framework and indicates how local and national policy and context influence the decision process. Starting with the top right the characteristics of "place and community" (place attachment, landscape value, cultural heritage) can impact how members of the public form expectations and engagement strategies. Socio-demographic factors like income and number years residing in the area can also be strong influencers.

Next, both national and local policies can be important in terms of project funding, engagement strategies and in of forming public opinion through supportive or unsupportive renewable energy schemes.

The "economic and business context" can dictate the type of renewable energy project being deployed, the level of engagement and the locational decisions of developers as well as the degree to which public opinion matters for the project.

Finally, the decision making process, which can be lengthy and involve many stages, feeds into the decision outcome.

This framework highlights the multifaceted and complex factors which influence public opinions on renewable energy projects, incorporating the expectations and reactions of both renewable energy actors and the public.

2.5: Mixed methods: Triangulation:

So far this chapter has outlined the concepts of non-market valuation and the importance of community interaction and consultation with regards wind farm acceptance. While the use of non-market quantitative valuation techniques such as choice experiments can provide important insight into public preferences for wind farm acceptance, the incorporation of qualitative techniques can strengthen results and deliver new perspectives on the topic.

'Triangulation' involves the use of multiple methods to provide validity or increase understanding of a topic (Denzin, 1970). This may require the combination of two or more theories, data sources, methodologies or investigators. This technique can be used within methods, i.e. using two or more qualitative methods; or can be conducted between or across methods, incorporating both qualitative and quantitative techniques in the same study (Thurmond, 2001).

By combining qualitative and quantitative techniques (e.g. focus groups and survey techniques) many of the biases associated with the use of one methodology can be avoided. These can be biases associated with the way the data were collected (measurement bias), biases associated with the sample studied (sampling bias) and biases which occur when respondents feel pressured to provide information (procedural bias) (Yeasmin and Rahman, 2012). Triangulation can provide researchers with confidence in their results and uncover unexpected phenomenon in the study sample. This technique can also reveal meaningful data that would not have otherwise been revealed though the use of a singular methodology (Jick, 1979; Thurmond, 2001).

Johnson et al. (2007) suggest the different types of mixed methods research that can be conducted, outlined in Figure 2.11:

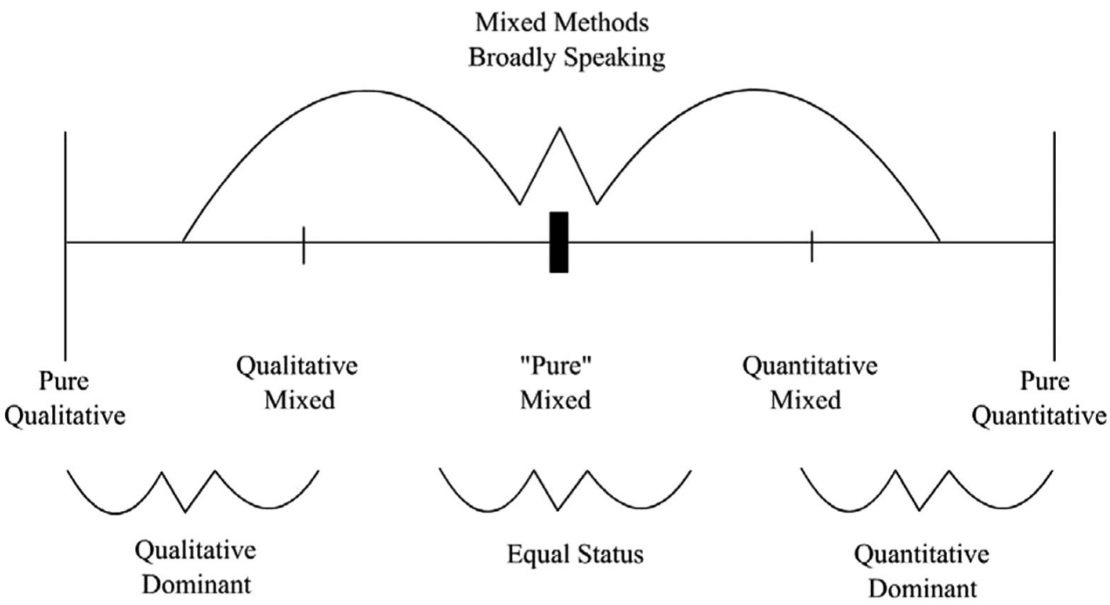


Figure 2.11: Three major research paradigms, including subtypes of mixed methods research (Johnson et al. 2007)

Mixed methods research can incorporate many overlapping sections of researchers or methodology type. Most mixed researchers belong primarily to one section: qualitative research, mixed research and quantitative research. In the centre of Figure 2.11; “pure mixed”; the researcher applies equal weighting to the importance of qualitative and quantitative research and believes that a combination of both can add insight to most, if not all research questions.

The second researcher type belongs in the qualitative dominant section. This researcher uses quantitative research in what is primarily qualitative work. Likewise, the quantitative dominant researcher applies quantitative research methods in the main, but recognises that the addition of qualitative research can improve the results or validity of most work (Johnson et al, 2007). Other non-mixed researchers belong at either end of the spectrum, either purely qualitative or quantitative.

There are disadvantages associated with triangulation, namely the increased time required to deploy and analyse two techniques; the difficulty in analysing large amounts of data; issues related to interviewer biases; conflicts arising from differing theoretical frameworks and a lack of understanding on the reasons for undertaking triangulation methods (Thurmond, 2001). Study replication is also quite difficult, particularly in the qualitative aspects (Jick, 1979). Despite these limitations, mixed methodologies offer new insight into research topics and can lead to superior findings over the use of one methodology alone (Johnson et al. 2007).

2.5.1: Focus groups in mixed methodologies:

The origin of focus groups can be traced back to the 1940's when Merton first introduced the concept of the "focused interview" as a reaction to poor scientific standards in the marketing field, which tended to lead subjects to a predetermined conclusion. The qualitative data from his research at this time indicated that interaction between subjects could result in more elaborative results (Merton, 1987). This interaction, based on attitudes and experience is of key interest to researchers (Morgan and Spanish, 1984).

Not all focus groups seek to generate the same types of information and so the distinction should be made between the different kinds of research being conducted.

Calder, 1977 distinguishes between three separate types of qualitative research approaches: exploratory, clinical and phenomenological. The exploratory approach incorporates focus groups that are conducted as a type of “pilot testing”. This type of research is commonplace at the outset of non-market wind farm valuation studies (Ek and Persson, 2006; Champ and Bishop, 2001; Álvarez-Farizo and Hanley, 2002). These groups may be used to check the wording of a survey or to clarify hypothesis and tend to be moderated in an unstructured fashion where open discourse amongst participants is encouraged. In this sense the researcher hopes to create scientific theories from the everyday knowledge of the subjects. This involves the notion of “grounded theory” which means that a theory has evolved from qualitative and quantitative research. This type of focus group serves as a starting point for further scientific research and should not be used to provide stand-alone conclusions, however they can also be used after quantitative research to confirm or clarify results. The clinical approach serves to counteract the weaknesses of self-reported responses in quantitative research which may not reveal the true causes of behavior. This approach seeks “depth” in responses and requires a skilled moderator to guide respondents to reveal their true feelings. This approach is applied and discussed in more detail in Chapter 4. The final phenomenological approach requires the moderator to observe respondents so closely that he or she almost becomes one of them. This approach is most commonly used in the field of sociology where moderators become involved in the lives of their subjects and share their experiences (Calder, 1977).

It is crucial for respondents to firstly find a common ground for discourse. This commonality means that they are acting and responding as a group; if this does not happen then these respondents are simply answering as individuals who share a common focus. Once this cohesion is established the respondents can then add their contributions to the commonality. They can do this by creating a narrative together or by referring to previous respondents discussions thereby strengthening the bond of the group (Hydén and Bullow, 2003). Interaction among participants can also take the form of interruptions, requesting or providing comparisons or by resolving differences through debate (Morgan and Spanish, 1984).

The information generated in a focus group differs to that provided by other forms of qualitative methods like individual interviews and these methodologies are complementary, not substitutes. Controversial or sensitive information is often easier to reveal through individual interviews, whereas focus groups provide a forum for in-depth discussion on a host of issues and an ideal setting for sourcing new information and ideas (Kaplowitz and Hoehn, 2000). Focus groups can be conducted as a stand-alone research exercise to analyse attitudes and opinions or in tandem with survey research, experiments or other qualitative methods to "triangulate" research (Morgan and Spanish, 1984). Focus groups can be used to confirm quantitative results or to clarify apparent contradictions (Wolff et al, 1993).

2.6: Conclusion:

The construction of a wind farm can result in a change in utility for those residing in the surrounding area**.** Stated preference studies allow researchers to assess the demand for the construction of a wind farm or maintenance of the current situation by using surveys to analyse consumer preferences for a hypothetical situation offering a change in the status quo. These techniques provide something that revealed preference methodologies fail to capture: non- use value, which may be significant for wind farm developments (Bergman et al. 2006) and the lack of which could underestimate the true value of an environmental resource (Parsons, 2003; Poor and Smith, 2004; Graves, 2007). Through rigorous design and thorough pilot testing, choice experiments in particular offer researchers a robust technique for analysing both use and non-use value for environmental protection, one which overcomes many of the limitations of other stated preference methodologies (Hanley et al. 1998; Adamowicz et al. 1998; Alpizar et al. 2003) and is therefore the non-market valuation methodology applied to the research in this thesis.

Through the use of qualitative and quantitative techniques, studies can be strengthened and new ideas can emerge. This thesis uses quantitative data from survey techniques as well as qualitative data from focus groups, conducted in a clinical manner, to elaborate on survey results and provide depth to the analysis of wind farm preferences amongst developers and community members in chapter 4.

Though many community concerns about the construction of wind turbines have been dismissed as NIMBYism by those in favour of development, this argument denigrates the true feelings and opinions of opponents, reducing their complex behaviour to that of a selfish agent. In chapter 5, those who choose to reject a wind farm development in the choice experiments are explored in detail to establish the specific factors which make an individual more likely to oppose.

Arnstein’s ladder of citizen participation and the framework for community engagement introduced in this chapter highlight the importance of true meaningful engagement and interaction with the community and the role that this plays in not only for the acceptance of wind farm developments but in the provision of distributive and procedural justice. These concepts form the basis for the introduction of a community consultation attribute in the choice experiment study outlined in the next chapter.

Chapter 3

Wind farm externalities and public preferences for community consultation in Ireland: A discrete choice experiments approach

Abstract

In Ireland the deployment of onshore wind turbines has become progressively more difficult in some areas because of the potential negative externalities associated with their operation. Using a discrete choice experiment (DCE) I employ a willingness to accept framework to estimate the external effects of wind turbines on local residents with the inclusion of community consultation and to quantify the compensation required to permit wind farms to be built in Ireland. My findings reveal that the majority of respondents are willing to make (monetary) tradeoffs to allow for wind power initiatives and I find that respondents require less compensation if provision is made for a community representative and setback distance is increased.

Key words: Discrete choice experiments, willingness to accept, windfarms, community representative, consultation.

3.1: Introduction:

Onshore wind energy is often hailed as a benign form of clean energy that is increasingly necessary in the transition toward greater environmental sustainability and a lower carbon footprint. This is particularly true for countries such as Ireland, which experience high wind regimes, have set ambitious renewable electricity targets for 2020 and have witnessed a rapid development of onshore wind capacity (McCarthy, 2010). Energy supplied from Irish wind farms increased from 16 GWh (gigawatt hours) in 1995 to 4,010 GWh by 2012 (SEAI, 2014) and presently 224 onshore turbines provide 16.3% of domestic electricity supply (Eirgrid, 2013). Expansion of onshore wind is expected to dominate the sector with a further 200 MW of new wind generation per annum by 2020 in order to meet the compulsory target of 40% renewable electricity by 2020 (DCENR, 2012). However, the proposed expansion of onshore wind is not without its critics.

Although there is evidence to suggest that consumers are willing to pay a premium for renewable energy (Longo et al., 2008; Zografakis et al., 2010) and there is widespread public support for renewable energy and onshore wind farms in Ireland and elsewhere (Warren et al., 2005, Eurobarometer, 2011; Hobman et al., 2012), individual wind farm projects across many jurisdictions, Ireland included, have faced significant local resistance (Wüstenhagen et al., 2007). Consequently, substantial research has been devoted to questions regarding their social acceptability and the negative externalities associated with their operation (Groothuis et al., 2008; Heintzelman and Tuttle, 2012; Jensen et al., 2014). As indicated in chapter 1 and 2, the construction of wind farm developments can result in negative externalities which tend to be concentrated on those in close proximity to the project. Localised negative externalities come in different forms and include landscape and biodiversity (Ladenburg, 2009a), noise pollution and shadow flicker (Devine-Wright, 2005a; Jensen et al., 2014) and declining residential property prices (Heintzelman and Tuttle, 2012; Jensen et al., 2014). These in turn frequently give rise to the ‘Not-in-my-back-yard’ or ‘NIMBY’ syndrome. Economists argue that NIMBYism results in an inefficient allocation of resources since the external costs of a wind farm are borne locally by the community surrounding the development while the benefits are distributed at large throughout the economy (Krueger et al., 2011). However, as outlined in the previous chapter a number of studies indicate that NIMBYism is too simplistic (Devine-Wright, 2005a; Wolsink, 2007), and they suggest instead that local attitudes are affected by the use of more deliberative approaches to planning (Gross, 2007; Wüstenhagen et al., 2007; Eltham et al., 2008; Hall et al., 2013), early and increased community consultation (Gross, 2007; Ek and Persson, 2014) and by providing employment and local ownership (Christensen and Lund, 1998; Maruyama et al., 2007).

In this chapter, I investigate whether enhanced community consultation between citizens and developers influences willingness to accept (WTA) for wind farms in Ireland. To my knowledge this is a novel exercise. My analysis differs from the choice experiment literature on the visual and physical impact of wind farms (Álvarez-Farizo and Hanley, 2002; Bergmann et al., 2006; Ladenburg and Dubgaard, 2009; Ku and Yoo, 2010; Meyerhoff et al., 2010; Heintzelman and Tuttle, 2012; Jensen et al., 2014), and from studies that consider the importance of institutional and social aspects such as type of ownership (Ek and Persson, 2014) and whether locals are involved in the planning process (Dimitropoulos and Kontoleon, 2009). My approach provides insights into how to address wind farm externalities through improved community consultation between wind farm developers and the Irish public. Implicit tradeoffs are probable between social and physical attributes and both will likely influence WTA values. Altering setback distance and community consultation may provide a means of addressing external effects associated with wind farms in Ireland and they both involve social and private costs. This research aims to: 1) establish if local communities are willing to accept compensation for wind farm production in their area; 2) identify factors that influence WTA compensation for wind farms in Ireland; 3) develop a framework to investigate tradeoffs between physical and social attributes that influence social acceptance of wind farms, and 4) identify efficient policy scenarios that internalize the social costs associated with Irish wind farms by combining social or institutional factors such as community consultation with alternative physical attribute levels (setback distance, number of turbines).

This chapter proceeds as follows: First, a literature review and some background to the topic is given on wind farm externalities and approaches used to measure them. Next, a description of the survey instrument and methodological approach is provided. Then, the empirical strategy used to explore the relationship between wind farm externalities and compensation is presented and the results discussed. Final remarks and considerations are offered in the conclusions.

3.2: Literature review:

Previous work on renewable energy from wind farms has focused on consumers' willingness to pay for renewables including environmental and physical impacts (Álvarez-Farizo and Hanley, 2002; Bergmann et al., 2006; Ladenburg and Dubgaard, 2009; Ku and Yoo, 2010; Meyerhoff et al., 2010; Heintzelman and Tuttle, 2012; Jensen et al., 2014), on social and institutional aspects (Christensen and Lund, 1998; Devine-Wright, 2005b; Maruyama et al., 2007; Wolsink, 2007; Ek and Persson, 2014), on energy security (Eltham et al., 2008), on the spatial allocation of wind farms (Meyerhoff et al., 2010), the level of experience of wind farms (Eltham et al, 2008; Kaldellis et al, 2013) , community consultation and information provision (Beddoe and Chamberlain, 2003; Zarnikau 2003; Gross, 2007; Hobman, 2012) and whether locals are involved in the planning process (Gross, 2007; Wüstenhagen et al., 2007; Eltham et al., 2008; Dimitropoulos, and Kontoleon, 2009; Hall et al. 2013; Ek and Persson, 2014).

In the main this work has used the contingent valuation method (Koundouri et al., 2009; Yoo and Kwak, 2009; Kontogianni et al., 2013) and choice experiments (Bergmann et al., 2006; Meyerhoff et al., 2010; Ek and Persson, 2014).

3.2.1: Choice experiment studies:

Studies using choice experiments have focused on the externalities associated with the physical attributes of wind farms such as turbine height (Dimitropoulos and Kontoleon, 2009; Vecchiato, 2014), size (Alvarez-Farizo and Hanley, 2002; Dimitropoulos and Kontoleon, 2009; Vecchiato, 2014) and distance between wind farms and residential dwellings and towns or villages (Fimereli, et al., 2008;

Meyerhoff, et al., 2010; Vecchiato, 2014). In general the literature indicates that individuals prefer to move onshore wind turbines further away from residential dwellings and settlements (Meyerhoff, et al., 2010). Findings from the literature with respect to turbine height and size are more mixed. In Germany, Meyerhoff, et al. (2010) report that turbine height does not affect individual choices and Navrud and Bräten (2007) indicate that fewer larger turbines are preferred whereas other studies (Ek, 2006; Bergmann et al., 2008) report that smaller wind farms are given preference. The choice experiment literature on the topic suggests that institutional, social and demographic factors may also play an important role in wind farm acceptance. With respect to institutional and social factors Ek and Persson (2014) report that Swedish consumers are WTP an increased renewable electricity fee provided that the wind farm is either owned partially or in whole by the local community and that local residents are involved in the planning process. Other studies suggest that being involved in wind farm ownership (Strazzera et al., 2012), employment (Álvarez-Farizo and Hanley, 2002; Bergmann et al., 2006) or other benefit sharing arrangements (Maruyama, et al., 2007) represent important factors that influence local acceptance. In Greece, Dimitropoulos, and Kontoleon (2009) find that respondents value participation in the planning process more highly than the number of turbines or their height.

In relation to demographic factors respondent income (Ladenburg and Dubgaard, 2007; Groothuis et al, 2008) and gender (Wiser, 2007; Kruegar et al., 2011; Susaeta et al, 2011; Ek and Persson, 2014) are also thought to influence the social acceptance of wind farms. Groothuis et al. (2008) find that respondents willingness to accept wind farm development decreases as income increases and Kruegar et al. (2011) report that male respondents were less tolerant of offshore wind farms compared with their female counterparts due to the impact of wind farms on the environment.

To my knowledge, this work is the first to put a value on community consultation between residents and the developer regarding a wind farm project. The willingness to accept format is employed in preference to WTP approach. As discussed in chapter 2, although it is customary to employ willingness to pay in choice experiments, WTA is more suitable in cases where the respondent is forgoing a good. In circumstances when individuals perceive the status quo defines the property rights the WTA becomes the relevant measure for compensation. The WTA framework therefore is appropriate considering the perceived property rights of individuals in this context. Choice experiments have been used successfully in the past to estimate WTA (Groothuis et al., 2008; Dimitropoulos and Kontoleon, 2009; Strazzera et al., 2012) in relation to wind farm externalities.

3.3: Methods and data:

Choice experiments can be traced back to Lancaster's (1966) "characteristics theory of value" which claims that the utility individuals derive from a commodity or a programme is based upon various attributes embedded in it. Respondents are typically required to make choices between hypothetical goods, services or projects described by a set of attributes which differ in terms of the level that the attributes take. In choice experiments it is crucial to present a clear description of the hypothetical good respondents are required to value and the attributes and levels needs to be relevant and understandable to respondents. In choosing alternatives respondents trade-off the levels of the attributes, of the service or project enabling the analyst to infer the

WTP/WTA for the good in question and the value of the attribute (Álvarez-Farizo and Hanley, 2002). Identifying the attributes and their corresponding levels can be a challenging task involving both results from the related literature and deliberations with focus groups and pilot surveys.

The attributes were identified following a two stage process that involved an initial scoping exercise followed by three public focus groups held in the west, midlands, and south midlands of Ireland. The scoping exercise involved a short preliminary face-to-face survey (outlined in Appendix II) of 36 local residents (15 women and 21 men) from these three regions between November 2013 and April 2014. The last page of the pilot survey included an option to participate in a focus group. The focus group participants were chosen from those who had selected this option in the affirmative. The three focus groups were held between March 2014 and February 2015 and involved 13 participants (7 women, 6 men aged between 23 and 77). Two separate focus groups were also held with wind farm developers. Further details on these participants and results from this work are discussed in the next chapter.

The choice experiments formed part of a survey which explored attitudes, experiences and demographic issues. The following section outlines the process of designing the survey questions.

3.3.1: Survey introduction and environmental attitudes:

The final survey is outlined in Appendix I. The cover page of the survey asked for name and address details. Interviewers then noted the date, start time, GPS coordinates of the location using their smart phone, the gender of the interviewee and at the end of the interview asked if the respondent was willing to partake in a focus group.

Section A aimed to explore general attitudes towards environmental issues and wind energy. The first question in the survey asked respondents to rank on a scale of 1 (very unimportant) to 10 (very important) the importance of environmental issues to them. Examples of environmental issues are given including pollution, recycling and climate change. Previous work has established that those with an interest in “green” issues are more likely to be in favour of wind energy in Sweden (Ek, 2005) and so this question was included to test the effect for Irish respondents. The question was framed as a scale due to the wide range of topics that might fall under “environmental”, making this question less well disposed to a simple “yes-no” framework.

As a follow-up to this question respondents are then asked to rank the importance of tackling climate change versus other government priorities, including reducing crime, employment, improving the health service etc. Previous studies have ranked the importance of climate change vs other governmental issues in the US, where it ranks poorly amongst the public in comparison to issues related to the economy, health care, education and tax reform among others (Saint Leo University Polling Institute, 2015; Leiserowitz et al., 2014). Similar priority areas to these studies were included.

The next question explored whether or not respondents believe there are enough wind farms in Ireland. This question was based on the Strategy for Renewable Energy 2012-2020 claim that significantly more wind farms, both on and offshore, will need to be constructed in order to achieve 2020 targets through wind (DCENR, 2012). This question offers the individual the choice between 5 options. This question was tested in the pilot survey and focus groups. Each respondent was able to select their preferred response without difficulty.

Following this, interviewees were asked their opinion about wind energy for export in particular. In the pilot survey, a specific section was dedicated to the export issue. However, as exportation to the UK was no longer a priority for the Irish government following the cancellation of the midlands development, this was amended to a simple “yes/no/I don’t know” framework.

3.3.2: Experience with wind energy

Section B in the survey requested information on respondent’s local wind farm, either in construction or in place. Only those who regarded themselves as living “near” a wind farm completed this section. Individuals self-selected whether or not they lived close to a wind farm. This method was chosen to prevent any introduction of bias by the interviewer. People may technically live within 2Km of a wind farm but may not consider themselves to live near one due to the layout of the landscape or turbine positioning. 124 out of 200 respondents completed this section.

The first question in this section asked individuals how far they lived from the nearest wind farm. The closest distance selected was 500m or less. This was selected due to the standard planning recommendations of 500m as a minimum setback distance (DECLG, 2013). The pilot survey asked a similar question of respondents starting at a minimum setback distance of less than 250m, however nobody lived this close. In the pilot, options were offered in bands, e.g. 500m-1Km, however it was decided to break these up into separate options with 500m intervals to offer more detailed responses.

The distances were offered both in metres, kilometres and miles following feedback from the pilot surveys, which only offered metres and kilometres. Though no maximum distance was set, the final distance option was selected as 4Km or more. The maximum distance stated by respondents in the pilot survey was 3-5Km. Respondents who stated that they did not live near a wind farm moved on to the choice experiment section.

The next question asked when individuals moved into their home. This is part of a number of questions in this section which aimed to establish attitudes towards development over time. The options included: before the wind farm, during construction, less than a year after the wind farm, more than a year after the wind farm or “don’t know”. Previous studies have found that attitudes towards wind energy can change from positive in the pre-planning stage, to negative following the announcement of a wind farm to even more positive than before once the development is established (Wolsink, 2006). Only those who moved in before or during the development answered the next question which asked respondents to think back to the construction stage and rank their feelings about the development from 1 (very negative) to 10 (very positive). This is similar to the technique used by Eltham et al. (2008) in their study in the UK.

The next question in this section relates to the purchasing of shares in the local wind farm. Respondents were asked if they would have been interested in purchasing shares. There are four options; yes, no, “I already own shares in the development” and “I don’t know”. Maruyama et al. (2007) find that the owning a share in a wind farm project can increase community acceptance, and the developer focus groups conducted in my study (discussed further in chapter 4) suggested that developers favour this type of community engagement above other methods. This question aimed to establish how the community respondents felt about share ownership. The following question elaborated on this, asking for approximate amounts that respondents would be willing to spend on shares. Purchasing a share in a wind farm can cost under £100 in the UK (Harrabin, 2014; Awel Co-op, 2016) so the minimum amount was set from €0-€99. 8 more bands were included up to the final amount of over €10,000. At this amount respondents were asked to write in the amount they would be willing to spend. The option “I don’t know” was also included.

Next, interviewees were asked if their community benefited in any way from the wind farm in their area. Several studies have found that the acceptance of wind energy is strengthened if residents believe they benefit from the development (Bidwell, 2013; Chen et al. 2015; Caporale and De Lucia, 2015; Guo et al. 2015). This is the first of four questions which probe local provision of benefits in this section. Following this, residents who did not answer no to the previous question were asked to elaborate and define all of the benefits they feel have been provided to their community from their nearest wind farm. These included those benefits most frequently cited in the literature and those preferred by community focus group respondents. An “other” option was included for respondents to include a benefit not specified and “I don’t know” was also included for those who believe benefits were provided but were unsure as to how to define them.

Next, residents were asked if they personally benefitted in any way in a simple “yes/no” format. If they responded yes, they were asked to define the monetary value of this benefit. Sample amounts are provided in monthly, annual and 25 year totals to aid in the calculation. As the benefit could range from a small amount (e.g. the monetary value of the utility gained from a local park) to a large amount (employment) an “other” category was included for residents to specify they type and amount of benefit in monetary amounts.

Finally, individuals were asked to rank how they felt about the development *now*, from a scale of 1 (very negative) to 10 (very positive). This returns back to the questions seeking to establish the change in feeling about the wind farm over time.

3.3.3: Choice set attribute selection

Section C in the final survey begins with an introduction to the wind farm choice sets. This section established that this would be a new wind farm in their area and would be in addition to any wind farms that already exist. The attributes are then introduced to the respondents. Table 3.1 outlines the attributes and levels used in the choice experiment.

Table 3.1: Attributes and levels used in the choice experiment:

Attributes	Information provided	Levels
Electricity discount	This refers to compensation paid to you for this wind farm development, in the form of a discount in your electricity bills each year over the project lifetime (20 years).	€110 €280 €450 €620
Number of turbines	This indicates the maximum amount of turbines in this wind farm for the project lifetime (20 years).	8 20 40
Turbine height	This indicates the maximum height of the turbines from base to blade tip in this wind farm.	80m 130m 180m
Setback	This refers to the minimum distance that these new turbines will be required to be spaced from your home.	500m 1000m 1500m

Community representative	This refers to the presence or not of a community rep to act as a negotiator for the community. This rep meets with local residents who are likely to be affected by development and organises public meetings for those interested. This rep provides information and updates about the development and meets with the developer to present community concerns and negotiate on behalf of the community.	Yes No

3.3.4: Electricity discount:

The first attribute presented to respondents is the electricity discount. In the pilot survey, respondents were faced with the choice between 4 different benefit schemes to act as compensation for wind farm development in their area. Two of these were paid privately to the individual, either in the form of a discount on their electricity bills or private monetary compensation. The other two were funds that would go to their local community. The question that was presented in the pilot survey is outlined in Table 3.2.

Table 3.2: Compensation mechanism

	Subsidised electricity	*Community fund*	*Private compensation*	*Public amenity*
Who is it paid to?	You	Local committee/council	You	Local committee/council
How much?	10-55% discount	€250,000-€1,000,000	€1,000-€6,000	€250,000-€1,000,000
How often?	Every bill during project lifetime	Every year during project lifetime	One-off Payment	One-off payment
Any conditions?	No	No	No	Yes: Must be spent on recreational project for whole community
Tick				

The estimates for the community payments were adapted from similar community benefit guidelines of £5000 per MW per annum in the UK (Highland Council, 2013; DECC, 2014), however a typographical error in this version of the pilot survey meant that the “community fund” option paid €250,000-€1,000,000 annually, when this was meant to state €25,000-€100,000 annually, significantly overstating the benefits to the community.

The electricity discount amounts were based on similar community benefits programmes in the UK (Auchrobert wind farm, 2012) and on the average electricity usage of a standard Irish 3 bedroom home of €1257 per annum (Money Guide Ireland, 2017). The one-off private compensation was estimated at up to the equivalent of a 25% electricity discount over 20 years. The pilot survey results indicated that 14 of the 36 respondents selected subsidised electricity as the appropriate compensation mechanism, making it the most favoured choice. Likely due to the typographical error, the second favoured option was the community fund, with 11 respondents selecting this. 7 respondents wished to have a public amenity and 4 selected the private compensation.

To further clarify the correct payment mechanism, focus group respondents were asked for their preferred form of compensation. When prompted for their preferred payment type, all participants were unanimous in selecting subsidised electricity.

Participants frequently discussed electricity discounts unprompted throughout the focus group discussions. Those living near wind farms proposed that if a wind farm development was to be announced then the people close to it would have to be compensated. A staggered compensation system was also suggested by participants, whereby those closest to the development got a higher amount of free electricity units than those further away. There was also a sense that looking for monetary compensation from the developer might be inappropriate but as the wind farm was generating electricity this should be of benefit for those residing locally. It was suggested that a project would be viewed more favourably if it reduced electricity bills for those in the area:

> Like it wouldn't be a major problem for me to have wind turbine, 69 wind turbines out in the bog if it were making a difference in my life, my bills every month, but like, it doesn't at all like. (Local [10])

Being offered reduced electricity was seen as addressing concerns of fairness and distributional justice for participants:

> There's nothing there only for the people that have invested in them. There's nothing for us, we're not getting free electricity or anything like that. (Local [17])

Studies point to local benefit schemes over private compensation as a potential route to improved community acceptance (Walker et al. 2014; Cass et al. 2010) and many Irish wind farm developers participate in some form of community benefit programme (Windfarm Community Funds, 2014; Bord na Mona, 2015; Sliabh Bawn Power, 2017b). The IWEA suggests that developers provide community support of at least €1000 per MW per annum for the lifetime of the project. These payments/ benefits in kind should begin no later than twelve months from the completion of the project (IWEA, 2013).

However, other studies have suggested that benefits in this form may come too late. Accusations of bribery are difficult to escape even if funding is paid to the community and not individuals, and without early and meaningful consultation with residents levels of acceptance may not improve (Aitken, 2010).

The resident's views outlined above suggest that private compensation, in the form of an electricity discount was more appropriate than some form of community benefit. Similarly, Cass et al. (2010) found that there was an assumption on the part of residents that a wind farm could provide cheaper or free electricity bills for those living nearby but that wind farm developers were not supplying this benefit. While respondents in their study were sceptical about the provision of community benefits, there was still a feeling that benefits should be delivered.

The results here suggest that the provision of community benefits, seen as the most suitable form of payment for the wind industry in Ireland (IWEA, 2013; Windfarm Community Funds, 2014; Bord na Mona, 2015; Sliabh Bawn Power, 2017b) may not be the form of payment preferred by residents, and instead developers should look to provide discounted electricity to those living closest to the projects. Similar discount schemes have been established in the UK offering reductions of £200 per annum (Local Electricity Discount Scheme, 2015). Industry research in the UK suggests that up to 74% of respondents in a survey stated they would support a wind farm if they received reduced electricity from it (Hillard, 2016).

Using the preferred choices of focus group respondents and following the literature (Bergmann et al., 2006; Meyerhoff et al., 2010), a decrease in the electricity bill was selected as the payment mechanism for the choice experiment.

3.3.5: Number of turbines and turbine height:

The attributes in the choice sets also included the physical attributes of number of turbines and turbine height. One of the questions in the pilot survey asked respondents how important a number of physical attributes of wind farms were to them if a new wind farm was to be established in their area. These were chosen based on the key literature and respondents were asked to rank the importance (from very important to very unimportant) of the following: wind farm size (Álvarez-Farizo and Hanley, 2002), number of wind turbines (Dimitropoulos and Kontoleon, 2009) and wind turbine height (Vecchiato, 2014).

33 of the 36 respondents stated that wind farm size was at least important, 27 respondents stated that the number of turbines was at least important and 24

respondents indicated that wind turbine height was at least important. As “size” is non-specific, and following the literature, the physical attributes number of turbines and height were selected to avoid confusion.

At the time of survey writing, there were 102 wind farms in Ireland with 10 or fewer turbines (totaling 525 turbines); 22 with between 15 to 25 turbines (totaling 408 turbines) and just 3 with between more than 35 turbines (totaling 143 turbines). The midlands exportation project, detailed in the next chapter, would have involved the construction of at least 1500 additional turbines across 5 counties. In their choice experiment study on two Greek islands, Dimitropoulos and Kontoleon (2009) selected between 2-6 turbines to represent a small wind farm, 7-13 to represent a medium wind farm, 14-20 turbines to represent a large wind farm and 21-40 to represent a larger wind farm. Following this, and the specific Irish data, 8 turbines were defined as a small wind farm, 20 as a medium wind farm and 40 turbines as a large wind farm.

At the time of survey writing, the most common private wind turbine in Ireland was a 0.84 MW turbine with a base to tip height of 75 metres (SEAI, 2004). Modern commercial turbines range up to approximately 120m in height (IWEA, 2008b). The midlands export development proposed wind turbines of up to 180m in height (Dail Éireann, 2013). Following this, and the literature (Vecchiato, 2014; Dimitropolous and Kontoleon, 2009) three height levels were selected: 80m, 120m and 180m.

3.3.6: Community representation

In chapter 2, the importance of distributive and procedural justice was highlighted, indicating the role that benefit provision and fairness in planning decisions plays in terms of wind farm acceptance (Ottinger et al. 2014; Cowell et al. 2012; Hall et al.

2013; Gross, 2007). Walker et al. (2011) outlined the impact that interaction between wind energy agents and community members has on the final decision outcome of a development. Arnstein's ladder of citizen participation portrayed the different possible levels of engagement that can take place. This ranged from nonparticipation where local residents are not given a voice; tokenism, where residents are provided with the illusion of choice in the outcome; and degrees of citizen power, where residents can make decisions, are actively involved in the planning process and in choosing the form and amount of benefits which arise from development. In this citizen power stage, developers approach residents at an early stage to negotiate on outcomes. This works well when the community has the financial ability to organise its own leaders and experts (Arnstein, 1969).

One of the questions in the pilot survey asked respondents their opinions about specific wind farm characteristics and included several options relating to the social attributes of development, incorporating possible ownership and interaction structures. These were chosen based on the key literature and respondents were asked to rank the importance (from very important to very unimportant) of the following: who owns the wind farm (Enevoldsen and Sovacool, 2016; Ek and Persson, 2014; Strazzera et al., 2012), compensation (Guo et al. 2015; Bidwell, 2013; Hall et al. 2013; Cowell et al. 2012), the amount of information provided (Gross; 2007; Beddoe and Chamberlain, 2003; Krohn and Damborg, 1999), job opportunities (Caporale and De Lucia, 2015), the amount of influence locals have over the project (Petrova, 2016; Hammami et al. 2016; Cotton and Devine-Wright, 2012; Agterbosch et al. 2009; Dimitropoulos, and Kontoleon, 2009) and whether or not locals can have the opportunity to own shares in the wind farm (Devine-Wright, 2005a; Maruyama et al. 2007).

Figure 3.1 outlines the number of respondents who stated that the above characteristics were *at least* important to them if a new wind farm were to be established in their area.

Figure 3.1: The importance of social wind farm characteristics

The results indicated that the most important social attributes to respondents were the amount of information provided and the amount of influence locals would have over the development.

This pilot survey explored the concept of information and interaction further, and included a section which offered respondents the choice between 3 website options. This question is outlined in Table 3.3. The first level (Bronze) offered respondents minimal information about a new development and this was provided free of charge. This represents the current minimal level of information provision required by the majority of wind farm developers in Ireland that is easily available to the public free of charge (IWEA, 2008b). The second level (Silver) offers more information including maps, distance to homes and timeline information. This is offered to respondents at the price of €3 per development searched. This represents a high information choice, but excludes the option to interact with the developer. The option to interact is provided in the final "Gold" level for the price of €5 per development searched. Similar wind farm project websites with maps, timeline details, project size details and contact information have been developed in Ireland, however these are provided to the public free of charge (Sliabh Bawn Power, 2017a; Raheenleagh Wind Farm, 2015). The amounts chosen were kept small bearing in mind that respondents may wish to look up more than one wind farm and interact with more than one developer and the availability of free information online. The labels of Bronze, Silver and Gold were chosen to replicate similar online purchasing options that respondents may make between different products (Website Works, 2011; Nuhaus, 2015; HEAnet, 2016). There may however be a framing issue with the labelling in this question, with Gold suggesting a "better" option than Bronze. Despite this the responses can still provide an indication of the importance of information and interaction to residents.

Table 3.3: Wind farm interaction and information website:

	1	***2***	***3***
Information provided	***Bronze***	***Silver***	***Gold***
No. of turbines	✓	✓	✓
Location	✓	✓	✓
Name of applicant	✓	✓	✓
MW of development	✓	✓	✓

Maps	No	✓	✓
Environmental impact statement	No	✓	✓
Distance to houses	No	✓	✓
Timeline information	No	✓	✓
Information on likely disruption dates	No	✓	✓
Interaction with developer through website	No	No	✓
Cost per development searched	Free	€3.00	€5.00
Tick			

One pilot respondent did not complete this question, so the results in Figure 3.2 are for 35 respondents. 32 respondents were willing to pay some amount for extended information provision. 19 were willing to pay the highest amount of €5, indicating the added value these respondents receive from interaction above extended information provision. The total WTP sum from the 35 respondents was €134.

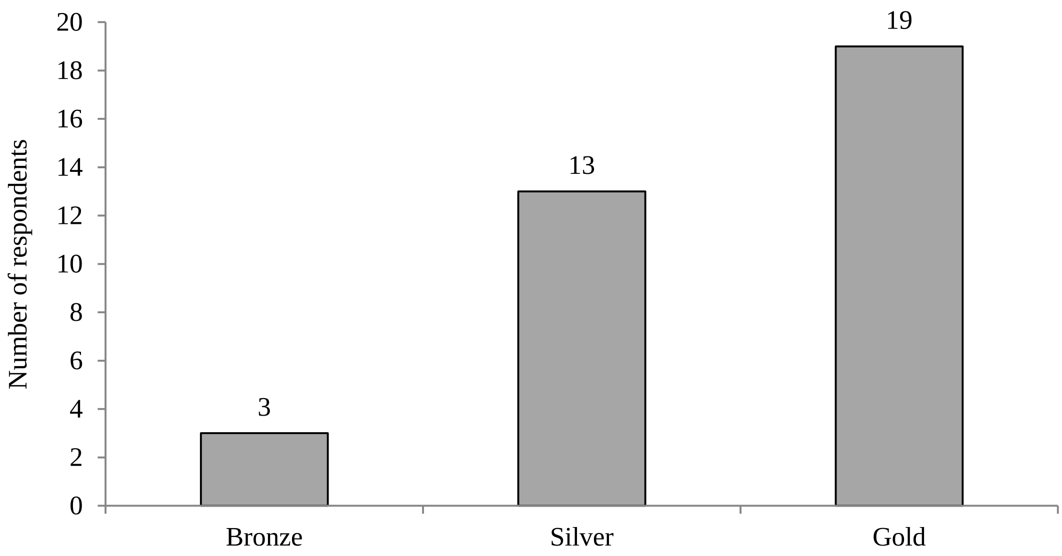


Figure 3.2: Willingness to pay for information and interaction website

The focus groups conducted with residents in three areas in the west, midlands and south west of Ireland discussed, among other things, the concepts of information provision and interaction, as well as possible ownership and share options. Many respondents felt that a "community wind farm" would be too much of a financial burden or require too much effort for residents.

As indicated in the pilot survey responses, there was a sense that wind farm developers would not willingly provide the desired information**.** Participants also felt that if locals or 'neighbours' were somehow involved in the process that they would be less inclined to oppose and that the development would be more respectful of local heritage. The concept of a community interaction group to engage and negotiate with the wind farm developer was proposed on the basis that developers could not be trusted to provide non-biased information:

> I think if you ... could get a few members of the community together…set up their own community group to meet with the developer, not necessarily on a one to one basis they are only a group but to have some chat with them that they can bring forward to the community as well. Because the developer is going to come in and tell you one thing and mean something else. (Public [15])

Two focus groups were also held with wind farm developers. More elaborative results from these discussions are presented in the next chapter. These sessions outlined that some industry members are aware of their failings in terms of community interaction and information provision and of the perceived negative attitude that residents have towards them. Developers were keenly aware that residents view them as "outsiders" looking to take advantage of their area, and the need to involve local residents in decisions to prevent the assumption of bias:

> The local community sets up the committee that puts the rules and regulations in place and it decides….The local community groups elect a committee that is over seen by ourselves and the local authority that distributes that fund, takes in applications. (Developer [12])

> …you need someone, because like obviously people are going to be cautious about believing in vested interests, right. (Developer [13])

In summary, the local residents appeared to value information provision and interaction highly and agreed that the current level being received by developers was insufficient. They also felt that share-holding, cooperatives or heavy community involvement in a project would place too much of a burden on local residents, though acknowledged that if local residents were involved somehow they would be less likely to object. Developers and industry members were aware of some of their failings in terms of information provision and advocacy and were concerned that residents would not believe what they had to say in terms of the benefits of wind farm development or potential local impacts due to their inherent bias.

While several forms of citizen involvement are possible, such as locals voting on wind farm developments, or independent opinion surveys, they may not offer the best solution in terms of meaningful engagement. Although the level of effort required in voting is less than direct community involvement in a wind farm and would give residents a say in the final outcome, the low levels of public participation in political elections suggests that residents may not be likely to engage with this process.

Opinion surveys may be expensive and lead to undemocratic outcomes whereby a minority have the power to block a development, excluding the attitudes of those who were not involved in the survey (Bell et al. 2005). These solutions also do not address resident's requirement for more information.

Bearing in mind the apparent lack of trust in wind farm developers and the results which indicated that job opportunities were important to 27 of the pilot respondents, it was decided that a community representative could be a suitable social attribute, combining the characteristics of information provision and community consultation/ influence. This representative concept was adapted from the "community group" idea which emerged both in the developer and resident focus groups.

This individual would provide local residents with a say in the development without requiring significant effort on their part. This representative would not be an employee of the wind farm developer but instead could be a resident from the local area with relevant expertise (perhaps trained in engineering, renewable energy, rural development or community development). As indicated in Devine-Wright (2012), the appointment of a local resident in a consultation role can be important in terms of acceptance. The representative could be more approachable and trustworthy in the eyes of local residents if they are familiar to them and as indicated in the community focus groups, residents are less likely to oppose a project that a 'neighbour' is involved in. The appointment of the representative could be decided by the council/ committee in the surrounding area of the wind farm development with input from the developer, however, the final decision on the representative would remain with the local council/committee. The representative would relay any concerns that impacted residents may have on the scale, location and local impacts of the development and can come to agreements with the developer after consultation with the community. This may include agreements on local benefit packages, which could prevent assumptions of bribery.

The representative could be paid for in part by the wind farm development company and in part by the local government. Many developers currently pay consultancy firms to set up meetings and deal with many of the concerns of local residents (SLR Consulting, 2014), however allowing the residents to select their own negotiator allows for true meaningful consultation and not the tokenism and placation associated with “educating” residents. The representative plays the role of ‘bridge-builder” between the residents and the developer, rather than a wind farm advocate, PR agent or local protester (Devine-Wright, 2012).

Local councils in Ireland offer funding for environmental projects which provide awareness and education on issues such as climate change. The Local Agenda 21 Environment Partnership Fund for example promotes sustainable development and is concerned with local participation in issues which impact the economic and environmental needs of residents (Galway City Council, 2014). This could provide a suitable partial funding source for community representatives.

A community representative was selected as the appropriate social attribute for use in the choice experiment.

3.3.7: Setback distance

In Ireland the minimum setback distance between a commercial wind turbine and a residential property has been the subject of recent controversy and debate. Presently guidelines indicate a minimum separation distance of 500m between any commercial scale wind turbine and any residential properties. A targeted statutory review has recently been conducted concerning wind farms with respect to noise, proximity and shadow flicker (DECLG, 2013), although the setback distance has not changed. A recent private members bill legislation was proposed in Ireland requiring that turbines greater than 25 metres in height require a minimum distance of ten times the height of the turbine be set between a turbine and a dwelling not associated with the development (‘setback distance’) (Seanad Éireann, 2012). If this bill were enacted commercial wind turbines 150m in height would need to be located at least 1.5 kilometres from residential dwellings. The Irish Wind Energy Association (IWEA) has stated that imposing such restrictions would be detrimental to the development of wind energy in Ireland due to the difficulty in sourcing appropriate locations that would meet this requirement (IWEA, 2014). At the time of writing the wind turbine bill has not been enacted into Irish law.

As with the other attributes, pilot survey respondents were asked to rank the importance of setback distance to them if a new wind farm were to be established in their area. All respondents replied that the setback would be at least important to them. Survey respondents echoed this, frequently stating the role of setback distance in terms of the provision of benefits and property price impacts. Pilot survey respondents were also asked what they believe the minimum setback distance should be. There were offered 7 setback distances as well as the option to select no minimum setback. 15 respondents chose 1Km as the appropriate distance. Following this pilot work as well as the current minimum Irish guidelines, the recommendations from Irish political parties and the literature (Mariel et al., 2015), 3 setback levels were selected: 500m, 1000m and 1500m.

3.3.8: The choice task and follow up questions:

The choice experiments with the attributes and levels outlined above were presented following standard choice experiment visual design (Dimitropoulos and Kontoleon, 2009; Vecchiato, 2014). The choice card set was created using Ngene software. The initial prior information was gathered from the literature and from the pilot interviews which then informed the final choice sets. The survey employed a sequential experimental Bayesian design of a multinomial logit model. The purpose being to increase the precision of the parameter estimates and reduce the potential for parameter estimate mis-specification (Scarpa and Rose, 2008). The design was updated after the pilot once, with the attribute order moving the electricity discount from the bottom of the choice set to the top. There was no statistically significant difference between the results from the different designs. 3 presentation options were tested with focus group respondents, with the final survey option using the version they choose as most clear. Respondents faced one “practice” choice card and then continued on. This practice card was the same as the third choice card in order to test for continuity.

Each respondent completed 12 choice tasks. These choice cards had 3 options. Option A and B offered different combinations of the selected attributes with their different levels, and Option C presented the status quo option of *No New Wind Farm*. Some of the choice tasks explicitly require respondents to trade-off information conveyed by the community representative and decrease in the electricity bill. The inclusion of visual aids and photomontage (i.e. Ladenburg and Dubgaard, 2009; Álvarez-Farizo and Hanley, 2002), to represent the attributes portrayed in the choice sets was considered in this present study but was precluded after careful scrutiny due to clear feedback from piloting warning against visual aids principally because of the different landscapes in the study area, the varied residential locations of participants, the fact that each individual was informed that the choice sets represented a new wind farm development near them all of which could potentially introduce a source of bias and consequently visual aids were not used in the choice set portion of this analysis. Two wind farm images were presented after the choice set section to analyse the impact of externalities on the decision making process and this is discussed further in chapter 5.

It is possible, however, that the presentation of the wind farm as a new wind farm near the respondent may have led to issues with endogeneity. Individuals may have taken into account specific local characteristics (type of landscape, number of wind farms already in place etc.) when making their decision. The endogeneity arises from these uncontrolled confounding variables. The number of wind farms already in place could be correlated with both an independent variable in the model (e.g. number of turbines) and with the error term. By omitting site-specific variables the model may over or underestimate the effect of one of the other factors included in the model. This limitation must be kept in mind when interpreting the choice experiment results presented in this chapter.

Following the choice experiments, residents were asked to rank how difficult they found this task from very easy to very difficult. “I don’t know” was also included as an option. Studies have indicated that respondents who find the choice task difficult are more likely to select the SQ (Boxall et al., 2009) and so this question was included to test for respondent understanding.

Similarly, respondents were also asked if they ignored any of the attributes. Ignoring attributes can suggest disengagement with the choice task (Meyerhoff and Liebe, 2009; Lanz and Provins, 2015) and so this question was included to test for this.

In order to clarify the reasons behind individuals decisions in the choice sets, respondents were asked to what extent (from completely agree to completely disagree) they agreed with 6 statements. These questions were designed to establish if attribute levels, attitudes towards wind energy and trust in developers were potential motivations behind decisions (Johansson and Laike, 2007; Ek, 2005; DeShazo and Fermo, 2002; Meyerhoff and Leibe, 2009; Hall et al. 2013; Gross, 2007).

Next, in order to ensure that individuals were not protesting due to the payment mechanism (Pearce and Özdemiroglu, 2002) respondents were asked to rank various other compensatory options including shares, a community fund, a recreational facility and cash payments. These were ranked as either better, as good as or worse than an electricity discount.

Trust in the process and outcomes of a wind farm development can be crucial in terms of acceptance (Walker and Devine-Wright, 2008; Hall et al. 2013; Gross, 2007; Cohen et al. 2014) and the focus group discussions; outlined in detail in the next chapter; indicated that respondents had little faith in wind farm developers. Due to this, a question was included to determine trust in wind farm developer’s ability to cooperate, provide information and financial support to the local community. Respondents were asked to rank their confidence on a scale of 1 (no confidence) to 5 (full confidence).

The construction of wind turbines can result in fears over the potential health, property value, wildlife and visual impacts as well as negative outcomes for residents in terms of quality of life (Walker et al. 2015; Onakpoya et al. 2015; Gibbons, 2015; Heintzelman and Tuttle, 2012; de Lucas et al. 2012). The pilot survey asked respondents how important some of these issues were to them. The following are the number of respondents out of a total of 36 who state that these impacts are at least important: shadow flicker: 25; impact on birds: 26; impact on animals: 26; noise: 29. Following these results, the literature and the focus group responses 7 "issues" were selected to be ranked by respondents. The respondents were shown two images (discussed further in chapter 5) and asked to rank the impact on the household in the image on a scale from "not at all" to "extremely affected". The option "don't know" was also included.

To elaborate on these results, two more questions on potential concerns were included. Respondents were asked to rank concerns from 1 (most important) to 4 (least important). The concerns included those about respondent's personal health, surrounding environment, property value and quality of life. The next question then asked the individual to rank these same concerns but instead framed as potential impacts on their community. Studies have shown that while individuals can have concerns over negative impacts on themselves, they can also be worried about these impacts on others (Schultz, 2001).

In the developer focus groups, the discussion about information provision revealed that developers could not always provide all of the requested information, including ownership and wind farm size, due to competition issues:

> But the problem was from the competition side, we couldn't have been seen to collaborate unless we were in a deal. (Developer [12])

The pilot survey and focus groups also indicated the strong preferences for full information provision that residents have. In the final question in the choice set section respondents were informed that it may sometimes be easier for a developer to not provide all of the information about a wind farm prior to construction. It was proposed that a developer may increase benefit payments in order to compensate for this lack of information. Respondents were then asked to select their preferred combination of information provision and compensation increases from 5 options. This ranked from no information and a 100% increase in compensation at one end to all information and no increase in compensation at the. This question aimed to establish if the respondents had preferences for information over the provision of compensation or if they were willing to trade-off information for financial benefits.

3.3.9: Demographics

The final section of the survey dealt with demographics. Previous studies have indicated that the frequency with which respondents experience turbines matter in terms of acceptance (Kontogianni et al. 2014; Swofford and Slattery, 2010). The first question asked respondents how often the respondents saw turbines. The survey offered 7 intervals ranging from never to once a day or more.

Of the pilot survey respondents, only 1 out of 36 had protested a wind farm and just 3 had put in an objection about it. In order to establish if residents preference for wind energy has ever led them to take action against a wind farm, individuals in the final survey were also asked if they had ever put in an objection to the planning authorities about a wind farm.

Many pro and anti-wind farm organisations are currently in operation in Ireland (Wind Aware Ireland, 2014b; IWEA, 2017; EPAW, 2016; Laois Wind Energy Information Group, 2013; TEA, 2013) and residents could also be part of a co-operative or own their own wind farm. Membership of such groups or businesses could suggest strong preferences for or against wind. Respondents were therefore asked if they were connected with any group/business/campaign related to wind farms. If they responded in the affirmative they were asked to provide details.

The community focus groups suggested that several participants were confused about CO_2 emissions in general. Studies have shown that those who are more interested in environmental issues are more likely to be in favour of wind energy (Johansson and Laike, 2007; Ek, 2005). In order to establish local resident's basic knowledge they were asked about the level of carbon emissions (air pollution) in their area. They were offered a range from high pollution to no air pollution. The option "I don't know" was also included.

An electricity discount was selected as the payment mechanism for the choice sets, and so respondents were asked to indicate their average bi-monthly electricity bill.

As wind energy development can result in rents and compensation to local land owners (Groothuis et al. 2008; Bidwell, 2013) survey respondents were asked if they owned land in the area.

Several studies internationally have assessed the impact of marital status on attitudes towards renewable energy with mixed results (Zyadin et al., 2014; Sardianou and

Genoudi, 2013; Hansla et al., 2008). To test for this, respondents were offered three options: married or living with partner; single; and widowed/ divorced/ separated.

The number of people in the household can affect income and spending decisions (Callan et al., 2007) and age can have an influence over attitude towards renewables (Ek, 2005). In order to establish the number of infants, children, adults and seniors in the household, interviewees were asked to write the number of members in their home that fit in the appropriate categories. They were then asked to specify their date of birth.

Focus group participants indicated fears over physical and mental health and well-being due to proximity to wind turbines:

> Well you are, you’re talking about people would have to just up sticks and go if it’s that close to them, you know. It’s, like you’re talking about your psychological wellbeing. (Public [9])

Previous studies have also analysed the potential health impacts from wind farms (Onakpoya et al. 2015; Walker et al. 2015; Pedersen and Waye, 2015). In order to establish if these individuals suffered from any potential negative health outcomes, they were asked to rank their physical and mental health on a scale from very good to very poor.

Studies have also analysed the influence of education on attitudes towards renewables (Ek, 2005; Dimitropoulos and Kontoleon, 2009) and so the survey asked for the highest level of obtained education. 4 options were available from primary to third level and higher.

Previous studies into renewables have assessed the impact of employment status on attitudes towards renewables (Ku and Yoo, 2010; Bergmann et al. 2006). Respondents were asked for their current work status, which offered 7 options. Following this, they were also asked to state their occupation.

Finally, studies have also found that income can be an important determinant of wind farm acceptance (Ladenburg and Dubgaard, 2007*;* Groothuis et al, 2008) and so the last question asked for estimated income. Nine income bands were selected, starting at less than €150 per week up to €2250 per week. These same income ranges were tested in the pilot survey and deemed acceptable, with no respondents earning the lowest or highest bracket and the majority centred on the mid-range income of €600-€899 per week.

The interviewer then noted the end time of the survey task. The final page of the survey asked for respondent's willingness to partake in a focus group and space was available for any notes or comments.

3.3.10: Survey implementation:

The three counties chosen for this research, Galway, North Tipperary and Offaly, represent an interesting case study because of the breadth of experience with wind farm development since the locations either had a wind farm already in place, a wind farm under construction, a wind farm planned for the area, are noted for their scenic views and tourism or were inexperienced with wind farms but located in an area with potential for wind farm development; that is; a windy location with an availability of land. From the summer of 2014 to spring 2015 the final survey was conducted using face-to-face interviews by two enumerators involving a random sample of 200 residents located close to potential new wind farm locations. Approximately 350 households were approached to complete the final survey, representing a response rate of 57% which is consistent with similar studies on the topic (Ek, 2005; Ladenburg, 2008). The status quo option was chosen by 86 respondents for each of the 12 choice sets so 1368 choice responses were ultimately used in the discrete choice models reported below.

3.4: Empirical specification:

The theoretical framework underlying choice experiments is random utility theory which suggests that a good can be assessed in terms of the attributes it contains and the levels of these attributes, e.g. a wind farm could be valued in terms of the number of turbines, height, setback distance etc. (Pearce and Özdemiroglu, 2002). Choice experiments differ from contingent valuation in the sense that individuals choose from a range of options and select the one that results in the greatest utility for them, as opposed to providing a value for one fixed option (Adamowicz and Boxall, 2001). The utility derived from the selection of an option depends on its attributes, the utility function of the respondent and an unobservable element. Generally, a monetary attribute is included, therefore when respondents decide on their optimal choice they make implicit trade-offs between the attribute levels and the different options in the choice set (Alpizar et al. 2003).

Following Adamowicz and Boxall (2001), an individual's utility can be described as:

$$U = V + \varepsilon$$

where V is the indirect utility function containing the attributes and ε describes this unobservable stochastic element . V can then be broken down further:

$$V_j = \beta_k X_j$$

where X is a vector of k attributes related to option j, e.g. height, setback distance etc. and β is a coefficient vector.

The conditional choice probability of selecting alternative j is:

$$Prob\ (j) = \frac{\exp(\mu\beta_k X_j)}{\sum_{i \epsilon C} \exp(\mu\beta_k X_i)}$$

where μ represents a scale parameter and C the choice set. In this situation μ is combined with the parameter vector and cannot be isolated (Adamowicz and Boxall, 2001).

The Multinomial Logit (MNL) model can account for some *observed* heterogeneity by assuming that utility is a function of individual specific variables Z_i , which vary across respondents but are constant across choices, and X_i which are specific to each option (Caporale and De Lucia, 2015):

$$U_{ij} = Z_i X_i + \varepsilon_{ij}$$

This assumes that the utility an individual derives from wind farms depends on the characteristics of the proposed wind farm (attributes), individual characteristics and unobserved idiosyncrasies, represented by a stochastic component. The multinomial logit (MNL) framework assumes that unobserved factors which may impact the choice of alternatives are strictly independent of each other, that is, the odds of choosing alternative j over alternative $j^{'}$ do not depend on the other alternatives in the choice set (Independence of Irrelevant Alternatives, IIA). This may not actually be the case. It is possible that unobserved factors that impact on the utility from wind farm A B or the status quo option are correlated with the observable factors included as attributes.

The restrictions of the MNL model are relaxed in the random parameter logit (RPL) model. The latter is more generalised and allows unobserved factors to be random and follow any (normal, lognormal, uniform etc.) distribution. The RPL model is not restricted by the IIA limitation associated with the MNL model and it explicitly accounts for heterogeneity in the results (McFadden and Train, 2000). In the RPL model one or more taste parameters are treated as random parameters. The random parameters produce a distribution around the mean that provides a means of revealing unobserved heterogeneity in the sampled population (Ghosh et al., 2013).

The description of the theoretical framework I applied for deriving a respondent's WTA is provided below.

In each choice set, the respondent faces a choice between a set of three alternatives: Wind farm option A and wind farm option B define two wind farms with different attribute levels whilst option C represents the status quo option (no new wind farm). An individual is assumed to choose the option from each choice set that gives them the highest utility. This choice can be seen as the probability of choosing option A, B or C and so this choice is analysed using the logit framework.

In general, a respondent q's utility from choosing alternative *j* in choice situation *t* in a random utility function with random parameters can be defined as:

$$U_{jtq} = V_{jtq} + \varepsilon_{jtq} \equiv \beta'_{qk} X_{jtqk} + \sigma'_{k} z_q X_{jtqk} + \varepsilon_{jtq} \ (1)$$

where respondent q (q=1,....Q) obtains utility U from choosing alternative j (Option A, B or C) in each of the choice sets t (t=1,…12). The utility has a non-random component (V) and a stochastic term (ε). The non-random component is assumed to be a function of the vector of k choice specific attributes: X_{jtqk}, with corresponding parameters β_{qk} which may vary randomly across respondents due to preference heterogeneity with a mean β_k and standard deviation σ_k. There are 5 attributes in this vector, TURBINES, HEIGHT, SETBACK, COMMUNITY REP and COMPENSATION and the alternative specific constant (ASC) representing the status quo option (this takes a value of 1 when the respondent chooses the option of no new wind farm). The ASC also captures all the attributes erringly excluded from X_{jtqk} and the utility associated with not choosing the status quo. It is assumed that the individual chooses the option j that provides them with the highest utility.

In the RPL framework preferences are allowed to vary across individuals and coefficients are characterised by a distribution which depends on certain parameters e.g. the mean and covariance of the distribution. By introducing individual specific characteristics, z_q, sources of preference heterogeneity can be identified. These variables are interacted with the choice-varying attributes X_{jtqk} . The RPL model described above will therefore identify two types of variation in preferences, the variation associated with individual specific characteristics (e.g. income) and a random, unobservable and unconditional preference heterogeneity captured by the standard deviation σ_k of the distribution of each random parameter β_{qk}. If this standard deviation is statistically significant, than the coefficient does actually vary across individuals, as opposed to the MNL model where homogenous preferences are assumed for all respondents. Given a specific distribution these parameters can be estimated by a simulated maximum likelihood estimator using Halton draws.[1]"

3.5: Results:

3.5.1: Descriptive statistics and attitudes to wind farms in general:

Descriptive statistics are shown in Table 3.4. The sample contains 100 females and 100 males and the majority of respondents are aged between 36 and 59. This is the same as the regional gender distribution for the counties surveyed. As reported above previous studies have shown that gender can have an impact on environmental attributes. In this vein interaction terms were created with all attributes to test the impact of gender.

The sample age and retirement statistics are higher than the regional mean for the surveyed counties Galway, North Tipperary and Offaly. This is probably a result of surveys being carried out primarily in rural areas where wind farms tend to be located. Approximately 42% of those aged 65 and over in Ireland live in rural areas and within rural areas older people make up approximately 13% of the population (Connolly et al., 2012). About 51% of those surveyed were in full or part-time paid employment, slightly less than the regional mean.

[1] Halton draws are "pseudo-random" sequences that simulate independent draws from a uniform distribution and are more efficient than standard random draws. It is recommended that a range of Halton draws are used from between 100-2000 draws (Hensher et al., 2005).

Though the majority of respondents are highly educated 56% of those surveyed earned below the national median income, slightly higher than the national mean. The median income was used as it is a more accurate indicator of earnings than the national average, which can be skewed by very high or very low incomes. Income can have an impact on the value for compensation, with economic theory suggesting that those on a lower income should have a greater utility for higher levels of compensation. Three dummy variables representing income below €24,000 per annum (p.a), income ranging from €24,000-€63,000 p.a and income over €63,000 p.a. were interacted with compensation: LOW INCOME*COMP, MID INCOME*COMP, HIGH INCOME*COMP.

Though a small proportion of those surveyed stated that they actually lived less than 1500m from a wind farm, 37% saw turbines daily whereas 9% of those surveyed moved into their home after a wind farm was built in their area. Some studies have indicated that individuals who have experience with turbines can be more accepting of negative externalities than those without such exposure (Kaldellis et al, 2012). However those that see several turbines on a daily basis can be less accepting of new turbine construction close to their home (Kontogianni et al, 2014; Ladenburg et al, 2013). Attitudes to wind farms can also change with experience; initial apprehension to development plans can abate over time (Eltham et al, 2008). Interaction terms were created with the physical choice set attributes to evaluate the impact on respondents who were not exposed to the initial planning phase of their local development but instead moved into their home once the wind farm was established: AFTER*TURBINES, AFTER*HEIGHT130M, AFTER*HEIGHT180M, AFTER*SETBACK1000M, AFTER*SETBACK1500M.

Table 3.4: Descriptive statistics:

Variable	Sample respondents	Population statistics from survey counties
Gender (percentage share of males)	50%	50%
Average age	49	37[a]
Over 65	22%	12%[a]
Retired	20%	13%[a]
In paid employment (full or part-time)	51%	59%[a]
Proportion with higher education	60%	24%[a]
Income below national median of €32,000	56%	50%[b]
Turbines less than 500m from home	6%	
Turbines less than 1000m from home	12%	
Turbines less than 1500m from home	17%	
Resident after wind farm was built	9%	

a: Central Statistics Office (CSO), Ireland, mean population statistics for counties Galway, Offaly and North Tipperary

b: O'Connor et al. (2015), Think-Tank for Action on Social Change (TASC), Median gross income reported for full-time employed, €28,500 for all including part time. Population statistic is national, regional unavailable.

3.5.2: Attitude to wind farms in Ireland:

An aspect of the research of interest to this study was the question of the extent to which respondents' value information and consultation provided by the developer compared to say direct monetary compensation, and these attitudinal results are presented in Table 3.5. In this regard respondents were presented with a question where they were required to rank private compensation (i.e. an electricity discount) versus information about a proposed wind farm as a ratio, as outlined earlier in this chapter. About 64% chose the final option, not to give up any amount of information.

This indicates that a significant proportion of the sample place a high value on information provided by the developer about a proposed wind farm project.

Only a tiny minority have actually placed an objection to a wind farm development and a significant proportion of the sample believe that there are not enough wind farms in Ireland at present.

Table 3.5: Attitudes to wind farm development, standard deviation within parenthesis:

Description	Sample respondents (Std dev)
Would forego increase in compensation for all information	64% (21.85)
Put in an objection to a wind farm to local authorities	4%
Believe there are not enough wind farms in Ireland	37% (14.92)

3.5.3: Model output:

All models were estimated using NLogit 5. The status quo option was selected by 43% of those surveyed, regardless of the combination of attributes offered. As outlined in chapter 2, one of the key axioms associated with decision making in choice experiments is that of continuity, which assumes unlimited substitutability between attributes. Individuals are assumed to take account and make trade-offs between all the attributes presented in the choice set. Discontinuous preferences can result in lexicographic ordering and can restrict the estimation of the marginal rate of substitution between attributes (Campbell et al. 2008). As with Westerberg et al. (2013); Vecchiato and Tempesta, (2015) and Kermagoret at al. (2016) respondents who selected the status quo in each choice set were removed from the analysis, leaving only those who were WTA a wind farm in at least one choice set. In this chapter therefore we are only interested in the trade-off between attributes and the difference this makes on the acceptance of wind farm developments, specifically with the inclusion of a community representative attribute. However, it is possible that some of these respondents represent “genuine zero bids” and these individuals are not WTA a wind farm because they do not value it in a utility sense. This does not mean, however, that a respondent is not WTA any form of wind farm. While the respondent states their hypothetical unwillingness to accept compensation, it is possible that this is not the case in “reality”. Those who report zero bids are often grouped together with protest responders (those who place a zero bid for reasons other than having a zero value) and those who select the status quo because don’t know their value; and are removed, leaving the analysis restricted to those WTA some form of compensation. Alternatively genuine zero bid respondents can be included with those WTA compensation. Either of these options can be problematic as the samples used may be ‘self-selected’ and results may be biased (Hanley et al. 2006). The ‘genuine zero bids’ cannot be confidently established from the data presented in this chapter and this possible weakness of the self-selected sample presented must be kept in mind. A t-test was performed on the welfare estimates for a full sample versus the restricted sample presented in this chapter and the difference in means was not statistically significant. The status quo respondents are returned to the analysis in chapter 5, in order to establish the motivations behind their decision to reject development. Of the remaining 57% of the sample, 10% always chose the option in which a community representative (REP) was present.

The Table 3.6 outlines the results of 3 models, a multinomial logit model (MNL), a random parameters logit model (RPL) and an extended RPL model with interactions.

Interactions are included since attribute preferences may be related to factors other than those connected to the attribute themselves. Interaction variables can help to explain the probability of choosing a wind farm option as these additional factors may influence the preferences for attributes. In this case the analysis considers the effect on the attributes of income, gender and moving into an area after a local wind farm is established.

As previously outlined, the MNL model assumes the Independence of Irrelevant Alternatives (IIA). This assumption was tested using the Hausman test in Nlogit. This is a two-stage test; the first stage estimates an unrestricted model with all alternatives and then a model with restricted alternatives is estimated. The test statistic is:

$$q = [b_u - b_r]' \ [V_r - V_u]^{-1}[b_u - b_r]$$

where b_u is a column vector of parameter estimates for the unrestricted model, b_r is a column vector of parameter estimates for the restricted model, V_r is the variance-covariance matrix for the restricted model and V_u is the variance-covariance matrix for the unrestricted model (Hensher et al. 2005).

The results from these tests (estimating 3 restricted models, one for each choice set option) resulted in p-values of 0.01 (removing option A), 0.09 (removing option B) and 0.00 (removing option C). Comparing the p-values for the tests for option A and C to alpha equal to 0.05, we reject the IIA assumption for the model. Although the result for option B is only significant at 10%, the three results together suggest that the MNL model may not be the most appropriate for this analysis and that a less restrictive model, such as the RPL must be considered (Hensher et al. 2005).

The coefficients outlined in the RPL models indicate the means of the random parameter distributions with the standard deviations shown to the right of columns 3 and 4 of the table. All parameters apart from COMP are characterised as random parameters with normal distributions. COMP is assumed to be non-random and so the standard deviation is not estimated. With regards to the other parameters, it is possible that the assumption of normality is not appropriate and that other distributions would provide a better fit. Triangular and uniform distributions were tested and the resulting log-likelihood values were not statistically significantly different to those of the normally distributed model. The significance of the standard deviations for TURBINES, SETBACK1500M, REP and the ASC indicate the existence of unobserved preference heterogeneity for these coefficients under the model assumptions and that these parameters do vary across individuals and choice decisions. The RPL model therefore provides a better fit. However, the standard deviations of the two height parameters are only significant at 10% in the third model and the standard deviation for SETBACK1000M is insignificant indicating that preferences for these attributes may not vary across individuals.

Both RPL models have a lower Akaike information criterion[2] (AIC), improved log-likelihood function[3] and improved pseudo R-squared[4]values which indicates the

[2] The AIC is a measure of the relative quality of models for a given set of data. In general, a lower number implies a better fit

[3] The log-likelihood cannot be used alone as a goodness of fit because it is a function of sample size. However, it can be used as a comparison for the fit of different coefficients. As the log-likelihood is maximised, the higher value is better.

[4] McFaddens pseudo R^2 treats the log likelihood of the intercept model as a total sum of squares and the log likelihood of the full model is treated as the error sum of squares. Though the pseudo R^2 is not the exact same at the R^2 of a linear regression, there is a relationship between the two (Domencich and McFadden, 1975). A pseudo R^2 of 0.30 represents a “good” model fit for a discrete choice model.

superiority of the RPL models over the MNL. However, the difference between the RPL with interactions and without is small (with a higher AIC for the model with interactions) suggesting that while the interactions may provide some explanations for preference heterogeneity it may not provide a significant improvement on the model without interactions.

Table 3.6: Parameter estimates, standard errors within parenthesis:

Attributes and interactions	MNL Coeff (s.e)	RPL Coeff (s.e)	Std dev	RPL with interactions Coeff (s.e)	Std dev
TURBINES	-.02257***	-.03747***	.04342***	-.01322*	.03670***
	(.00267)	(.00594)	(.00622)	(.00739)	(.00572)
HEIGHT130M	-.24103***	-.39232***	.07962	-.56224***	.35709*
	(.09093)	(.12244)	(.36522)	(.18715)	(.18582)
HEIGHT180M	-.35618***	-.67340***	.07962	-.89305***	.35709*
	(.08933)	(.13610)	(.36522)	(.19910)	(.18582)
SETBACK1000M	.66635***	1.02317***	.28407	1.56596***	.16216
	(.12318)	(.19817)	(.57558)	(.32924)	(.46031)
SETBACK1500M	.69127***	1.13295***	1.08215***	1.27412***	1.18553***
	(.08679)	(.16280)	(.17394)	(.24311)	(.19077)
REP	.62342***	.96176***	1.48339***	1.02612***	1.54489***
	(.06785)	(.17570)	(.17819)	(.24298)	(.18629)
COMP	.00172***	.00261***		.00164**	
	(.00019)	(.00026)		(.00070)	

Pseudo R^2 values between 0.30 and 0.40 are equivalent to an R^2 between 0.60 and 0.8 in a linear model (Henscher et al, 2005).

ASC	-.25039*	-2.97646***	4.48897***	-3.34352***	3.94568***
	(.14342)	(.74558)	(.93895)	(.68801)	(.48355)
LOW INCOME*COMP				.00222***	
				(.00077)	
MID INCOME*COMP				.00149**	
				(.00074)	
HIGH INCOME*COMP				.00135	
				(.00138)	
AFTER*TURBINES				-.07178***	
				(.01949)	
AFTER*HEIGHT130M				-.40422	
				(.45828)	
AFTER*HEIGHT180M				-.94333*	
				(.54339)	
AFTER*SETBACK1000M				-1.31557**	
				(.64481)	
AFTER*SETBACK1500M				.38248	
				(.56797)	
FEMALE*TURBINES				-.03694***	
				(.01088)	
FEMALE*HEIGHT130M				.39669	
				(.26144)	
FEMALE*HEIGHT180M				.58997**	
				(.28752)	
FEMALE*SETBACK1000M				-.69812*	
				(.39337)	
FEMALE*SETBACK1500M				-.25492	
				(.32070)	

FEMALE*REP			.08539
			(.34535)
FEMALE*COMP			-.00102*
			(.00052)
Log- Likelihood	-1234.86887	-936.99389	-914.29190
McFadden Pseudo R^2	0.11	0.38	0.40
A.I.C	1.747	1.367	1.378
No. of respondents	200	200	200
No. of observations	1380	1380	1380
No. of Halton draws		1000	1000

Level of significance, ***=p<1%, **=p<5%, *=p<10%

The sign on the coefficient TURBINES is negative across all models indicating the reduced utility for each additional turbine for respondents in the sample. Tests indicate the presence of non-linearity for the TURBINES attribute; utility losses increase significantly beyond 20 turbines. Due to this, the TURBINES results may be overstated for cases with fewer than 20 turbines. In the RPL model with interactions, TURBINES is only statistically significant at 10%, the interaction coefficients for AFTER*TURBINES and FEMALE*TURBINES are negative and strongly statistically significant. It is possible that female respondents and those who moved to the area after their local wind farm was built partially accounts for the negative attitude towards additional turbines in the MNL and RPL models without interactions.

In all three models turbine HEIGHT is specified as a dummy variable and indicates a movement from a base turbine height of 80m to 130m and 180m respectively. This is negative for both dummy variables indicating a loss in utility from moving from a lower turbine height to a higher turbine height. The difference in utility between the two heights is not statistically significant in the MNL model but it is significant at the 5% level in the RPL model and at 10% in the RPL model with interactions. The RPL models imply that there is a statistically significant negative impact when increasing from a height of 130m to a height of 180m.

The variable SETBACK is also represented as a dummy variable representing a greater distance between the respondents' home and the wind farm. The base distance is 500m between the wind farm and a households' residence. The attribute SETBACK1000M and SETBACK1500M therefore implies the hypothetical wind farm moving 500m and 1000m further away from the resident respectively. In all instances results from the MNL model and both RPL models reveal a highly significant positive coefficient on the setback attributes. This implies that respondents' gain positive utility if the hypothetical wind farm were to be moved further away from their residence. However, the difference between SETBACK1000M and SETBACK1500M is not statistically significant in any of the models, and in the final model with interactions the size of the coefficient SETBACK1000M is greater than SETBACK1500M. This indicates that there is no significant utility improvement in increasing setback distances from 1000m to 1500m. The sign on the REP attribute is positive and highly statistically significant in all models suggesting that respondents gain positive utility if provision is made for a community representative to provide consultation between the developer and the community.

The coefficient on the compensation variable is also positive. This is as expected in a WTA estimation, given the way the DCE was framed. This implies that respondents' gain positive utility from greater amounts of compensation. COMP is only significant at 5% in the RPL model with interactions but the interaction coefficient for LOW INCOME*COMP is positive and strongly statistically significant indicating that value for compensation in the models without interactions may arise from the preferences of lower income respondents.

The alternative specific constant (ASC) representing the status quo option is negative in each model, indicating the overall reduced utility in refusing a wind farm and foregoing compensatory benefits.

Looking at the RPL model in column 4 of the table the first group of interactions on income reveals, as expected, a positive relationship between those on lower incomes and the willingness to accept compensation and an insignificant relationship between those on higher incomes and compensation. Moving down the column, the next group of interactions indicates a negative relationship between those who moved into their home after a wind farm was built and TURBINES as well as HEIGHT180M. This implies that those who moved into their home after a wind farm was built value attributes differently than those who went through the planning and construction phase of a local wind farm and/or those who do not currently live near a wind farm. This cohort reveals a negative relationship with SETBACK1000M suggesting that those who lived in their home before a wind farm was built and/or do not reside near a wind farm may place a greater value on increased setback distances than those who moved in after a local farm was established.

The third group of interactions indicate a negative relationship between additional turbines and females. As stated previously, this implies that females have a stronger negative reaction to additional turbines compared to male respondents. For women in the sample the sign on increased turbine height is positive and medium setback distance is negative indicating that the strong negative values for HEIGHT180M and positive values for SETBACK1000M found in the three models is due to the preferences of male respondents. The interactions also suggest that females are less sensitive to increases in compensation values. This is consistent with the work by Ek and Persson (2014), which suggested that males rather than females were more likely to be cost sensitive.

In order to further analyse preference heterogeneity in the model, the probability of respondents holding opposite preferences to the mean (e.g. positive preferences for additional turbines, negative preferences for greater setback distances) was tested using the means and standard deviations of the RPL models reported in Table 3.6. The probability results are displayed in Table 3.7.

Table 3.7: Estimated probability of opposite preferences for wind farm attributes:

Model	Variable	Prob. opposite preferences to mean
RPL without interactions	TURBINES	0.20
	HEIGHT130M	0.01
	HEIGHT180M	0.00
	SETBACK1000M	0.00
	SETBACK1500M	0.14
	REP	0.25
RPL with interactions	TURBINES	0.36
	HEIGHT130M	0.06
	HEIGHT180M	0.01
	SETBACK1000M	0.00
	SETBACK1500M	0.14
	REP	0.25

The results indicate that preferences for the number of turbines do vary across individuals with a probability of between 0.20 and 0.36 that individuals have positive preferences for turbines. Similarly, there is a significant probability that individuals will have negative preferences for a community representative or setback distances beyond 1000m. This is similar to the findings of Ladenburg and Lutzeyer (2012) which suggested that a significant proportion of the population may have no demand for visual disamenity reduction and may in fact have a positive demand for being able to see wind farms. The results for HEIGHT and SETBACK1000M show that preferences for these attributes may not vary across individuals as was previously indicated by the insignificance of the standard deviations for these attributes.

3.5.4: Welfare estimates:

Table 3.8 indicates the marginal willingness to accept (WTA) amounts for all three models. The WTA amounts are similar for the first two models and vary somewhat with the inclusion of interactions in the third model. The estimated WTA for the turbines and height attributes are positive. Respondents would require between €8 and €14 per annum in compensation for each additional turbine included in the wind farm, a fairly stable result amongst the three models. However, as stated previously the TURBINES variable may be non-linear so this amount may be overstated for wind farms with less than 20 turbines. The table below shows that respondents would require compensation of between €140 and €346 for HEIGHT130M and between €208 to €549 for HEIGHT180M. In contrast the parameter estimates for the setback coefficients are negative. As one might expect this suggests that as setback distances between the wind farm and private residences are increased the required WTA in compensation falls. For example the attribute SETBACK1000M indicates that if the distance were increased from 500m to 1000m the respondent would require between €388 and €963 less in compensation per annum (in the form of a discount to their electricity utility bill). As one moves further away from the turbines it is reasonable to expect the respondent to accept lower levels of compensation. The reduced WTA is actually somewhat higher for the SETBACK1000M compared to the SETBACK1500M in the final RPL model. This corresponds with the finding that there is no statistically significant difference between the two setback distances. As expected the introduction of a community representative (REP) leads to a decline in the amount of compensation required for a given respondent, the reduction in compensation is similar in magnitude in the first two models and rises to €631 in the final model.

Table 3.8: Marginal WTA estimates, standard errors within parenthesis:

	MNL € /H.H,P.A	RPL € /H.H,P.A	RPL with interactions € /H.H,P.A
TURBINES	13.1500***	14.3598***	8.13492
	(1.93384)	(2.42322)	(5.68454)
HEIGHT130M	140.459***	150.333***	345.931*
	(53.42251)	(46.48453)	(177.4674)
HEIGHT180M	207.559***	258.043***	549.470**
	(54.69500)	(53.27314)	(254.3815)
SETBACK1000M	-388.305***	-392.074***	-963.495**
	(80.65751)	(79.23539)	(451.5644)
SETBACK1500M	-402.827***	-434.142***	-783.934**
	(63.03744)	(67.87624)	(360.3377)
REP	-363.286***	-368.540***	-631.345**
	(50.98482)	(70.95451)	(305.9944)
Log- Likelihood	-1234.86887	--936.99389	-914.29190
McFadden Pseudo R^2	0.11	0.38	0.40
No. of respondents	200	200	200
No. of observations	1380	1380	1380

No. of Halton draws		1000	1000

Notes: Level of significance, ***=p<1%, **=p<5%, *=p<10%

3.5.5: Policy Simulations:

In Table 5.9 I convey my findings by simulating WTA for 6 wind farm policy scenarios, and arrange it so that wind farm size is fixed at the mid-size level of 20 turbines per farm and wind farm height remains at 130m in all cases. These two variables are fixed in order to analyse the impact of a change in the two most influential attributes: setback distance and community representative. Table 5.7 presents the WTA estimates and standard errors associated with 6 scenarios for the RPL model with interactions. In case 1, a "worst case" scenario given my results, the wind farm is simulated at 500m from residents and a community representative is not provided. This scenario results in a compensation requirement of €437.53 per person per annum (p.p, p.a). In the second scenario, a community representative is included but otherwise all attributes remain the same. In this case, there is a welfare change amounting to €368.54 (€437.53-€68.00) p.p, p.a. in the form of a reduction in required compensation. Moving right across the table from case 1 each scenario prior to case 5 provides an improvement in utility on the previous case. This indicates that reductions in WTA values can be achieved either by increasing setback distance or including a community representative (where a representative was not previously present). Notably case 4 results in a higher utility level than case 5. Increasing setback distance to 1500m and not including a representative in case 5 results in a utility loss of €319.70p.p, p.a. in comparison to a scenario with a setback distance of 1000m and inclusion of a community representative.

Table 3.9: Policy simulations (standard errors within parenthesis).

Attribute	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
SETBACK	500m	500m	1000m	1000m	1500m	1500m
REP	No	Yes	No	Yes	No	Yes
WTA	437.53*** (70.76)	68.99 (90.36)	45.45 (94.15)	-323.09*** (116.27)	3.39 (82.86)	-365.15*** (110.68)
CONF INTERVALS	298.836 576.221	-108.1165 246.0934	-139.0759 229.9842	-550.964 -95.208	-159.0195 165.7919	-582.084 -148.223

Notes: Level of significance, ***=p<1%, **=p<5%, *=p<10%

The standard errors (within parenthesis) were calculated using the WALD command in Nlogit and values were obtained using the Krinsky and Robb method with 1000 draws.

Using the estimates reported above by way of example I calculate the effect of increased setback distance and the inclusion of a community representative separately over the lifetime of a wind farm. Assuming 100 residents are affected by a 20 year wind farm development and holding turbines and height as depicted above; a total compensation payment of €875,060 (case 1) is required for a 500m setback distance when no community representative is present. If a representative is included at the same setback distance, this compensation falls to €137,980 (case 2). Increasing the setback distance to 1000m involved a further reduction of the required compensation to €90,900 (case 3). The inclusion of a representative at 1000m results in a negative compensation amount of -€646,180 (case 4); in effect a net benefit. These amounts rise for wind farms greater than 20 turbines, turbine heights above 130m and with higher numbers of impacted residents.

My results suggest that greater setback distances alone may not result in the highest utility for residents. By increasing setback distances to 1500m and including a community representative (case 6), the largest welfare gains can be achieved.

However, case 2 and case 4 provide interesting scenarios from a policy perspective. Case 2 might be more suitable for less densely populated communities. The provision of a community representative with compensation payments of €68.99 p.p, p.a. could aid in internalising the externalities of wind farm development yet it constitutes a relatively inexpensive solution to the issue of community acceptance for developers. Case 4 may represent the most suitable compromise between residents and wind farm developers in regions with a greater number of impacted residents. Residents benefit from increased setback distances (reduced noise, reduced visual impact etc.) over the longer term as well as the short term gains of improved information provision and interaction with a developer. For developers, case 4 may present a more attractive result than case 6. Increasing setback distances to 1500m would greatly restrict future development due to Ireland’s one off housing policy. Depending on the number of affected residents, the provision of a community representative could offer a lower cost solution for developers. The inclusion of a temporary community representative with minimum setback distances established at 1000m could provide significant welfare gains to moderately densely populated communities in development areas and prevent strict restrictions on the land available for wind farm construction.

3.6: Conclusion and policy implications:

An important aim of this study was to evaluate if local communities are willing to accept compensation for wind farm production in their area and to evaluate whether the community consultation influences the WTA for wind farm projects in Ireland. Overall I demonstrate that the majority of respondents are willing to make (monetary) tradeoffs to allow for wind power initiatives provided that local residents are offered private compensation (discounted utility bill) or are better represented, consulted and informed by developers by having a community representative in their locality, even if they are not directly affected themselves. I estimated that a given respondent requires between €363.29 and €631.35 less in annual compensation if provision is made for a community representative for the wind farm.

With respect to willingness to accept, the DCE used in this study produces what appear to be reasonable results. Willingness to accept is price sensitive and all attributes have a significant impact on the choice of the wind farm. Respondents prefer wind farms located further away from their homes. They also prefer smaller wind farms with smaller turbine heights. Respondents exhibit a strong preference for a local community representative that would act on behalf of residents affected by a potential wind farm development and provide information and open dialogue between residents and the developer about the wind farm project.

I also find that those on lower incomes derive greater utility from increases in the WTA amounts than those on higher incomes. Experience of wind farms influences how respondents value externalities. Individuals that moved into their home after a local wind farm was established had stronger negative preferences for additional turbines and greater turbine heights than respondents who lived in their home prior to the establishment of a wind farm or local residents that do not do not reside near a wind farm. Female respondents also value externalities differently to their male counterparts. The former exhibit stronger negative preferences for additional turbines. Males view taller turbines more negatively than females and have stronger preferences for increased setback distance than females. Females are also less sensitive to increases in WTA amounts than males.

The negative parameter estimates for setback distance indicate that respondents prefer turbines that are further away from residential dwellings and this is consistent with the literature (Fimereli, et al., 2008; Meyerhoff, et al., 2010; Vecchiato, 2014). However, respondents are willing to make (monetary) tradeoffs to allow for setback distances to be changed. For example the RPL model with interactions reveals that if the distance were increased from 500m to 1000m the respondent would require €963.50 less in compensation per annum (in the form of a discount to their electricity utility bill). My findings are consistent with the study by Meyerhoff et al. (2010) who find that median willingness to pay decreases with increasing distance between the wind turbines and residential areas. Meyerhoff et al. (2010) report that respondents are not willing to pay significantly more for moving turbines from 1100m to 1500m away from settlements.

My findings reveal that increasing the number of turbines and reducing setback distances results in a welfare gain for some respondents. This corresponds with previous findings that a proportion of the population may enjoy having wind farms in their neighbourhood (see Ladenburg and Lutzeyer, 2012).

It is conceivable that the externalities associated with wind farms are reduced by the positive benefits provided by wind energy as reported by Groothuis et al (2008). This effect is likely to be more pronounced for individuals who favour green energy and may therefore require less compensation to allow wind farms in their locality. In this present study the electricity production output was not fixed in all cases. A limitation of the study is that the parameter estimates were not compared to another wind farm alternative, thus the variables estimated may also contain a wind energy value component. I also accept that the number of respondents surveyed in my study is small and that the data is not nationally representative. Despite these limitations, I believe my results can be of relevance to policy makers and land managers concerned with wind farm development.

In this regard, my results suggest that a policy focussed on consultation and information provision using a community representative combined with moderate increases in setback distance would be a more effective instrument to address wind farm externalities than ratification of the proposed wind turbine bill. This is because most respondents are willing to make (monetary) tradeoffs between all the key attributes used in this study. Recent evidence suggests proximity to dwellings does not strongly influence wind farm planning approvals in Ireland (van Rensburg et al., 2015). To a certain extent this gives policy makers and planners a certain degree of leeway in meeting renewable energy targets. The proposed wind turbine bill would not provide the same degree of flexibility for policy makers concerned with renewable energy. At the time of writing statutory guidelines indicate a minimum separation distance of 500m between any commercial scale wind turbine and any residential properties (DECLG, 2013). The enactment of the private members wind turbine bill (Seanad Éireann, 2012) would make it illegal to construct a commercial turbine less than 10 times the distance of the height of the turbine. In practical terms, this would increase the setback distance to at least 1500m. Ireland's one-off housing policy[5] means residential dwellings in rural areas tend not to be concentrated in villages or towns. This has implications for the placement of wind farms. Increasing minimum setback distances in Ireland as set out in the wind turbine bill could therefore severely

[6] One-off housing refers to the construction of individual rural dwellings, outside of towns and villages. Watson and Williams (2003) found that nearly one third of the housing stock in Ireland is made up of one-off housing, i.e. detached housing in the open countryside.

restrict the capacity for future onshore wind farm development and make it more difficult to meet future renewable energy targets compared with a policy of compensation. Instead I recommend that prior consultation involving a community representative between potential stakeholders and the wind farm developer be made a legal requirement for all commercial wind farms. It is also recommended that the guideline minimum setback distance be increased from 500m to 1000m for moderately densely populated communities.

Finally, my findings are consistent with Ek and Persson (2014) and Dimitropoulos, and Kontoleon (2009) as well as a number of qualitative studies that find that the interaction between local authorities and developers with the local community is a key indicator of local acceptance and a positive planning outcome (Wolsink, 2006; Gross, 2007; Higgs et al 2008; Loring, 2007; Devine-Wright, 2005; Toke 2005), as is the quality of information available to the local community impacted by the project (Zoll, 2001). Loring (2007) reports, for example, that projects with high levels of participation in the planning stages in the form of inclusive public meetings are more likely to be successful. Huber and Horbaty (2010) contend that the credibility of a wind farm can be built in part by providing trusted community members with sufficient information to consider supporting the initiative and explaining it to the community. This may include site visits to an operating wind farm and their respective communities by these local advocates. Smith and McDonough (2001) emphasise the importance of open and transparent decision making to avoid perceptions of ‘secrecy and selective dealings’ which erode trust in the developer and the planning process. The following chapter discusses developer and citizen attitudes towards increased interaction, information provision and involvement in wind farm projects with a focus on large scale development for export.

Chapter 4

Public acceptance of large scale wind energy generation for export from Ireland to the UK: Evidence from Ireland

Abstract

Although international trade in energy may offer a flexible and cost effective means by which European countries could meet their renewable energy targets, developers in the exporting nation can face local opposition for reasons which are not always clear. Using focus groups and a public survey, this chapter contrasts perspectives between local stakeholders and wind farm operators and investigates the community impacts associated with large-scale wind energy for domestic use and export from Ireland to the UK. Although the export of renewable energy from Ireland to the UK is currently on hold, these findings suggest that significant investment is required by the state and wind farm operators in better information provision, trust building, effective instruments to internalise wind farm externalities and co-management arrangements before Ireland can fully capture the benefits of wind exports to the UK.

Key words: Export, wind farm externalities, focus group

CHAPTER 4: PUBLIC ACCEPTANCE OF LARGE SCALE WIND ENERGY GENERATION FOR EXPORT FROM IRELAND TO THE UK: EVIDENCE FROM IRELAND

4.1: Introduction:

In recent years, a number of studies have shown that there is an increasing interest in the trade in renewable energy exports (REE) between EU countries (EC 2014a; IWEA 2012b; DCENR 2012). Energy policies in the EU and elsewhere have encouraged this interest based on technology transfer (Doukas et al., 2009), subsidies (EC, 2014b) and flexibility in terms of achieving renewable energy targets (EC, 2001). Researchers have argued that the flexibility associated with renewable energy trade can be mutually beneficial to both member states, resulting in increased energy security, lower electricity prices and system efficiencies (Gullberg et al., 2014). The cost differential in the marginal wholesale electricity prices between the UK and Ireland serves as one such example[6]. Ireland has been working with the UK to develop its export market and become a significant exporter of renewable energy (DCCAE 2010; DCENR 2012). In January 2013, a memorandum of understanding (MoU) was signed between the Irish Minister for Communications, Energy and Natural Resources and his UK counterpart, the UK Secretary of State for Energy and Climate Change. This initiated plans for three large wind farm developments in the midlands of Ireland which aimed to export all electricity produced to the UK by private operators Element Power, Mainstream and the semi-state body Bord na Mona. A recent study indicated that the trade in renewable energy from the project could be beneficial to both member states (Cleary et al. 2016) and the initiative received a strong endorsement by

[6] Recent legislation in the UK means that electricity generated from wind farms is likely to be primarily restricted to offshore sources (DECC 2015) which is more expensive to produce than onshore power. This is not the case in Ireland, giving Ireland a considerable comparative advantage.

the Irish state (IWEA 2012b; DCENR 2012; SEAI 2014). However, the project was strongly opposed by local residents (O'Brien 2013; Westmeath Examiner 2013; Clifford 2014).

Public scepticism internationally over large-scale development of renewable energy resources specifically for exportation represents a major obstacle to the industry (Wang et al., 2015; O'Connor 2013; Bychawski 2014; Doran et al., 2014). A number of explanations have been advanced, including psychological factors that influence preferences for domestic consumption by patterns of ownership (Devine-Wright, 2005), concerns regarding distributional and procedural justice (Gross 2007; Hall et al., 2013), landscape and environmental impact (Bergmann et al., 2006) and issues related to setback distance between turbines and residential dwellings, such as noise pollution (Shepherd et al. 2010), shadow flicker (Pohl et al., 1999) and declining residential property prices (Heintzelmen and Tuttle 2012). These are subjects of national political debate (O'Brien 2015; Seanad Eireann, 2012) and are a priority for policy-makers charged with expanding Ireland's renewable energy portfolio, since externalities impacting on stakeholders arising from renewable energy projects lead to an inefficient allocation of resources (Groothuis et al., 2008), put at risk Ireland's comparative advantage in renewables, its ability to export renewable energy through trading and generally give rise to considerable uncertainty for REE operators regarding the future deployment of REE projects (Bell et al., 2005; SQW & Queens University Belfast, 2012).

Internationally, many countries with an interest in exploiting renewable energy trade within Europe also face challenges related to administrative inefficiencies, environmental group and NGO opposition to the potential landscape impact of development, the absence of financial incentives, complex planning procedures and a lack of communication with residents, which can lead to protests (Creutzig et al. 2014; Boie et al. 2014; Gullberg et al., 2014). These barriers can be addressed indirectly, by increasing pollution taxation of emissions on fossil fuels, for example, or directly by identifying the bottlenecks to development through discussion with key stakeholders and by deploying policy actions based on early and meaningful consultation to overcome these issues (Painuly 2001; Boie et al. 2014; O'Keeffe and Haggett 2012). However, most of the renewable energy economics literature considers perspectives on social acceptance by the public in terms of domestic consumption not trade (Álvarez-Farizo and Hanley, 2002; Bergmann et al., 2006; Ladenburg and Dubgaard 2009; Ku and Yoo, 2010; Meyerhoff et al., 2010; Heintzelmen and Tuttle 2012; Jensen et al., 2014) and none of the work that examines the economic benefits of trade (Cleary et al. 2016) considers external effects on citizens or stakeholders. In addition, with a few exceptions (Cass et al., 2010), this subject typically treats local stakeholders and wind farm operators as separate topics of enquiry with the survey data being collected at different times rather than within the same study as outlined in this chapter.

This chapter aims to contrast Irish perspectives on the exportation of wind energy; specifically those held by local stakeholders and wind farm operators in Ireland. In particular it aims to: (1) evaluate whether wind farm operators and public stakeholders support the development of large-scale wind farms for domestic use and export; (2) determine whether public stakeholders and wind farm developers agree that adequate information and consultation is provided by wind farm operators of large-scale wind farms for domestic use and export, and (3) establish whether wind farm developers and the public both accept that developer-led wind farms are the most realistic option to meet domestic and export electricity demand from renewables in Ireland.

This chapter proceeds as follows: first, a literature review and some background to the topic is given on wind farm externalities and approaches used to measure them. Next, a description of the survey instrument and methodological approach is provided. Then, the empirical strategy used to explore the relationship between wind farm externalities and compensation is presented and the results discussed. Final remarks and considerations are offered in the conclusions.

4.2: Background:

The resource curse (also referred to as the paradox of plenty) refers to the failure of countries with abundant resources to capture the benefits of their natural resources and the failure of their governments to respond effectively to the welfare needs of their citizens. Countries with abundant natural resources often experience higher rates of conflict and lower rates of economic growth in comparison to nations without these resources. This conflict can often be seen in oil-rich countries, such as Iraq, Libya and Angola, which are twice as likely to experience civil war compared with non-oil producing nations. Governments in these nations often get trapped in a boom- bust cycle due to drastic fluctuations in commodities prices leading to inefficient spending and borrowing. In many instances only a small amount of the resource benefit is retained in the country. Often this occurs due to government's over-eagerness to gain royalties and lower tax rates without realising the true value of the resource (NRGI, 2015). Eisgruber (2013) argues that the 'resource curse' is not confined to exhaustible resources but is an issue facing countries that export renewable energy. Internationally, large-scale development of renewable energy resources specifically for exportation has been problematic. In 2012, the United Kingdom signed an MoU with Iceland to investigate the possibility of importing geothermal energy from Iceland to the UK via an underwater cable (DECC 2012). Negative externalities associated with geothermal development are known to occur, including noise, chemical pollution and impact on the landscape (Krater and Rose 2009; Kristmannsdóttir and Ármannsson , 2003). This agreement, along with proposed plans to change Iceland's conservation laws in order to increase the exploitation of geothermal energy, led to a backlash from the general Icelandic public, the Iceland Nature Conservation Association, the Icelandic Environment Association and national and international celebrities (Bychawski 2014). Feasibility studies for the 'Icelink' are underway with a decision due in the summer of 2016 (Landsvirkjun 2015).

Large renewable energy projects for domestic use can face local public opposition on the grounds that the development may harm the local environment; due to a lack of trust in the developers (Wallquist and Holenstein 2015); because of disagreements over the payment of compensation (Sovacool et al. 2011) and due to a lack of information and local interaction on the behalf of project developers (Diduck et al. 2012). If residents in energy exporting countries are reluctant to accept renewable energy technologies to meet domestic needs, then they may be unlikely to approve of projects that will use these resources to meet the energy requirements of other nations (Wüstenhagen et al 2007).

4.2.1: Irish & UK wind farm electricity export: the midlands project:

Ireland and the UK have set ambitious renewable energy targets, as required by Directive 2009/28/EC, under which 16% and 15% of all energy consumed in these states must come from renewable sources by 2020. Directive 2009/28/EC allows for the use of energy importation to be counted towards the achievement of renewable energy targets, and in September 2012 the Irish Wind Energy Association (IWEA) published an export policy document. It outlined the comparative advantage that Ireland has in terms of wind energy and stated that prior to 2020 there will be an abundant surplus of energy available for export (IWEA 2012b).

I use the Irish Midlands exportation project as a case study. This initiative involved two large separate private Irish developers and an Irish semi-state wind farm operator. In June 2012, Mainstream Renewable Power announced plans for a 5GW ‘Energy Bridge’ project, involving 400 turbines across five counties in the midlands region of Ireland with the chief goal of exporting all electricity to the UK (Mainstream, 2012). In January 2013, Element Power revealed a proposal for a 3GW wind farm development, the ‘Greenwire’ exportation development which would result in the construction of up to 750 turbines in these counties (Greenwire 2014a). In October of that year, Bord na Mona declared plans for a 2GW export development, the ‘Clean Energy Hub’ which would result in up to 600 turbines also across the same region

(Carty, 2013). At the time, two small wind farms, totalling nine turbines, were in operation within these counties (IWEA, 2015). Although the majority of the planned development area was to be located in a sparsely populated rural area, proposed development sites also included land surrounding local towns with significant populations including Clara, Banagher, Portarlington and Edenderry in County Offaly, Mountmeelick and Stradbally in County Laois, Derrinturn in County Kildare, Kilbeggan and Kinnegad in County Westmeath and Longwood in County Meath (Greenwire 2014b). These combined areas have a total population of 35,523 (CSO, 2011). Localised project benefits outlined by each developer included annual rents to local landowners and millions of euro worth of payments to local authorities; community benefit schemes worth hundreds of thousands per annum in each county; 1 billion euro in direct investment into the local economy; €62.5 billion in export revenue over 25 years and the creation of 54 thousand jobs for scientific studies, construction, transport, administration, accounting, maintenance and management (Mainstream 2012; Energy Ireland 2013; Greenwire 2014c).

The broader economic benefits, including welfare estimates for Irish and British consumers, are outlined by Cleary et al. (2016) who simulated the financial implications of the introduction of Irish wind energy exports on the UK and Irish electricity market. They find that the midlands initiative would reduce the System Marginal Price (the price electricity generators receive through the market) by 2% in the UK market and 0.6% in the Irish market. They also report that these projects would reduce the overall cost of electricity generation and reduce operational CO_2

emissions in the UK, concluding that the majority of the benefits arising from the exportation project would be received by the UK compared with the Irish market.

Although the midlands exportation project is currently on hold, it provided an opportunity to investigate public attitudes to a renewable energy project developed purely for export and not domestic consumption. A number of reasons have been advanced to explain why the project did not go ahead, including high construction costs (O'Doherty 2014); developers public dismissal of the concerns of the Irish public on live television debate shows (McGreevy 2013); organised Irish protests against the development (McDonald 2014); bilateral UK and Irish Governmental disagreements (Duffy, 2014); the UK Government's inability to make key decisions (DCCAE 2014a); a change in the UK Conservative Governments energy policy away from wind energy in favour of fracking, oil and nuclear power instead (McGreevy 2014) and the economic, political and regulatory complexities of designing an energy trading framework by 2020 (DCCAE 2014a). Despite the obstacles that stalled this particular project, the willingness of the UK and Ireland to cooperate on future renewable wind energy trading initiatives remains strong, although this is unlikely to occur before 2020 and so will not be available to meet renewable energy targets (DCCAE, 2014b).

4.2.2: Public concern, externalities & large scale wind farms:

One of the main challenges to the future of large-scale wind farm initiatives such as the midlands exportation development is social acceptance (McKenna et al., 2016).

Case studies of regions covered in the EU SUSPLAN[7] project found that an integrated renewable energy Europe incorporating solar energy and on and offshore wind could potentially be delayed by opposition to renewable energy development and infrastructure projects in general. This opposition could derive from public fears over the health, wildlife and landscape impacts of associated high voltage transmission lines and wind farm project infrastructure as well as the lack of coordination and transparency in the planning and siting of renewable energy projects (Boie et al. 2014). Proposals for a project to integrate international energy systems by storing German renewable energy in Norwegian hydroelectric dams received mixed reviews. This project would reduce the cost of the Energiewende[8] and the amount of future wind farm construction required for Germany and, as a result, German political actors were largely positive towards the development and downplayed any potential Norwegian opposition. However, in Norway, environmental groups were troubled about the impact on the landscape and recreational facilities and politicians were concerned about potential increases in electricity prices for Norwegian consumers (Gullberg et al., 2014).

Large-scale wind farm projects may represent a positive development for members of the wider public who favour renewable energy (Zografakis et al. 2010; Longo,et al., 2008; Groothuis et al., 2008) or stakeholders who benefit directly such as landowners or shareholders who rent land or own shares in the venture (Jobert et al., 2007;

[7] The SUSPLAN project aims to increase the share of RES in Europe and lead to a more integrated European energy market. In the project nine regions/countries were selected to analyse their potential for grid integration (EC, 2014a).

[8] The *Energiewende* (energy transition) is the German transition to a low carbon renewable energy supply (Energy transition, 2015).

Devine-Wright 2005), but they can also impose negative externalities on local residents (Swofford and Slattery 2010) or members of the public concerned about sensitive landscapes (Pasqualetti 2011; Meyerhoff et al, 2010; Lothian 2008).

The impact of wind turbines on residential property prices has been a controversial topic in Ireland, with Irish agricultural consultants and property experts proposing that homes near wind farm projects could lose up to 50% of their initial value, subject to a host of variables including the number of turbines and setback distance (Phelan, 2014). Fianna Fáil, the Irish opposition political party, included a property depreciation element in their 2014 policy paper on wind energy. This proposed that an independent assessment be carried out on the property value of homes within distances of eight times the turbine height. If the loss in property value is found to be greater than 1%, they propose that equivalent compensation must be paid to the owner by the wind farm developer (Fianna Fáil, 2014). However, a national industry lobby group and the state’s energy authority have emphasised that there is no strong evidence that turbines harm property prices, and that any impacts would be minimal (IWEA 2013a; SQW & Queens University Belfast, 2012). This topic is the subject of enquiry in six separate revealed preference studies in three other countries yielding mixed, often conflicting, scientific evidence to address the controversy. Hedonic models applied in Denmark, the UK and New York report a negative impact of wind turbines on house prices (Heintzelmen and Tuttle 2012; Jensen et al., 2014; Gibbons 2015), whereas Lang et al., (2014) and Hoen et al. (2011) in the USA and Sims et al. (2008) in the UK find no effect.

Public opinion, as opposed to the views of local residents, may be important. In Saskatchewan, Richards et al. (2012) suggest that a lack of public support was identified as a potential barrier to building larger wind farms. Firestone and Kempton (2007) found that public confidence for a large-scale off-shore wind farm in the USA was reduced if there was a negative impact on wildlife or if the turbines were very visible. The study reveals that an improvement in air quality, reduced electricity prices, assurances that wildlife would not be harmed, enhanced employment for local residents and guarantees that wind energy would supply the local area all increased public support for the project.

4.2.3: Public consultation & information:

A significant literature exists documenting the need for information provision and public consultation during the pre-planning, development and post installation phases of large scale wind farm development for domestic consumption (Hammami et al, 2016; Richards et al, 2012) and export (Element Power, 2013; DCENR, 2013). The amount of information provided to local residents (Gross, 2007; Zoellner et al, 2008; Enevoldsen and Sovacool, 2016; Liu et al, 2013) and the public (Krohn and Damborg, 1999) by wind farm developers can be vital in terms of local acceptance. As the results of the previous chapter acknowledge, information provision and interaction from a wind farm developer could reduce resistance and increase the success of projects (Ek, 2005; Wolsink and Breukers, 2010) particularly if they begin this consultation from the outset. Toke (2005), Eltham et al, (2008) and Dimitropoulos and Kontoleon (2009) suggest that social acceptance is more likely if wind farm operators moved away from a “top-down” method with decisions coming directly from the developers to a more open, co-operative design integrating community perspectives.

A number of studies reveal that additional information about a wind farm development can reduce public health and environmental concerns (Crichton et al., 2015) but moreover actually increase support for a wind farm project (Firestone et al., 2007).

Statutory authorities may also influence public information provision. González et al, (2016) suggest that the fragmented nature of local planning authorities can prevent developers from providing coherent information to local residents about new wind farms. This generates mistrust, protests and opposition and is an impediment to projects which require large areas of land. A lack of faith in operators or a government’s ability to internalise the externalities arising from wind farms can lead to opposition to development or the inability to expand production (Dimitropoulos and Kontoleon, 2009). Scepticism about the motives or real identities behind wind farm operators can result in reduced utility for local residents (Strazzera et al., 2012), and a lack of trust in national government and its ability to provide adequate information about wind farm developments can increase social externalities and reduce acceptance (Wiser et al., 2007; Kontogianni et al., 2014).

4.2.4: Cooperation, ownership and compensation:

In Ireland the development, ownership and control of wind farms has remained exclusively in the hands of private operators or semi-state bodies (van Rensburg et al., 2015). This contrasts starkly with the situation in other countries such as Germany and Denmark where ownership and co-ownership and community initiatives are the norm (Bolinger, 2001). A strand of the literature on social acceptance suggest that co-ownership and cooperation between wind farm operators and the state or local communities can enhance the social acceptance of wind farms (Jobert et al, 2007, Maruyama et al, 2007; Musall and Kuik, 2011; Wolsink and Breukers, 2010; Khan, 2003). Even if the community are not direct owners of local wind farms they can be beneficiaries of production. Community benefits may include: financial grants to landowners directly and indirectly impacted by development (IWEA, 2012a); a community fund to be spent on resources for local residents (SECAD, 2015); benefits in kind, whereby the developer directly supplies a facility or improvement to the community e.g. sports facilities or environmental improvements (IWEA, 2013) and local employment through construction and operation (SEAI, 2011). Though benefits can be useful in terms of acceptance, many community members view financial compensation as a bribe (Cass et al, 2010), particularly if these benefits are portrayed as such in the media or by local anti-wind farm groups (Walker et al, 2014).

4.2.5: Using deliberative methods to contrast stakeholder and wind farm operator perspectives:

Many new renewable energy projects are characterised by conflict, uncertainty, and top down approaches and a number of studies have attempted to contrast perspectives between local stakeholders and wind farm operators (Cass et al., 2010; Hooper et al., 2015) and combine individual surveys with deliberative methods such as focus groups (Cass et al., 2010; Hooper et al., 2015) to address these concerns. Walker et al. (2011), as outlined in chapter 2, extends their case study research by establishing a theoretical framework for understanding the impact that the multifaceted interactions between stakeholders have on project outcomes.

In a mixed method study involving 249 focus group participants and a public survey of 2911 individuals on wind farm benefits in the UK, Cass et al (2010) report that focus groups allowed for an exchange of views between participants and revealed that local residents may have pre-formed expectations of local benefits which are influenced by local politics. They suggest that developers need to be very sensitive about how and when benefits are introduced in local debates and how their motives are perceived and understood. The same study suggests that a public survey could not consistently ask questions about wind farm benefits due to the great variability across projects studies but that combining a survey with focus groups could achieve this goal. Focus groups are also thought to provide a more complete picture of the research topic, allow scope for consensus or compromise reaching, for clear identification of points of disagreement whereby participants query each other and explain why their views might differ.

Spiess et al. (2015) reports that compared to survey methods, focus groups enabled data representing the views of a broad variety of stakeholders to be collected very efficiently. This is not possible using individual surveys which tend to be better at getting yes or no answers, determining the prevalence of attitudes and experiences and at gathering information on sensitive topics. On the other hand with focus groups there is a tendency for the socially acceptable positions to dominate and for certain participants to dictate the conversation (Smithson, 2000). Spiess et al. (2015)

suggests that participants can be influenced by vocal group members and points out that focus groups do not solicit the opinions of active stakeholder representatives.

Table 4.1 provides some examples of studies that provide contrasting positions between wind farm operators and stakeholders and wind farm agencies and their representatives:

Table: 4.1: Summary of stakeholder perspective literature:

Paper	Methodology
Breukers and Wolsink, 2007	Collection of case study documents and interviews with developers, cooperatives, environmental organisations, anti-wind power groups, research institutes and government agencies.
Cass and Walker, 2009	Semi-structured interviews with developers, policy makers and regulators, NGO's, environmental groups, anti-wind farm groups, politicians, consultants, manufacturers and engineers of renewable technology and financiers.
Cass et al, 2010	Multi-disciplinary approach involving semi-structured interviews with developers and key stakeholders (see above) as well as focus groups and questionnaires with local residents.
Walker et al. 2011	Theoretical framework constructed from interviews with key industry, policy and political agents and case studies of engagement format and local reactions to renewable energy developments.
Fast and Mabee, 2015	Qualitative study which interviewed local opponents and supporters of wind energy, wind company representatives, local planning officials and landowners leasing land for development. This was supplemented with public documents and statements published during the planning process.
Hooper et al, 2015	Face-to-face semi-structured interviews with local fishers and developers of off-shore wind farms supplemented with surveys from off-shore wind farm developers.

Speiss et al, 2015	Two separate focus groups were conducted. The first with adult stakeholders comprising of energy utility representatives, NGOs, a tourist guide, a member of the local community, a local renewable energy promotion agency, a member of the regional development association and a science and research organisation. The second was held with local secondary school pupils.

Cass and Walker (2009) portray anti wind arm feelings as states of high ‘arousal’ whereby developers depict wind farm opponents as calculating and strategic in their use of emotions to play on fears and myths, and through this to apply pressure to influence others. In avoiding vocal opposition, developers preferred exhibitions involving visual information to public meetings, which could be, in their view, dominated by aggressive participants. Developers perceived public engagement and information provision in the form of “myth busting”, as a way of alleviating fears promoted by anti-wind farm groups and once this is done, community concerns will be quelled.

Cass et al (2010) report that wind farm operators have attempted to standardise and rationalise modes of benefit provision but suggest a high degree of public ambivalence and scepticism towards wind farm benefits and strikingly divergent views regarding their distribution. They reveal strong public feeling that local residents would be more supportive of projects which emphasise local benefits in the form of cheaper electricity as opposed to benefits being distributed further afield to distant shareholders.

The framework of community engagement outlined in chapter 2, was developed from a number of case studies and key stakeholder interviews to establish attitudes, opinions and reactions to renewable energy projects across the UK. The process involved semi-structured interviews with developers and local stakeholders as well as focus groups and surveys with local residents. This allowed the researchers to establish the factors and processes involved in forming interactions between renewable energy agents and local residents (Walker et al, 2011).

Hooper et al, (2015) employed a semi-structured interview based approach with 64 fishers individually and 11 off-shore developers that completed questionnaires and took part in one-on-one interviews. This study revealed that offshore developers can lack knowledge about the fishing industry, and their concerns about keeping costs low can deter them from addressing issues regarding ecological impact, safety measures and compensation for gear loss and forgone income from fishing activities.

Breukers and Wolsink (2007) reveals that anti-wind farm groups claim that planning authorities do not recognise the views of local residents but that supporters of wind energy excused these opinions as NIMBYism and fear of change. Fast and Mabee (2015) report divergent views between wind farm operators and the public and suggest that supporters of development tended to downplay the visual impact of turbines as opposed to the critics that believed turbines would industrialize the landscape. This study also found that locals were more likely to trust the opinion of neighbours that are in favour of development and that wind farm developers were slow to take advantage of the benefits of local advocates.

Despite these potentially conflicting perspectives, developers can be open to the idea of community interaction and benefit sharing arrangements. Speiss et al. (2015) conducted two separate focus groups involving adult stakeholders and secondary school pupils. This Swiss study found that acceptance of a wind farm was more likely by the local community if they benefited directly from reduced electricity prices. Wind farm developers also agreed that early involvement in the project and profitability for local communities would be crucial for future acceptance.

4.3: Methods and data:

4.3.1: Participants:

In this chapter, I draw on five focus groups held in the case study locations in the west, midlands and south midlands of Ireland between March 2014 and February 2015. These groups were run to gather data on general perspectives towards wind energy, with specific questions on wind energy for export. The focus groups were also used to test the final survey, as highlighted in the previous chapter. The groups were identified to broadly reflect the views of two stakeholder categories: a group that built and operated wind farms and relied on them for their livelihoods (developers) and a group that did not rely on wind farms for their livelihoods but that lived in close proximity to wind farms/wind farms for export and may be affected by these developments in some way (public). Three focus groups involved members of the public and two were undertaken with wind farm developers. Each focus group was conducted separately and wind farm operators were not mixed with the public in order to allow for a common ground for discourse. This commonality means that they are acting and responding as a group; if this does not happen, then these respondents are simply answering as individuals who share a common focus. Once this cohesion is established, the respondents can then add their contributions to the commonality. They can do this by creating a narrative together or by referring to previous respondent's discussions, thereby strengthening the bond of the group (Hydén and Bullow 2003). It was felt that mixing the groups could create conflict, derail the discussion and increase the likelihood of the conversation being dictated by more dominant respondents. All participants were adults and some wind farm operators knew one another, but the individuals in the public focus groups did not. The focus group participants were recruited from those who had selected the option to take part after completing a pilot survey. Although this may potentially suggest a self-selection bias, the pilot survey results from those who selected to take part and those who did not were not significantly different and so this is not believed to be problematic. The three community focus groups involved 13 participants (7 women and 6 men, aged between 23 and 77). Eight wind farm developers were identified to represent different wind farms with respect to scale and ownership in two separate focus groups. A full description of the focus group participants is outlined in Table 4.2:

Table 4.2: Description of focus group participants:

Focus group	*Type of participant*	*Description*
Focus group 1	Public	Local residents in the west of Ireland, 1 woman, 2 men
Focus group 2	Public	Local residents in the south midlands of Ireland, 2 women, 2 men
Focus group 3	Public	Local residents in the midlands of Ireland, 4 women, 2 men
Focus group 4	Developer	1 chairman of a wind farm cooperative; 1 private small wind farm owner; 1 manager for large private wind farm operator; 1 director for large private on and off-shore wind farm operator; 1 manager for large semi-state wind farm operator; 4 men, 1 woman.
Focus group 5	Developer	2 private small wind farm operators; 1 director for large private on and off-shore wind farm operator; 3 men.

4.3.2: Procedure:

Participants received an informed consent form which outlined the title and a brief synopsis of the topic, the names of the researchers involved and the funding source. Respondents were informed that their participation was voluntary, that the focus group was being recorded and they could choose how much or how little they spoke. They were informed how the information they share may be used and that their details would remain confidential. Each participant signed this form. Three researchers ran the focus groups. One moderated the groups. The second tape recorded and transcribed the sessions and the third built rapport and recorded the group dynamic.

The focus groups were held in local meeting rooms and refreshments were offered to participants.

The moderator introduced a number of open topics/questions to allow for a range of insights into the issue and these were considered by all five focus groups. These broad topics are listed below:

- Wind farm exportation
- Public acceptance and externalities
- Information provision, community cooperation and compensation

The discussion documents containing the broad questions presented to both the public and developer participants are included in Appendix III. The developer discussions included specific issues pertaining to grid access and intermittency reduction which are not relevant to this research and the results of which are not included. Although these documents appear specific, the discussion was kept open and the moderator would intervene only if the debate deviated significantly off topic. No strict time limit was imposed by topic and the moderator ensured as far as possible that everyone participated in the discussion. Each focus group was approximately 60 minutes long.

The early part of the public focus groups were kept broad and began by obtaining information on their knowledge and experience of wind farms, positive and negative impacts, experience of and attitudes toward wind farm developers, information provision, who should be involved in the deployment of wind farms nationally and whether locals should receive benefits from wind farms.

Developers were also asked about their experience and attitudes of local stakeholders, information provision, local involvement and consulted on issues pertaining to ownership, compensation and co-management arrangements.

One of the goals of this study was to examine respondents' views on developing wind farms in Ireland specifically for export as opposed to their development to meet domestic requirements. In order to ensure all respondents understood this, the moderator made it clear that the discussion on exportation was targeted specifically for an export market to the UK and not for domestic consumption.

A standardised questionnaire survey (outlined in detail in the previous chapter) was also administered in all case study locations with responses received from 200 individuals. The survey covered a variety of topics but could not ask respondents specifically about community benefits arising from wind exports because of the great variability across case study areas. However topics included attitudes to energy export from Irish wind farms, public acceptance and externalities and questions to establish opinions regarding questions of local ownership and compensation and the importance of information provision representation and consultation. As stated in chapter 2, it is not unusual for focus groups to be combined with other methods the most frequent pairings being either in depth individual interviews or surveys with focus groups (Morgan 1995). The community focus group information is combined with the survey responses to provide a depth to responses that is not possible from survey data alone (Crabtree et al. 1993).

4.3.3: Analysis:

Responses were analysed using the thematic analysis procedure (Hayes, 2000; Braun and Clarke, 2006). This is a method for recognising, analysing and presenting themes within qualitative data. Themes can be derived from a patterned response in the data, e.g. more instances of discussion; however greater frequency is not necessarily an indicator that the theme is more important, and so a flexible approach to analysis is required. The analysis in this chapter followed a "theoretical" approach in that data were coded with broad research questions in mind (attitudes towards exportation, community engagement, wind farm ownership etc.) as opposed to the inductive approach whereby the coding is processed without fitting it into a thematic framework (Braun and Clarke, 2006).

As outlined in Braun and Clarke (2006), the first stage of thematic analysis is to familiarise yourself with the data. The five focus groups were transcribed and preliminary ideas were noted. Next, initial codes were generated. This was done with the use of Saturate, a web based system for coding and code categorisation of qualitative data. The community focus groups were combined for analysis which resulted in a large number of codes (e.g. cheaper electricity, national energy source, locals should receive the benefits etc.) Next, these codes were categorised into 21 broad themes (e.g. benefits, fairness, trust etc.) After more refining, these codes were classified into 4 broad themes: distributive justice, procedural justice, externalities and other forms of energy (e.g. tidal, off-shore wind). Table 4.3 outlines the full list of codes under each of these community themes:

Table 4.3: Set of community themes identified:

Distributive justice	*Procedural justice*	*Externalities*	*Other forms of energy*
Local benefits	Information provision	Noise	Offshore wind
Who receives the benefit	Involving community	Shadow flicker	Nuclear
No benefits	Trust in the system	Property prices	Wave
Those living close should receive the benefit	Locals vs others	Flooding	Tidal
Exports	Opposition	Human health	Dams
Ireland should receive the benefits	Outsiders	Wildlife	
Ireland selling out its resources	Less experiences vs more experience	Landscape impact	
	Siting	Tourism	
	Planning decisions	Environmental impact	
	Familiarity with semi-states	Setback distance	
	Connection to the land	Visual impact	
	Exports	No impacts	
	Who owns it		

Similarly, the two wind farm developer focus group transcripts were combined and codes applied using Saturate. The initial codes (e.g. community investment, impartial advisors, NIMBYism) were categorised into 12 initial themes (e.g. benefits, promotion, community perception). Finally these were refined into 4 broad themes:

community engagement, exports, externalities and public perception. Table 4.4 outlines the full list of codes under each of these developer themes:

Table 4.4: Set of developer themes identified:

Community engagement	*Exports*	*Externalities*	*Public perception*
Difficulties	Difficulties	Property prices	Opposition
Local benefits	Accepting mistakes	Landscape impact	Negative view of developers
Community investment	Benefits	Environmental impact	Lacking education
Advocacy	Debate	Noise	Exports
Reselling wind	Promoting to UK	TV signal interference	Trust
Positive			Energy prices too high
Participation			Ignoring local concerns
Government			Urban vs rural
Exports			NIMBYism
Energy crisis			No benefits
			Impartial advisor

4.4: Results:

4.4.1: Wind energy exportation:

When asked if they were in favour of the construction of wind farms for export 59% of the wind farm survey respondents indicated that they were against wind energy development specifically for exportation as shown in Figure 4.1.

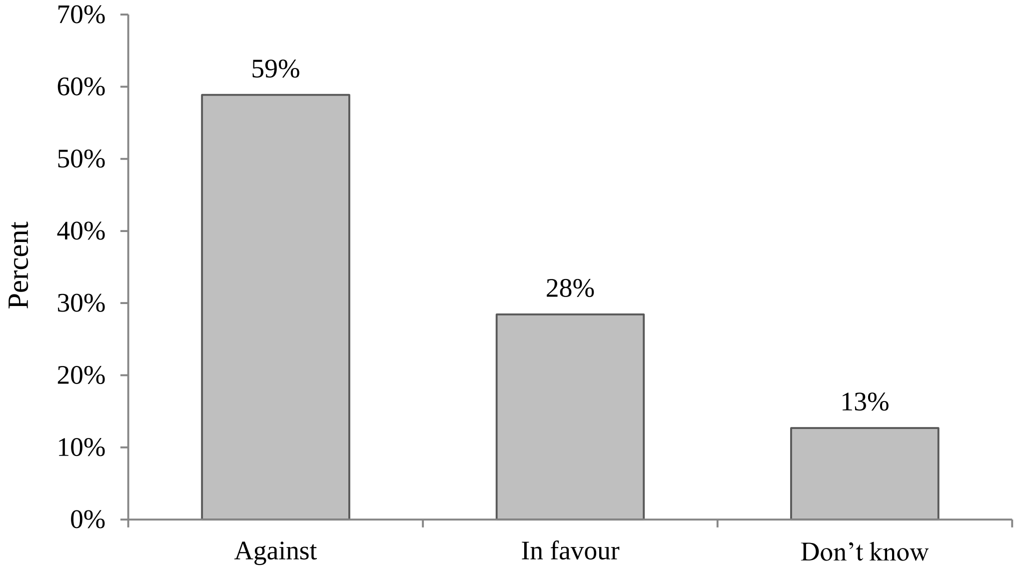


Figure 4.1: Attitudes towards the construction of wind farms in Ireland specifically for the exportation of wind energy.

The analysis of the focus group responses provides some insight into this largely negative view of exportation development. Much of the community focus group reactions to the concept of wind energy exportation fell under the broad theme of distributive justice. As outlined in chapter two, the distribution of benefits from a wind farm development can be a crucial determinant of acceptance. The benefits associated with a project can vary on a scale from local and collective, whereby the majority of the positive outcomes of the project are received by those in the local area, to distant and private, where the benefits are felt most by agents unconnected to the surrounding area (Walker and Devine-Wright, 2008). In the community focus groups there was a sense of scepticism about the possibility of any potential positive outcomes, locally or nationally, and there existed the suspicion that the majority of benefits would go to multinational corporations, viewed as “outsiders”:

> Some multinational corporation’s profit margins go up because of so many hundred thousand acres taken over in the midlands. Great for the multinational companies, but, like, what is the benefit for Ireland? (Local [10])

> Well it won’t be Ireland that will be taking advantage of it, it will be multinationals taking advantage of Ireland. (Local [9])

The development of wind energy for export was seen as unfair, as all of the negative aspects of development, such as flooding, visual impact, noise etc. would be felt locally, with all of the benefits (in this case, free or cheap electricity) being enjoyed by those unwilling to “suffer” these externalities:

> I don’t see why we should be providing England with electricity when they are not allowing it on their own land as we hear presently. They want us to get the rubbish and them get the benefit. (Local [7])

> You see the biggest problem here, we’re not getting offered any electricity. We should be like, because they’re being built here on Irish ground. We should be the first to get it before England gets it or anyone else. (Local [3])

Devine-Wright (2009) argues that what is often viewed as NIMBYism is in fact place-protective action, the desire to protect one’s sense of belonging and connection to a place when a new development threatens this. This cultural attachment appears to extend to the energy produced in a region, as many felt that the wind energy should power that area first and that the importing nation was less likely to appreciate the energy produced:

> So that means the actual place where the energy is being produced or made is losing out to some place that has no idea where (place name) is. But, basically, they wouldn't care, you know? (Local [15])

Despite the general opposition to wind farm development for export, some of the participants offered scenarios that would make exportation more acceptable to them, which related to both the distribution of benefits and participatory justice in terms of state ownership. These scenarios included local employment, local financial benefits such as electricity discounts, ownership by the state, all benefits accruing to the state and priority given to meet Irish electricity demand first with the surplus then being exported to the UK:

> For once in our life if we've got something that we can export, we've got to look at employing Irish people. (Local [15])

In contrast, most participants from developer focus groups discussed the concept of exportation in a positive manner, viewing it as an opportunity for "Ireland" to benefit in terms of jobs and export revenue:

> Should we be talking about developing a sector that can export a billion a year, two billion a year, no problem – and the jobs and all the types of benefits that come with that and if Irish society doesn't want that, then let's have that debate and let's forget about it. But it will be a massively missed opportunity. (Developer [12])

Despite this, there was an acknowledgement amongst the developers that the midlands exportation project had not been handled correctly in terms of community engagement, information provision and the recognition of local impacts, reflecting broadly the perspectives of community focus group participants. Developers were also keenly aware of the issues associated with labelling those who oppose wind farm development as NIMBYs:

> So, the whole thing, everybody learns from what happens, but I think that the vision we are looking at here, the reality is guys not everybody shares that vision and at a time you can adopt the attitude that you will always have those people. In actual fact, it was a little bit of that that caused that project to crash, because people said well they are just ignoring me and we had the famous, the infamous incident, where your former Chief Executive laughed at a lady on the television and that was the night it was all over. (Developer [12])

Cass and Walker (2009) find that wind farm developers can often be negative towards “emotional” responses to wind farm developments and can blame emotional influences for planning decisions that don’t go their way. While there was an acceptance amongst the developers in these focus groups that ignoring local issues and concerns was a major factor in the failure of the midlands development, scepticism still remained about emotional responses and the assumption that these feelings were not based on rational facts persisted:

> I think anyone who was looking at what happened in GB in recent years could see that this was coming down the track in Ireland and we stuck our heads in the

> sand and decided not to go on the “Prime Times” (Irish current affairs programme) and the this and the that, because it is going to be a white wash anyway. I would be the first to say that I think that Prime Time has handled some of the programmes its done – it has been completely emotive and not at all based on facts and proper journalistic analysis, but having said that you can’t just ignore it either and I think we were very slow as an industry to come out and to do the kind of changing of hearts and minds. (Developer [13])

Although all developers acknowledged that the midlands project was on hold, some community focus group participants adamantly insisted it was still being constructed. Developers believed that the project did not go ahead due to a lack of state support and because of the public backlash in Ireland, whilst also blaming political factors, suggesting that the UK Government did not want to ‘upset’ the Irish public due to the two countries difficult past:

> Now, our first at attempt at doing it, we botched it, we botched it, and make no bones about it, we can all point the finger at who was responsible. The big problem in Whitehall was Jesus Christ we have spent 800 years upsetting those people over there, we have just got about 25 where they like us. Elisabeth has just gone over there, don’t upset those people. Nobody should underestimate the fact that is why these talks went bang because the way this was being portrayed across the water horrified the British. (Developer [12])

The majority of developers and community members however, believed that the exportation of wind energy from Ireland would eventually go ahead in some form at some future stage.

4.4.2: Public concerns and externalities:

With respect to questions about externalities elicited from the public survey respondents were asked to rank their primary concerns from 1 to 4, 1 being the main concern and these are shown in Table 4.5. A lower mean ranking suggests a greater concern for that issue. The third column indicates the proportion of respondents who selected each concern as their primary issue. Close inspection of the table reveals that most respondents afford greater priority to their physical and mental health and quality of life and compared with changes to residential property values and impact on the surrounding environment.

Table 4.5: Primary concerns about wind farm development, standard deviation within parenthesis:

Ranking of concerns	Mean ranking (Std dev) [a]	Main concern percentage[b] (Std dev)
Personal physical & mental health	2.24 (1.21)	41.22 (9.70)
Decline in quality of life & wellbeing	2.33 (0.95)	21.54 (8.86)
Decline in property value	2.66 (1.12)	20.45 (4.15)
Surrounding environment	2.74 (1.09)	16.79 (5.68)

[a] 1= main concern, 2= second concern, 3= third concern, 4= least concern.

[b] Percentage of respondents that ranked the relevant externality as their main concern, n=131

Group deliberation broadly reflects this pattern except that more weight is attributed to environmental impact compared with changes in property values. The majority of community focus group participants emphasised the effects of noise and shadow flicker on their health. Some discussed epilepsy and cancer, although the evidence was anecdotal and participants were not in agreement:

> I don't think it's harmful to health other than getting a belt off the blades or something! (Local [12])

The focus group respondent's discussions highlighted the interconnected nature of wind farm externalities and the detrimental impact that issues like noise can have on many facets of life, from physical and mental health, to environmental value and quality of life values:

> There's also this thing called "ultra sound" which is a sound that you can't hear but it's a physical wave that's actually going into your body. (Local [9])
>
> And the air, beautiful. It's so quiet. That's gone. (Local [10])

As with Gibbons (2015), Heintzelman and Tuttle (2012) and Fianna Fáil, (2014) the impact of wind turbines on property prices appeared inextricably linked with setback distance:

> So, and again 500 metres is nothing. I would keep them at least 2 miles away from me, because the value of your house, your land, your area will go down immediately. (Local [7])

Walker et al. (2011) outline the factors that form resident's expectations about a wind farm, including expected externalities. Experience and information provision can be crucial in determining whether or not locals expect negative or positive outcomes from a development, and the public focus group responses reflect this:

> I know, it's one of those things that you really won't know, you won't really have, you can have an idea, but you won't really know until it's there. (Local [10])

> You don't know whether its effecting land, whether its effecting cattle, whether it's effecting human beings, look, reception of electricity, television reception, you know, telephone, you know. There's not enough information. (Local [15])

As established in chapter 2, a wind farm project can create negative impacts on those in the surrounding area and the provision of benefits can be seen as a method of increasing justice and fairness for those who experience these costs (Cowell et al. 2012). This was reflected in the public focus group discussions, which frequently discussed the necessary provision of benefits in compensation for experiencing externalities:

> But hang on a second, if they devalue, just to come back to your point there, if a wind farm devalues your land or your home, then I think that you should be entitled to compensation. (Public [15])

> You can see them flickering and they are flickering along in the field in front of you. It's not a big issue, but if you were getting something out of it. (Public [14])

As with Fast and Mabee (2015), much of the group deliberation by developers tended to downplay the role of negative external effects, with no clear consensus being achieved on this issue. Instead participants focused their attention on the wider societal benefits provided by a development, such as the role of wind farms in reducing CO_2 emissions:

> Another opportunity that is possibly missed, is to try an increase the size of our own market, while using the fact that we have very competitive low carbon energy resources and try and attract in the users. (Developer [16])

Cass and Walker (2009) found that developers were often suspicious about externality claims, with many assuming that opponents deliberately chose to campaign against potential impacts on birds and wildlife due to its emotive power. Similarly, many of the developers in these focus groups were sceptical about environmental impact claims:

> You can run in to sort of stuff, some crazy environmental stuff – I know a project in Clare now that got recently refused because of a pearl water mussel that was 15 km away. (Developer [16])

> The farmer, in spite of what the antis will say, crops do grow very well underneath turbines, cattle do graze very well underneath turbines, foals and

> mares do get on fine underneath turbines, birds do nest on the steps. (Developer [12])

Again arguments in a similar vein to the NIMBY assumption were proposed, with several developers suggesting ulterior motives to externality claims:

> It is something I think is going to come up because if they are going to build these big projects near people's home in the midlands, there are going to people going out with their noise counters and saying you are outside the limits – switch off. So that is like the risk, so maybe it's paranoia that is an issue that is coming up, there is that uncertainty. There are very well resourced, clever people, who are, shall we say mortally opposed to your project. (Developer [5])

However, several developers also conceded that the construction of wind turbines, particularly large scale development, could have a negative impact on the environment and on those residing in the surrounding area:

> But these are the issues, but they are real environmental constraints that have to be taken into account and that is accepted, they have to be. (Developer [12])

> At the end of the day, a wind farm is an imposition on those who live around it. (Developer [5])

4.4.3: Information:

Questions regarding information provision from the public survey in the last row of Table 4.6 indicate little public confidence that developers will provide information to communities about new wind farm developments in Ireland.

Table 4.6: Trust in wind farm developers, standard deviation within parenthesis:

Statements	Mean ranking[a] (Std dev)	Low confidence percentage[b] (Std dev)
The wind farm developer will provide financial support to the community	1.96 (1.13)	74.15 (15.18)
The wind farm developer will cooperate with the community	2.12 (1.28)	65.93 (13.84)
The wind farm developer will provide information to the community	2.28 (1.28)	64.04 (10.43)

[a] 1= No confidence, 2= little confidence, 3= neither confident nor unconfident, 4= confident, 5= full confidence

[b] Percentage of respondents that ranked the relevant statements as 1 or 2 indicating low confidence,

n=89

Arnstein's ladder of citizen participation suggests that informing the community is the first stage in the engagement process (Arnstein, 1969). The community focus group responses indicate that if developers were to provide information than fears over possible externalities may be lessened, particularly in the area surrounding the midlands development, although there was a general resignation that this would not happen:

> Gives them a sense of security if they know what's going on in there, you know? You wouldn't be so worried about if they would know what's going on. (Public [4])

> Like the thing is, they are going ahead building wind farms, but people don't know anything about them. There's no information coming out there. And that's the biggest problem. If people were told, look we will bring you to a site there, we'll show you, we'll explain it to ya, there mightn't be half as much trouble. But that's not, they won't do that. (Public [3])

The general lack of trust in wind farm developers was evident, with respondents assuming that developers would either not provide information or that if they did, this information would not be sincere. These assumptions were largely based on negative local experiences:

> As we keep saying we had no knowledge, anyway they weren't going to give it to us there. (Public [17])

> You are told one thing at one meeting, you are told a different thing at another meeting. (Public [4])

The type of information requested was discussed, with respondents presenting a range of information requested. These included information on the layout of the wind farm, the pros and cons of the development, planning permission details, ownership details, maps, environmental impact statements, operating procedures, scientific studies, future plans for the development and the potential negative effects of the project on local residents, wildlife and the landscape. This information was seen as a fair demand of the developers, who are again outsiders entering their community:

> Everything kind of written down in black and white and say, “look, this is the amount of turbines we hope to put up in (place name)...they are going to be 150 feet high or whatever…it’s going to be 50% owned by the community or, you get 89 or 111 euro of free electricity per year” or whatever it is. And have everything down in kind of black and white … all the information is there...you’re leading people into your community to basically ruin your landscape and probably effect your livelihood, so you’re entitled to have all the information down in front of you to read exactly what’s going to happen. (Public [15])

The need to provide the public with more information about wind farm development was debated by the majority of developers, and similar to the attitudes to the public respondents, many of the developers declared that there was a lack of information provided about the midlands exportation project, particularly in terms of benefit provision:

> I think that one of the mistakes that was made was that the three major players did not work together and what the public saw, what Joe Public saw, and I talked to plenty of them, is well sure this guy is telling me I am going to get this community fund, the other guy is telling me it’s going to be this, sure you are all talking rubbish. Sure how do I know who to believe? And there is a total mixed message coming out and the public don’t know the difference between Bord Na

> Mona, Mainstream and Element, they just think they are being told a pack of lies. (Developer [13])

However, as with Cass and Walker (2009) the provision of information was mostly discussed in the form of 'public education' and 'myth busting' rather than the delivery of meaningful, non-biased project information sought by participants in the public focus group:

> So what is needed now is to build public confidence in the fact and information and to debug some of the myths and that doesn't happen easy and the next couple of years are crucial for the industry to do that. If we get things back on an even keel, we then need to ask our public, we have this resource, we seem to have a market, we seem to be sitting on the edge of a market, it looks like it is something we can export, do you think we should and policy needs to either say yes or no and move in that direction. (Developer [12])

Many developers assumed that those who opposed wind farms were simply uneducated or lacked the correct knowledge and once they had this information they would agree with developers:

> I think the key thing is to people to equate what they do in their daily lives to energy. Turning on the kettle in the morning, everyone turns on the kettle in the morning. Everyone uses electricity every single day of their lives, but very few actually think "where is that coming from?" That is the key – and it is simple and you need to boil it down to simple – and you need to equate. The best thing

> that could happen for or maybe the worst thing is that gas is cut off from Russia. (Developer [16])

> We began to try to educate people, that is a horrible word to use, about the fact that we are so reliant on gas and that gas infrastructure – this issue of we will sell it, but by Jesus we won't sell it to the Brits and now we would be telling people that actually if they adopted the same principle in relation to gas, we would be totally f****d. (Developer [12])

The bottom rungs on Arnstein's ladder of citizen participation represent "non-participation", whereby those in power try to "educate" or "cure" those without decision making capabilities. The developers in these focus groups indicated some characteristics associated with these levels, agreeing that there was a need for an organisation, either the IWEA or a government department, to play a more active advocacy role to instil a positive view of wind energy. Again, the provision of information was viewed more as a marketing and promotional issue as opposed to a method for engagement and community involvement:

> We have been pretty good with the advocacy side with the Department and the government. We have got a policy that has delivered to us 2.5GW onshore. Our problem is Joe Public, sorry our challenge is Joe Public, public acceptability – a massive issue. (Developer [12])

4.4.4: Cooperation and ownership:

The findings from the public survey and group deliberation convey a number of points on topics that include developer and community cooperation. The data from the public survey presented in Table 4.6 reveals little confidence by the public that developers will cooperate with the community.

As outlined in chapter 2, local involvement in a wind farm development can range from a process which is open and participatory, incorporating a wide range of influences and opinions to one which is closed and institutional, with little local contribution (Walker and Devine-Wright, 2008). The majority of community focus group respondents had strong preferences for a process which allowed for negotiation with local residents:

> If someone is building a wind turbine here and it has to be done and he doesn't want the wind turbine there, there should be some kind of agreement that says, look, we will move you somewhere else or it should be that we should write some kind of agreement. It should not just be "look, that's just the way it goes, we are building it there and that's it." (Local [10])

This level of engagement corresponds with rung seven on Arnstein's ladder of citizen participation, the stage at which the residents hold more decision-making power and the developers must negotiate with locals in order for the project to go ahead. There was a sense that engaging those from the surrounding area could minimise potential negative impacts as residents have a stronger emotional and cultural connection to the development site, and if somebody familiar was involved opposition would be lessened:

> Well, I mean there is a possible positive characteristic if you know, the thing is set up and the local community take it on board. You know, that's a positive. And the local community would probably ensure that it's not going to interfere with their landscape, heritage, or their local residents, you know? (Local [9])

> It would make a difference, I wouldn't want to be objecting to what local people are doing like. I wouldn't like to be objecting to what a neighbour would be doing. (Local [14])

However, the concept of community ownership, cited by many studies as key to acceptance (Enevoldsen and Sovacool, 2016; Musall and Kuik, 2011; Maruyama et al. 2007), was not considered to be a panacea to all problems. As with information provision, experience formed this scepticism, with residents in an area with a community wind farm outlining the issues associated with defining what a "community" is and who should be involved. The issue of locals versus outsiders arose even when considering participants close to the development site:

> Well it was definitely kind of their little project more so than a community project. Even though it's (place name) "community" wind farm, it's definitely their own project. (Local [16])

> Another thing about this is, some blow-ins have invested in this as well. (Local [14])

Ireland's Renewable Energy Partnership conducted a study into the potential for community ownership of wind farm developments and found that the barriers associated with a lack of access to finance and specific expertise were too great (Renewable Energy Partnership, 2004). Similarly, when discussing community ownership, many residents felt that this would be too difficult for small communities to take on board or unlikely to occur:

> But very often, like, the local teacher would have been involved in the local community co-op and his wife would be a full time house maker or whatever the correct word is. So it was seen as being okay, you could take your few night a week off to work voluntarily with the local community. People don't have the time now. (Local [9])

> Going back to local communities, you'd have to be a very wealthy local community to bring on a project like that, I mean they cost millions. So that would be out of the question, for local communities taking them on, we can't even hardly keep a little co-op going because all the grants being pulled back and cuts here and cuts there. (Local [7])

When it came to a discussion on what the preferred ownership type would be, many residents preferred state ownership. Familiar state bodies, such as Bord na Mona or the ESB (Electricity Supply Board) were spoken about in favourable terms particularly in areas with high levels of employment from these agencies. This suggests that the provision of local benefits through employment, and positive experiences and interactions with an agency can engender feelings of trust and loyalty and that a general mistrust persists about “outsiders” or unfamiliar developers:

> Irish semi state would make you feel more positive anyway, they would be more qualified to do any of that stuff. (Local [2])

> As me granny used to say better the devil you know then the devil you don’t. (Local [4])

Although the majority of developers were enthusiastic about partial community ownership of wind farms, citing successful projects of this type in Denmark, this was very much tied to the idea of community investment rather than the granting of shares as “compensation”. As opposed to the community view that the provision of shares or benefits from the wind farm was deemed fair due to the externalities endured, the developers held the perspective that it was only fair if communities invested in the wind farm to receive the benefits:

> The problem as we see it in Ireland goes back to the begrudgery thing and I am a very proud Irishman. Paddy thinks that ownership is for free. (Developer [12])

> It comes down to ownership – it is equity. If you are going to have something, you have to put something in. There are an awful lot of individuals that seem to think that they should get something for nothing, just because they are there. (Developer [5])

Many developers were enthusiastic about the concept of share ownership, suggesting a model of 10% open to community investment at a fixed amount per share with a guaranteed return. At the end of the project, there would be the opportunity to sell the share back to the developer. It was suggested that if the community were involved they would be more likely to be more positive towards wind farms:

> …It is just part of the model you can provide perhaps access to cheap financing through local credit unions and that sort of thing. I think there is a model there to be looked at and it certainly is where the local community feel there is benefit flowing from the piece of infrastructure, it is a totally different scene, it is a totally different scene. (Developer [12])

However, this was the only type of community engagement deemed acceptable to the majority of the developers. Most of the developers did not want the communities involved in the day-to-day running of the project or to have any say over business decisions. The developers preferred type of planning process was one which was closed and institutional (Walker and Devine-Wright, 2008):

> He (developer) would maintain full control – you could not have interference in how you run. (Developer [5])

4.4.5: Compensation:

As shown in Table 4.6, the majority of respondents surveyed had no confidence that a wind farm developer would provide financial support to their local community.

Survey respondents were also asked their average electricity bill for two months. The average from those who responded was €189.41 (*n*= 183).

As indicated in section 4.4.3, providing compensation was seen as a necessary stage in the engagement process. In order for the development to be deemed “fair” those in the surrounding area must receive at least some of the benefits of production. If the distribution of benefits is not deemed to be fair, then this can lead to social divisions, which are likely to make it more difficult to build wind farms in that location in the future (Hall et al., 2013):

> There’s no use in me paying massive ESB bills and those yokes just up the hill behind us and nobody getting nothing from them. (Local [14])

Reasons given by community members for compensation provision included noise inconvenience, shadow flicker, reduced property value, disruption during the construction phase and to provide positive public relations between residents and the developer. The concept of the fair distribution of benefits is important even on a local scale, as many pointed out that not everyone in the community would be negatively impacted by the development in the same way. Therefore those living closest to the turbines should be given greater weight in decisions over benefits arising from wind farm projects:

> People live very near them, people are very near them. They should definitely be entitled to something out of it. (Local [14])

> The first one will always go back to the people who are living more next to the turbines should be paid more. Even if that meant that instead of 50% going to the community, that you dropped the 50% to 40% to the community. And the other 10% are split between people that are living in the direct vicinity of the turbines. Because I think, if they are going to be the people that… are going to be listening to noise….to the shades or whatever off the blades. (Local [15])

The payment of local benefits or compensation can be troublesome for developers as many residents can view this as bribery or as a sign that there will be some detrimental impact of development (Aitken, 2010). Issues with trust arose frequently in the community focus group discussions, with many participants appearing suspicious about the motives of developers and local landowners:

> Well the farmers are getting a good handshake. (Local [3])

> Why would they be compensating? Is it because they are going to impinge on our livelihoods? (Local [7])

> See if it was private companies or developers, they possibly wouldn't have to give compensation to the community. (Local [16])

The concept of compensation was discussed by the majority of developers and some were sympathetic with the community stance of seeking payment for wind farm externalities:

> … 99% of people, Joe Public, are going to get nothing and they say why in the name of god should we put up with this, nothing in it for us. (Developer [6])

Electricity discounts, the preferred compensation choice of the community participants, was discussed by one developer who proposed a scheme to provide this benefit to local communities:

> Credit unions have a clientele with the potential of developing a supply business, selling electricity to the coop members at a price that would be less than they would normally pay if they were buying electricity from Airtricity or otherwise. (Developer [5])

Despite understanding that most residents deem compensation or benefit endowment as an entitlement in the provision of distributive justice, many developers were very concerned with being taken advantage of if they provided benefits. As outlined in section 4.4.2, the many of the developers deny that wind farms result in negative externalities on those in the development area and so viewed much of the community complaints as a method of extracting money unfairly from them:

> ….people have… heard these stories that if you complain you might get something out of it. When we were building, there were a few people joked and messed, ah sure you will give us a few quid for double glazed windows for houses or whatever it is… It is what they can get out of you. (Developer [16])

Some provided their own personal stories of being pestered for increased compensation by the local athletic association for facilities, members of the community and the council for unreasonable amounts of compensation. The role of benefit provision in terms of community acceptance was understood, but it seems that the “greed” of local authorities and some residents hardens developer’s attitudes to the provision of benefits and makes them less likely to engage or provide benefits in the future:

> …it is like different stages within the life of a project from conception to implementation or development and the attitude of the developer to the community issues is at one stage, I need them aboard because I need to get my planning, I don't want to have too many objections. But when I have it built…I am getting bang for double on rates and this, that and the other… it becomes a parasite on the future of the development and you know when you are trying to get planning, you have to be very nice to people. When you have got your project and it is built, you are in a different situation. (Developer [5])

> They are grabbing that – so to me 2 years ago, I would have been all in favour of this, now, no, not a penny. (Developer [6])

4.5: Conclusions:

Arguments have been made that Ireland may have a comparative economic advantage in wind energy exports to the UK (IWEA 2012b) and the assumption is sometimes proposed in the wind energy literature that this comparative economic advantage is a necessary and sufficient condition for trade (Abrell and Rausch, 2016). Despite the fact that little attention is paid to the social or environmental costs of wind energy exports, these findings from a public survey and focus groups indicate that issues related to information provision, distributional justice, externalities and local involvement threaten the acceptance of wind energy development for export from Ireland to the UK.

These results point to some possible differences between the levels of social acceptance of wind farms for export vs. for domestic needs, with support for the domestic case appearing to be somewhat stronger. The survey data, outlined in more detail in chapter 3, shows that though the majority (57%) of respondents are willing to accept wind farm construction for domestic use, this is not true in the case of exporting wind farms, with 69% opposed to the construction of wind turbines that involve possible trade with the UK. These results also suggest that there may be some subtle differences between public perspectives on wind power for export compared with the domestic case with respect to benefits. Deliberation by local stakeholders in this study indicates that the majority were opposed to exportation. This stemmed from a strong sense that whilst local residents would bear the brunt of the external costs, most of the benefits would not be felt in Ireland, certainly not in the Irish midlands, but instead be distributed further afield to wind farm operators, private corporations and their distant shareholders. For community participants, questions of distributional justice outweighed the perceived wider economic benefits to the Irish state. This corresponds with findings from Cleary et al. (2016) who report that the UK would receive the majority of the benefits of the midlands exportation project.

For their part, wind farm operators did not acknowledge that there might be possible differences between export vs. domestic projects with respect to benefits in so far as they affect the general public. While community groups focused on the negative external effects, mainly health and quality of life issues, developers emphasised the general economic benefits associated with trade for Ireland. Proponents of domestic wind energy projects often list energy security, reduced carbon dioxide emissions, green energy provision and local employment as arguments in favour of greater wind penetration. Several domestic wind farm studies have shown that the general public do value these attributes and have argued that some respondents may downplay the external costs that affect them because they are in favour of wind energy (Groothuis et al., 2008). This effect is likely to be more pronounced for individuals who favour green energy and may therefore require less compensation to allow wind farms in their locality. Yet, export case studies, such as the midlands project, have no value locally or nationally precisely because they are part of the 'export package' to the country concerned, in this case the UK.

There are a number of potential differences between export vs. domestic projects with respect to social costs. The proposed turbines for the midlands exportation project are larger than any used in other areas of Ireland and consequently the potential externalities related to amenity and landscape issues are perhaps greater. Although local residents and developers are aware of the social costs and the potential for Coasian bargaining, the frameworks for such bargaining to address these social costs were not implemented by the three major players or the state and were perceived by both developers and public focus groups to be inadequate. Although there are examples of domestic projects that do not internalise wind farm externalities in Ireland, there are plenty of other examples that do, offering financial benefits to those in the vicinity of the wind farm (Windfarm Community Funds, 2014; Bord na Mona 2015). A wind farm project of this scale has never before been conceived in Ireland and yet these findings indicate that the three major players and the state failed to coordinate information amongst themselves and to convey fundamental information to local communities regarding the project. In the absence of a Coasian framework for bargaining between communities and wind farm operators or state intervention of some kind, local community focus group respondents are prepared to forego the midlands venture altogether even if this compromises the benefits from the project entirely.

Finally, it is worth remembering that the status quo itself may be valued by local people. For local residents, the status quo of no midlands wind farm project is not without its public good amenity benefits in the form of landscape and rural amenity, biodiversity and avoided externalities associated with noise and shadow flicker. Notably, public participants and wind farm operators are, in principle, both supportive of co-management initiatives. However, community respondents conveyed awareness that developing a wind farm is a complex, risky and multi-faceted endeavour that requires considerable expertise and commitment before any financial returns are realised, which they feel unable to achieve on their own. They also believed that it was very unlikely that developers would cooperate with communities on such initiatives. For their part, wind farm operators emphasised that they would be willing to consider co-operative arrangements provided community members were prepared to financially invest in such ventures. Survey data and group deliberation by local residents indicate a strong preference for state or semi-state led initiatives not private developers. Current policy does not favour one group over another specifically, but does make it difficult for community ownership through lack of support. In the Irish context, McCarthy (2010) reports that there is currently a dearth of community-owned wind projects in Ireland. Although community renewable energy is mentioned in a number of Irish Government documents (such as in DCMNR 2007, at section 2.2.3), specific measures to increase community involvement and reduce barriers in the establishment of community renewable energy resources have not yet been outlined (Comhar SDC 2011). In this regard, Ireland's Renewable Energy Partnership conducted an extensive analysis of the potential for communities to benefit from the establishment of wind farms and their final report concludes that communities should actually refrain from investing in their own wind energy projects because the level of risk and uncertainty is too high (Renewable Energy Partnership 2004).

I acknowledge a number of shortcomings in this study. Though the number of focus groups may appear small, segmentation and replication would have greatly multiplied the number of groups required and, in my view, these are not necessary given the research goals. This study focused mainly on what was said, rather than how things were said and the impact the discussion had on the participants did not represent a key aim of the research. Instead far more important for the aims of this study was an assessment of the views and attitudes of the different stakeholder groups. Also the nature and complexity of the topics under discussion required a high level of participant involvement for which small groups are deemed more effective than larger groups (Morgan, 1996). For this reason, five different stakeholder groups were thought to be sufficient to meet the research goals of the study.

These findings indicate that large-scale deployment of wind farms in Ireland specifically to export electricity to the UK may be premature. Although the midlands initiative is currently on hold, a major policy question is how Ireland should reposition itself in terms of preparing its communities for that eventuality should the concept re-surface in a different guise. Policy-makers concerned with this sector need to reflect on better information provision, community consultation, trust building, effective instruments to internalise wind farm externalities and co-management arrangements before Ireland can fully capture the benefits of wind exports.

Chapter 5

Determining the local acceptance of wind farms in Ireland: Identifying predictors of the status quo using a choice experiment.

Abstract

In the stated preference literature on wind farm acceptance, it is not always clear as to why respondents may consistently choose the status quo (SQ) option of no new development. Using a discrete choice experiment (DCE) offering two wind farm options and a SQ of no new wind farm, I examine the factors that influence respondent's preference for the SQ. I compare two choice set samples; those who selected a wind farm option and those who always selected the status quo alternative using survey data analysis and a binary logit model. I identify the reasons underlying respondents selection of the SQ and find that externalities, attitudes towards wind energy, experience with wind farms and demographic factors are crucial determinants of a SQ response whereas choice task complexity and attribute disagreement are not. The implications for renewable energy policy are discussed.

Key words: Discrete choice experiments, willingness to accept, windfarms, status quo, choice task complexity

5.1: Introduction:

The construction of wind farms can often be controversial and lead to objections and protests in the surrounding area of the project due to associated public externalities (Zografos and Martínez-Alier, 2009; van der Horst, 2007; Woods, 2003). In Ireland, those against these developments state disagreement with governmental energy policy, fears over landscape, health (Griffin, 2014) noise and shadow flicker impacts, mistrust of developers (Fleming, 2014) and fairness issues around wind farm siting (Carey, 2015) as reasons for their opposing perspectives. Numerous studies have investigated the issue of social acceptance of wind farms generally and find that issues such as visual impact (Devine-Wright 2005; Jones and Eiser 2010), environmental impact (Wolsink, 2000; Dimitropoulos and Kontoleon 2009), attitudes towards environmental issues (Johansson and Laike, 2007; Ek, 2005), demographic factors (Ladenburg and Dubgaard, 2007*;* Groothuis et al, 2008 ; Ek and Persson, 2014) and the frequency with which residents experience turbines (Kontogianni et al. 2014; Swofford and Slattery, 2010) significantly influence the acceptance of wind farms. Studies have also suggested that respondents are less likely to be accepting of a wind farm if the associated externalities are perceived to be significant (Firestone et al. 2015; D’Souza and Yiridoe, 2014; Kontogianni et al. 2014).

Many of these studies have used choice experiments to analyse preferences for wind farm projects (Caporale and De Lucia, 2015; Van Rijnsoever et al. 2015; Strazzera et al. 2012; Westerberg et al. 2015; Dimitropoulos and Kontoleon, 2009; Ek and Persson, 2014; Ladenburg and Dubgaard, 2007). As outlined in chapter 2 and 3, in choice experiments respondents are typically required to make a decision between hypothetical goods, services or projects described by a set of attributes which differ in terms of the levels that the attributes take (Adamowicz, et al. 1994). In general, choice experiments offer a respondent the choice between these alternatives and a status quo (SQ) option (Hanley et al. 1998) representing the option to do nothing or remain in the current situation (Meyerhoff and Liebe, 2006), however in the wind farm stated preference literature it is not always clear as to why a respondent may choose to forgo any benefits associated with a wind farm project; like compensation, job creation or avoided CO_2 emissions; and consistently select the SQ, indicating their preference for a scenario without development (Borchers et al. 2007; Konsenius and Ollikainen, 2013; Krueger, 2007; Westerberg et al., 2013).

While respondent preference for the SQ may be due to wind farm issues like externalities and attitudes, they may also emerge as a result of survey design. Studies have shown that increased numbers of choice sets with greater combinations of attributes and levels can lead to a larger proportion of SQ selection as respondents struggle to complete the task (DeShazo and Fermo, 2002; Meyerhoff and Leibe, 2009). A high SQ selection ratio may also indicate disagreement with some element of the choice task. In general, follow up questions are used to elicit these attitudes which may include disagreement with attribute levels, objections to paying for the good, issues of fairness surrounding payment, beliefs that the developer or government should pay for the good, requiring more information or time and disbelief in the likelihood of the presented situation occurring (Pearce and Özdemiroglu, 2002).

Though the reasons underlying SQ selection have been examined in empirical studies analyzing preferences for biodiversity (Spash and Hanley, 1995), forest ecosystems (Boxall et al. 2009) and water quality (Marsh et al. 2011; Lanz and Provins, 2015), no study has examined or sought to explain the reasons why respondents may prefer the SQ in any detail with respect to wind farms, despite the fact that choice experiment results indicate that many respondents frequently reject these developments by selecting the SQ (Kermagoret et al. 2016; Borchers et al., 2007; Kosenius and Ollikainen, 2013). As the reasons for SQ selection may be based on wind farm issues such as externalities and attitudes (Firestone et al. 2015; D'Souza and Yiridoe, 2014; Kontogianni et al. 2014; Johansson and Laike, 2007; Ek, 2005) and/or survey issues like choice task complexity or disagreement with the presented options (Marsh et al. 2011; Bonnichsen and Ladenburg, 2010; Brazell et al., 2006) this information may be crucial not only to stated preference analysts in terms of survey design, but also for general wind energy researchers, policy makers and developers who may wish to identify the factors most likely to lead to rejection of these projects due to prior attitudes, experience and demographic factors. The impediments to windfarm acceptance and the implied costs could play a significant role in relation to national and EU directives advocating the wider implementation of renewable energy.

My analysis helps fill this gap in the literature because it represents one of the few choice experiment papers which consider the factors that influence respondents preference for the SQ, in this scenario indicating a rejection of new wind farm development, through the incorporation of both the wind farm acceptance and status quo literature. This study utilises a choice experiment sample analysing wind farm preferences in Ireland and divides the respondents into two categories; those who reject the provided wind farm options and always select the SQ of no new wind farm and those who do not. Through the use of attitudinal survey data and appropriate follow up questions, this study evaluates the underlying reasons behind the decision not to choose a wind farm option. This study analyses two aspects of status quo preferences; those related to wind farm issues, namely externalities, attitudes, experience and demographic factors; and those related to survey issues such as complexity and attribute disagreement, to provide a wide-ranging review of the reasons underpinning these preferences. The chapter proceeds as follows: First, a review and some background to the status quo topic and wind farm preference literature is given. Next, a description of the survey instrument and methodological approach is provided. Then, the empirical strategy used to explain why respondents choose the status quo is considered and the results discussed. Final remarks and considerations are offered in the conclusions.

5.2: Literature review:

In choice experiments, the utility derived from the selection of a presented option depends on its attributes, the utility function of the respondent and an unobservable stochastic element. In the majority of studies, a monetary attribute is included to analyse respondents implicit trade-offs between the attribute levels and the different options in the choice set enabling the analyst to infer the Willingness to Pay/Willingness to Accept for the good in question and the value of the attributes (Alpizar et al. 2003). The SQ exists as an option in a choice set to avoid forcing the respondent to make a decision which is suboptimal for them (Batsell and Louviere, 1991) and to increase the realism of the choice task decision (Carson et al. 1994) where the consumer cannot be forced to purchase a good or accept a negative outcome (Adamowicz and Boxall, 2001). The design of a SQ alternative in choice sets can vary from a simple “none of these” choice, to one offering an alternative policy option or current baseline, each of which require a different type of analysis (Alpizar et al. 2003). Where the option exists in reality to opt out of a policy outcome a SQ is particularly relevant, though the inclusion of an opt-out type of SQ is not necessary or appropriate for all scenarios (Adamowicz and Boxall, 2001).

In the literature there is a distinction between respondents preferences for remaining with the SQ, indicating a SQ “effect”, which may occur for a number of reasons including risk aversion (Hartman et al. 1991), endowment effects (Atkinson, 2011) and regret avoidance (Chernev, 2004); and SQ bias which may arise due to choice task complexity (Marsh et al. 2011) and protest beliefs (Bonnichsen and Ladenburg, 2010). Choice tasks with large numbers of attributes and levels can increase the complexity and size of the design (Bateman et al. 2002; Pearce and Özdemiroglu, 2002) leading to inconsistent results, distorted welfare estimates (DeShazo and Fermo, 2002) and greater numbers of SQ respondents (Meyerhoff and Leibe, 2009). The levels of these attributes also need to be realistic and cover the range over which respondents are expected to have preferences. Levels that are too high or too low can result in insignificant results or a higher likelihood of SQ selection (Pearce and Özdemiroglu, 2002).

5.2.1: Status quo studies:

Previous studies have analysed the underlying reasons behind SQ preferences for environmental goods and services. Lanz and Provins (2015) found that the SQ was chosen by 60% of respondents in their study into water services in the UK and 14% of the survey sample chose it for each scenario. To determine the motivation behind the high SQ responses, they included variables on complexity, protest attitudes, socio-demographics, satisfaction with the current SQ and the importance of water services. They found evidence for disagreement with the choice set attribute levels: many respondents believed that the current level of water quality was better than that presented in the choice sets and so selected the SQ. Many of the respondents also disagreed that some of the attributes were important to them. This study also suggested that respondents may have had protest motives: those who didn't believe the improvements provided in the choice sets would be implemented, those who don't believe customers should pay and those who believe the information provided was insufficient were more likely to select the SQ. Older respondents and females were less likely to deviate from the SQ and choice task complexity was also positively correlated with serial SQ selection; i.e. selecting the SQ in each choice task.

Meyerhoff and Liebe (2009) conducted a SQ analysis in their study of preferences for forest biodiversity. Approximately half of the survey respondents disagreed with paying for the resource and about 40% believed that forest conversion was not a priority. The sample was divided between two survey regions and the study found that 49% of one region and 59% of the second selected the SQ in each scenario. In their analysis of the motivations behind this high SQ response, they find that respondents having a protest perspective; that is; disagreeing with paying for the resource, and perceived choice task complexity correlated with a positive likelihood of selecting the SQ (though the latter in one sample only). Those with a positive attitude towards forestry conversion, older and higher educated respondents and those who use the resource were less likely to select the SQ in each scenario.

Boxall et al. (2009) analyse the impact of choice task complexity in their study on forest biodiversity, finding that greater numbers of changes in levels and attributes in choice sets led to an increased propensity for the SQ. Facing difficult choice tasks, respondents selected the SQ as an alternative which demanded less of a cognitive burden. Older and less educated respondents selected the SQ more frequently.

5.2.2: Wind farm preference studies:

Although there is an extensive literature on wind farm externalities (Álvarez-Farizo and Hanley, 2002; Bergmann et al. 2006; Ladenburg and Dubgaard, 2009; Ku and Yoo, 2010; Meyerhoff et al. 2010; Heintzelman and Tuttle, 2012; Jensen et al. 2014), some of which employs DCE (Dimitropoulos and Kontoleon, 2009; Vecchiato, 2014; Álvarez-Farizo and Hanley, 2002; Fimereli, et al., 2008; Meyerhoff, et al. 2010; Bergmann et al. 2008), none of this work critically evaluates why respondents may prefer the SQ alternative. Nevertheless in Table 5.1 I summarise this literature in terms of the proportion of respondents that chose the SQ, the inclusion of the SQ, possible reasons given as to why respondents chose the SQ and the extent to which they explain why respondents chose the SQ. Framing of the SQ option varies considerably depending on study aims and local circumstances. All papers listed in Table 5.1 included a SQ option, with the exception of the two studies by Ladenburg and Dubgaard, (2007) and Ek and Persson (2014) who argue that since a policy decision to develop the wind farms had already been taken the inclusion of the SQ would have been unrealistic. Although many of these studies examine the utility or disutility associated with the selection of the SQ, relatively few provide information on the number of respondents who chose the SQ either at least once (Borchers et al. 2007; Kosenius and Ollikainen, 2013; Krueger, 2007), the percentage of respondents that chose all SQ (Kosenius and Ollikainen, 2013; Kermagoret et al.,2016; Westerberg et al., 2013) with just one paper reporting on the use of follow up questions in order to explain why respondents might choose the SQ (Kermagoret et al. 2016).

Table 5.1: Treatment of SQ in wind farm studies:

Paper	% of respondents selecting SQ at least once	% of respondents selecting all SQ	Reasons for not choosing the wind farm
Karlõševa et al. 2016	Not stated	Not stated	Concern over cost of policy option
Kermagoret et al. 2016	Not stated	25.4%	Lack of compensation, opposed development
Ek and Persson, 2014	-	-	-
Vecchiato, 2014	Not stated	Not stated	Reluctant to pay for renewable energy
Kosenius and Ollikainen, 2013	35%	17%	Reluctant to pay for renewable energy
Westerberg et al. 2013	Not stated	4.5%	Setback distance
Dimitropoulos and Kontoleon, 2009	Not stated	Not stated	Planning process
Borchers et al. 2007	39%	Not stated	Demographics, attitudinal
Ladenburg and Dubgaard, 2007	-	-	-
Krueger, 2007	7.1%	Not stated	Visual disamenities

In a study in Finland Kosenius and Ollikainen, (2013) used a dual response method, in which the respondent was initially forced to choose between 4 renewable energy options, including wind energy, and then subsequently asked if they would in fact prefer the SQ current energy mix. The SQ was the most popular option with 35% of respondents choosing it at least once and 17% selecting it in each of the 8 choice scenarios, indicating the reluctance to pay for renewable energy. However, the underlying reason for this attitude is unclear due to a lack of appropriate follow up questions.

Kermagoret et al. (2016) analysed preferences for compensation for a proposed wind farm. Their choice sets offered two compensation options and a SQ “none” opt-out. This study reports that 25.4% of respondents selected the SQ in every choice set and follow up questions indicated that the main reasons respondents selected the SQ were disapproval of the wind farm and the lack of compensation in the form of dedicated benefits for the affected local community. Those who selected the SQ in each scenario were defined as protest bidders and removed from the analysis.

A study by Borchers et al. (2007) into preferences for renewable energy projects, including wind, incorporated two SQ options. Option A and B represents two renewable energy projects, Option C represent support for the renewable energy project but is defined as an unwillingness or inability to pay whereas option D denotes the alternative to not choose either of the programs. The status quo option was selected in 39% of cases, making it the most popular choice. However, the proportion of respondents who selected the SQ each time was not stated. The likelihood of selecting the SQ increased for lower income respondents and decreased for respondents below the age of 30 and above the age of 50. Those who had concerns about the environmental impact of electricity generation were also more likely to select the SQ.

None of the studies cite choice task complexity or disagreement with the presented choice set attributes as reasons for choosing the SQ, and with one exception (Kermagoret et al. 2016) there is no explicit attempt to give reasons for the choice of the SQ alternative. Instead they generally explain opposition to wind farms in terms of externalities associated with their function (Krueger, 2007; Westerberg et al., 2013; Vecchatio, 2014), institutional and social aspects involved in their deployment (Ek and Persson, 2014; Dimitropoulos and Kontoleon, 2009) experience of wind farms (Ladenburg and Dubgaard, 2007) demographic factors (Borcehrs et al., 2007; Kosenius and Ollikainen, 2013) and protest responses (Westerberg et al., 2013). By convention, Westerberg et al. (2013) and Kermagoret et al. (2016) removed respondents that chose the SQ in each scenario from the analysis. The reporting of the treatment of SQ responders in stated preference studies like the ones above has been noted as inadequate in the literature by Meyerhoff and Leibe (2010) who recommend that standardisation occur and recording be improved.

5.3: Methods:

5.3.1: Framing of the SQ alternative:

Details of the choice experiment methodology, and the process of choice set design is provided in chapter 2. Option A and B in these choice sets offered different combinations of the selected attributes with their different levels, and Option C presented the status quo option of *No New Wind Farm*. The status quo option was chosen by 86 respondents for each of the 12 choice sets, representing 43% of the sample. This is large in comparison to the 17% of Kosenius and Ollikainen, 2013 or the 25.4% of Kermagoret et al. 2016 but lower than Meyerhoff and Leibe 2009 who report between 49-59% serial SQ responses. This high result could indicate the presence of a SQ bias in the data (Meyerhoff and Leibe 2009).

In order to explain why respondents may have chosen the SQ a number of questions were included in the survey to tease out motivations. These statements are broken up into sections representing wind farm issues; based on externality perspectives, attitudes towards environmental issues, experience with wind energy and demographic factors; and survey issues based on the perceived complexity of the choice sets and potential attribute disagreement.

5.3.2: Wind farm issues: Externalities:

In order to evaluate the physical impact of wind turbines on respondents the section following the choice sets included graphical representations of two wind farms; one including turbines close to a residence (Figure 5.1) which is labeled as a large wind farm and the other with only wind turbines positioned in the distance (Figure 5.2) labeled as a small wind farm. The use of photographs or illustrations in preference studies can be problematic, and depicting a scenario deemed realistic to all respondents can be difficult (Karjalainen and Tyrväinen, 2002). If the images are meant to represent a specific location, this can also be challenging due to the differing visual effect of turbines depending on whether the landscape is hilly, the angle of the photos etc. (Meyerhoff et al. 2010). These images were therefore proposed to residents not as something representative of a development near them, or even to represent the environment in their surrounding area, but rather as an abstract representation of developments “near” a house. The images were created in Pixlr Editor, a web based photo editor using free images from Google Commons. Although perhaps not representative of most of Ireland, a flat landscape was selected to ensure a simplistic and clear visualisation of the wind turbines. 6 large turbines were placed to the forefront of the first image to represent a small but visually impactful wind farm, with a larger wind farm in the distance. Similar wind farms at approximately 500m or less from homes have been built in Wexford in Ireland (Phelan, 2014) and in the UK

(Croft, 2011). The second image then removes the turbines in the forefront leaving 16 turbines in the distance. As the exact setback distance is dependent on the height of these turbines, this information was not provided to respondents.

Although these photos are not perfect representations of a realistic landscape, they were presented to participants in the three community focus groups as part of the final survey testing. These individuals did not raise any issues with these images and were able to answer the related questions without assistance. Nielsen et al. (2007) state that presented images do not have to depict a hyper-realistic representation of reality in order to be understood, and instead images can be used in an illustrative manner. Nevertheless, the limitations associated with these images, including the potential that respondents may not have believed them to be realistic, must be kept in mind when considering the results in this chapter.

Figure 5.1: Large wind farm:

Figure 5.2: Small wind farm:

Respondents were then asked to rank a range of impacts/issues and requested to specify to what degree they believed residents would be affected by each wind farm from 1 (not at all) to 5 (extremely affected). These issues included the mental and physical health of residents, the health of livestock and birds, property value, visual pollution and the happiness of members of the local community. This aims to establish what respondents believe to be the key negative aspects of wind turbines. It is hypothesized that those who always select the SQ view these externalities differently to those willing to accept a wind farm and that respondents who feel that wind turbines have a negative impact on visual surroundings, recreation and quality of life are more likely to oppose wind farms (Johansson and Laike, 2007). Similar graphical representations in other studies have been used as part of a choice set (Ladenburg and Dubgaard, 2007; Strazzera et al. 2012; Westerberg et al. 2015) though in this study I include them not as part of the choice task but as a stand-alone query.

5.3.3: Wind farm issues: Attitudes towards wind energy:

In the first section of the survey and in the section following the choice task, respondents were presented with questions and statements to establish attitudes to environmental issues and wind energy in general. These are presented in Table 5.2.

Table 5.2: Attitudes towards wind energy:

Statements/ Questions
How important are environmental issues to you? (E.g. pollution, recycling, climate change)
Do you think there are enough wind farms in Ireland?
Are you in favour of building wind farms in Ireland specifically to export wind energy to other countries?
Wind energy is not the best form of renewable energy
Wind farms can damage the appearance of the landscape
I do not trust wind farm developers
It is not appropriate to build wind farms in my area

It is hypothesized that respondents who rank environmental issues as unimportant and are less positive about wind farms for the reasons stated above are more likely to select the SQ (Kosenius and Ollikainen, 2013; Ek, 2005; Borchers et al. 2007; Vecchatio, 2014; Zografakis et al. 2010; Molnarova et al. 2012; Lothian, 2008).

5.3.4: Wind farm issues: Experience and demographics:

In order to establish the impact of experience on the likelihood of selecting the SQ, respondents were asked how often they see wind turbines. Though the literature is mixed on preferences for those who view turbines with varying frequency (Ladenburg and Dubgaard, 2007; Eltham et al. 2008; Krohn and Damborg 1999), it is hypothesised that those with daily experience of turbines will be more likely to select the SQ than those who see them a few times a year or less (Kontogianni et al. 2014; Swofford and Slattery, 2010).

The final section of the survey consisted of demographic questions. It is hypothesised that those below the age of 30, those on lower and middle incomes, unemployed individuals and male respondents will be less likely to select the SQ whereas those on high incomes and retired respondents will be more likely to select the SQ (Kosenius and Ollikainen, 2013; Mariel et al. 2015; Ladenburg, 2010, Ek, 2005, Devine-Wright, 2005b).

5.3.5: Survey issues: Choice task complexity & attribute disagreement:

Immediately after the choice sets, respondents were asked to rank the perceived difficulty of the choice task. It is hypothesised that those who found the choice set difficult are more likely to have serially selected the SQ (Boxall et al. 2009; Meyerhoff and Leibe, 2009). Respondents were also probed to establish if they ignored any attributes in the choice sets, which may indicate disengagement with the presented task. These respondents are hypothesised to be more likely to select the SQ (Meyerhoff and Liebe, 2009; Lanz and Provins, 2015).

Potential attribute issues were tested in the pilot stage and possible problematic attributes are included in Table 5.3. It is hypothesised that respondents are more likely to select the SQ if they agree with these statements (Krueger, 2007; Westerberg et al. 2013; Kermagoret et al. 2016; Beddoe and Chamberlin, 2003; Pearce and Özdemiroglu, 2002).

Table 5.3: Attribute disagreement:

Statements/ Questions
The setback distances provided were too close
The compensation provided was too low

5.4: Model Specification:

The analysis in this paper primarily focusses on the likelihood or not of a SQ response in each scenario given a host of independent variables, therefore a binomial logit model is used:

$$\pi = Pr(Y = 1|X = x_1, x_2 \dots x_n)$$

In this analysis the individual respondents either selected the SQ for each scenario or they did not:

$$Y_i = 1\text{: All SQ response from individual }_i$$

$$Y_i = 0\text{: Not all SQ response from individual }_i$$

$$X = (x_1, x_2 \dots \dots x_n):$$

are a set of variables that help explain the probability that a respondent selected ALL SQ or not, e.g. attitude to wind farms, choice task complexity, age etc.

The probability of always selecting the SQ therefore is:

$$Pr(Y) = \frac{e^{\beta_o + \beta_1 x_1 + \beta_2 x_2 \dots\dots \beta_n x_n}}{1 + e^{\beta_o + \beta_1 x_1 + \beta_2 x_2 \dots\dots \beta_n x_n}}$$

where e is the natural logarithm base (Schüppert, 2009). In the analysis, each respondent answered 12 choice tasks. Each individual either responds with 12 SQ responses ($Y_i = 1$) or not ($Y_i = 0$). Binomial logit models have been used to analyse attitudes to wind farms (Ladenburg, 2009b; Pedersen and Waye, 2007; Ek, 2005) and the probability of selecting the SQ (Lanz and Provins, 2015).

5.5: Results:

In much of what follows for the purposes of the analysis respondents that chose the SQ in each scenario are treated as a distinct group compared with those that did not. The survey sample was therefore divided into two separate groups in order to analyse the difference between those who chose the status quo (SQ) in each choice set and those who chose at least one wind farm option (WF).

5.5.1: Demographics:

Key demographic information is outlined in Table 5.4, for the SQ group in column two of the table whilst the non- SQ group is represented in column 3. The survey results indicate that fewer males than females chose the SQ in each situation and that these individuals were older than those in the WF sample.

Table 5.4: Demographic information:

Variable	SQ Sample Respondents	WF Sample Respondents	Population statistics from survey counties [b]
Gender (percentage share of males)[a]	47%	52%	50%
Average age	53	45	37
Over 65 years of age	18%	16%	12%
Retired	25%	17%	13%
In paid employment (full or part-time)	45%	55%	59%
Proportion with higher education	56%	63%	24%
Income below national median of €32,000[c]	53%	57%	50%
Turbines less than 500m from home	6%	3%	
Turbines less than 1000m from home	16%	8%	

Turbines less than 1500m from home	21%	14%

a: Sample mean calculated from 85 SQ survey responses and 115 WF survey responses
b: Central Statistics Office (CSO), Ireland, mean population statistics for counties Galway, Offaly and North Tipperary
c: O'Connor et al. (2015), Think-Tank for Action on Social Change (TASC), Median gross income reported for full-time employed, €28,500 for all including part time. Population statistic is national, regional unavailable.

The mean ages in both sample cases are older than the average age in the counties surveyed. A larger proportion of individuals are retired in the SQ case, corresponding with the higher average age for this cohort. Again, both groups contain a greater proportion of retired individuals than the regional mean. The WF sample has a higher proportion in full or part-time employment than the SQ group, though it is slightly lower than the regional average. This group also has a higher proportion of individuals with a university education than the SQ case, though both are much more educated than the regional average. The SQ individuals are slightly better off financially than those in the WF category, with a smaller proportion earning an income below the national median. The SQ respondents also appear to be much more familiar with wind farms than the WF group, with a higher proportion of the former living less than 500m, 1000m and 1500m from a wind farm.

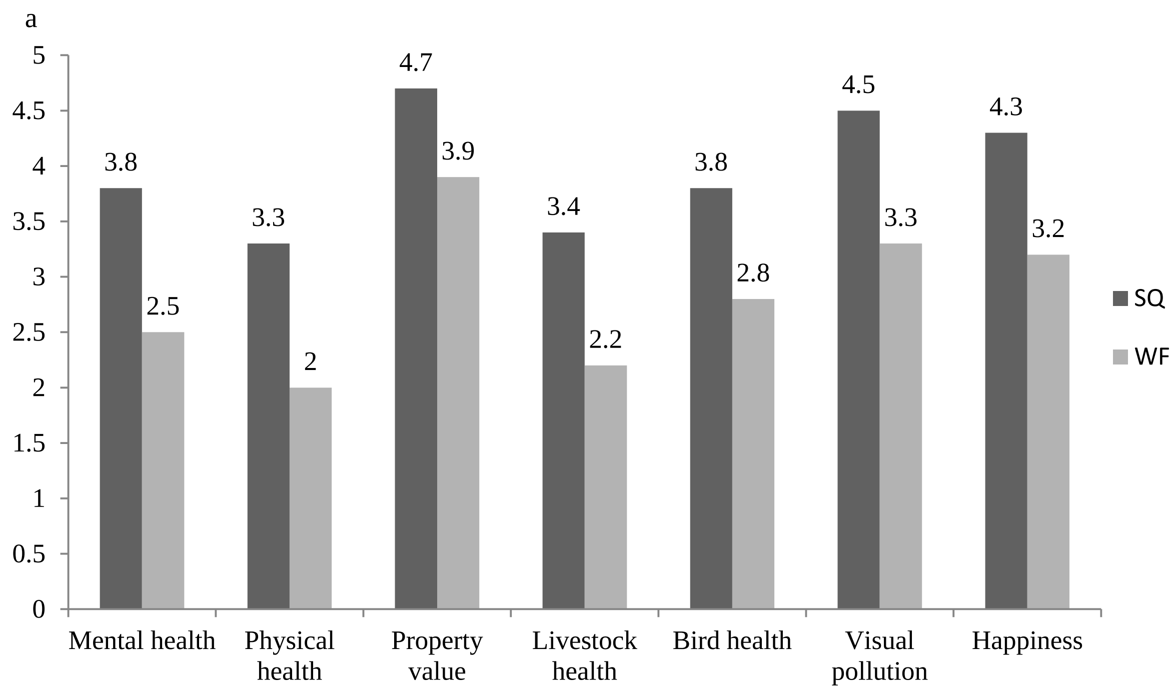
These demographics suggest that there are differences between those who select the status quo in each situation and those willing to accept a wind farm. Those opposed to selecting a wind farm, on average, are older and more likely to be retired and to live near a wind farm. On the other hand, those willing to accept are more likely to be full time workers and to have obtained a university education.

5.5.2: Wind farm externality results:

The mean ranking results from the large and small wind farm images described previously are presented in Figures 5.3 and 5.4. As the scale is ranked from 1 “mild” to 5 “extremely affected”, a higher mean score is associated with an increased assumed detrimental impact. As with the demographic section, the sample is split into two groups representing the SQ and WF respondents respectively.

5.5.3: Large wind farm externalities:

Figure 5.3 presents the mean results from the SQ and WF group for the large wind farm image. The SQ group mean score for the first two concerns, the impact on mental and physical health, is above 3 or “moderate”, whereas the WF cohort classify the effects on these attributes from this large wind farm less severely, regarding them as“mild”.



a: Degree of impact was ranked from: 1”No impact”; 2: “Mild”; 3: “Moderate”; 4: “Severe” and 5: “Extremely affected.”

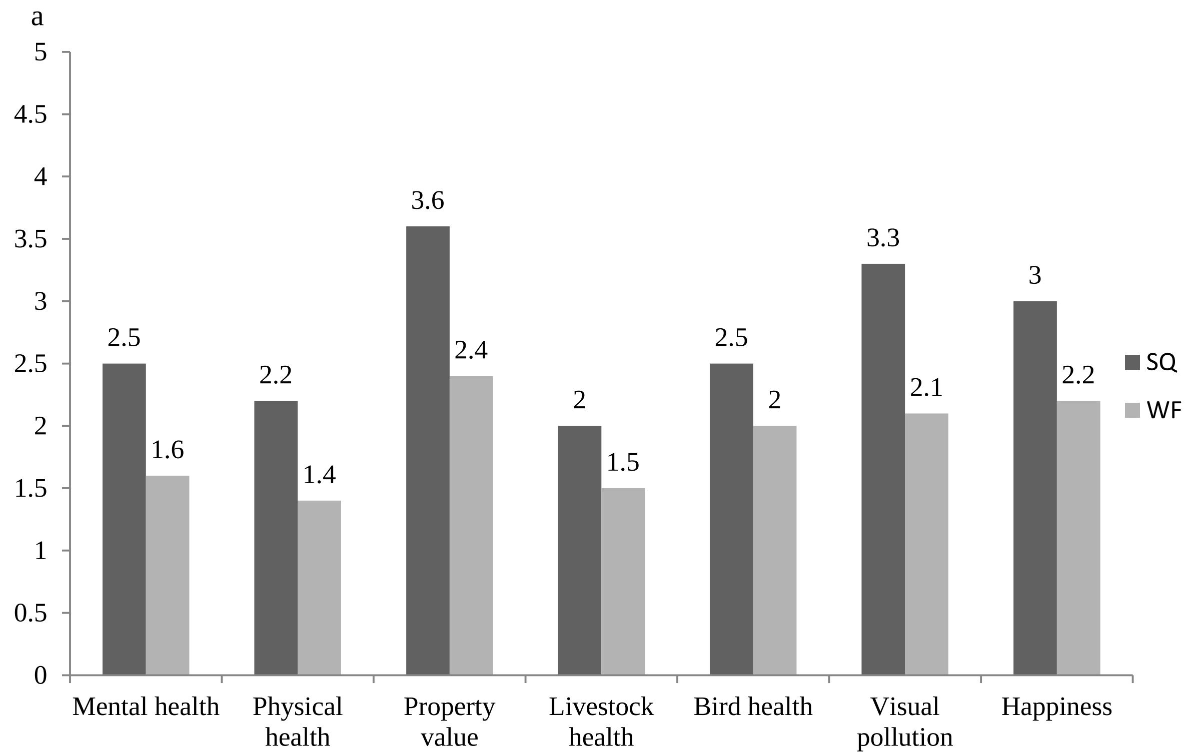
Figure 5.3: Large wind farm image results

The impact on property prices is considered to be significant by both groups but again there is a divide in the scale of the impact, with the SQ group classifying it as “severe” and the WF group as “moderate”. The effect on livestock and bird health are regarded as “moderate” for the SQ and “mild” for the WF samples respectively. This wind farm is considered to have a “severe” impact on the visual aspect of the area and the happiness of members of the local community according to the SQ group but only a “moderate” impact on these attributes for those in the WF sample.

Notably, though both samples regard the scale of the impacts differently, the ranking of the concerns is similar. Property price impacts are ranked highest for both groups, followed by the visual impact and the happiness of local residents. The impact on mental health and bird health are the joint 4th worst impacts of this project, however for the WF group, the impact on bird health is afforded more weight than that on mental health and so they rank the two 4th and 5th worst respectively. The two concerns regarded by both groups to be the penultimate and least affected are livestock health and physical health. Interestingly, there seems to be a distinction for both groups between mental and physical health impacts, with both groups considering the mental health impact to be the 4th greatest concern and the physical health impact as being the least concern. T-test results indicate that the difference between the ratings for both groups for the large wind farm is statistically significant (p=0.00).

5.5.4: Small wind farm externalities:

Figure 5.4 presents the impact results for the smaller wind farm image. The mental and physical health impacts for the SQ cohort are regarded as “mild” whereas the WF group suggest this wind farm has no impact on these attributes. The property price impacts are “moderate” for the SQ group and “mild” for the WF sample and on livestock are “mild” for the SQ group whereas the WF sample find “no impact”. While both groups are in agreement that the impact on bird health is “mild”, the SQ sample still ranks this attribute higher, or more severely, than the WF group. The ranking disagreement returns with the visual impact and effect on happiness of members of the local community being regarded as “moderate” for the SQ sample and “mild” for the WF group.



a: Degree of impact was ranked from: 1”No impact”; 2: “Mild”; 3: “Moderate”; 4: “Severe” and 5: “Extremely affected.”

Figure 5.4: Small wind farm image results:

With regards the ranking order, both groups again classify property price impacts as their number one concern however this smaller wind farm leads to slight differences in the ranking of the rest of the attributes for the two samples. For the SQ group the second and third greatest concerns are visual pollution and happiness, whereas these positions are reversed for the WF group. The SQ group then rank mental health and bird health equally in 4th place, whereas the WF group place bird health singularly followed by mental health. The SQ sample then rank impact on physical health in 5th place followed by impact on livestock as the least concern, whereas again the WF sample reverse this order. T-test results indicate that the difference between the ratings for both groups for the small wind farm is statistically significant (p=0.00).

Comparing the results overall, the SQ cohort values for the small project are similar to those of the WF group for the large one. This suggests that both those opposed to the development and those who are willing to accept a wind farm have similar concerns, however those who are opposed view the externalities of wind farms in a much more negative light. The SQ group considers the visual and property price impact as well as the effect on local happiness to be moderate for even a relatively small wind farm. Both the WF and SQ group view the impacts of the small wind farm to be statistically significantly different to the impact of the large wind farm (p=0.00 for both groups).

5.5.5: Model Output:

A binary logit model was estimated using NLOGIT 5 with *ALL SQ* (takes a value of 1 if the respondents choose the status quo for each choice set) as the dependant variable and 22 explanatory variables. The output from this model is presented in Table 5.5.

5.5.6: Beliefs and attitudes:

In all 5 variables were chosen to represent possible factors that may influence respondents initial attitudes to a new wind farm and their probability of choosing *ALL SQ*. These results are outlined in the first section of Table 5.5, with the coefficients in column 2 and the partial effects[9] in column 3. These variables are all dummies that take a value of 1 if respondents answered affirmatively to the statement. Looking at column 2, those who responded that environmental issues are unimportant to them (*not environmental*), believe there are too many wind farms in Ireland (*anti_wf*) and those that don't know how they feel about the number of wind farms in Ireland (dk_wf) are more likely to choose *ALL_SQ*. On the other hand, those that are in favour of wind farm construction for export (*pro_ex*) are less likely to choose *ALL_SQ*. Though it appears that those who agree that wind energy is not the best form of renewable energy (*n_best*) and that turbines damage the landscape (*landscape*) are more likely to select ALL_SQ, this relationship is insignificant. SQ respondents are also more likely to believe that their area is not appropriate for development (*not_appropriate*). The ALL_SQ respondents are less likely to state no trust in wind farm developers (*no_trust*), though these effects are insignificant.

The partial effects for each of the dummy variables in column 3 illustrate the largest attitudinal predictors of an *ALL_SQ* response. These results show that the probability of selecting the SQ increases by 31% if the respondent does not care about environmental issues, by 32% if they believe there are too many wind farms in Ireland, by 14% if they don't know how they feel about the number of wind farms in Ireland and by 39% of the respondent does not believe the development is appropriate for their area. The probability of selecting the SQ decreases by 14% if the respondent is in favour of wind farms for export. The effect for those who believe that wind

[9] A partial/ marginal effect indicates the rate of change in one variable relative to the rate of change in another. The partial effect is the change in probability given a unit change in a variable *ceteris paribus*. This is particularly useful for dummy coded variables, in which a unit change represents an 100% change. (Hensher et al. 2005)

energy is not the best form of renewable energy that wind farms damage the landscape is insignificant.

These results reveal that a negative opinion of wind farms and environmental issues can influence the probability of selecting *ALL_SQ* and a positive attitude towards development for export can reduce the likelihood of selecting *ALL_SQ*. The partial results illustrate that the perception of the appropriateness of an area for development, being unconcerned with environmental issues and holding anti wind farm beliefs are the three greatest attitudinal influences over the probability of selecting *ALL_SQ*. These results correspond with those of Kosenius and Ollikainen, 2013; Ek, 2005 and Borchers et al. 2005 which found that those holding a "pro environmental" attitude were more accepting of wind farms. It is also in line with the results in Meyerhoff and Leibe 2009 who found that the presence of a positive attitude towards forestry negatively affected the likelihood of selecting the SQ.

Table 5.5: Binary logit output with average partial effects:

Parameters	Logit Coeff (S.E)	Average Partial Effect (S.E)
Beliefs and attitudes		
Not_environmental	2.82953* (1.48717)	.30763** (.14595)
Anti_wf	2.74289*** (.98582)	.32612*** (.11020)
Dk_wf	1.34159*** (.51871)	.14358*** (.05244)
Pro_ex	-1.31090** (.58896)	-.13976** (.06035)
Not_best	.26946 (.74166)	.02862 (.07922)
Landscape	.46433	.04986

	(.64632)	(.07018)
No_trust	-1.27041 (.83280)	-.12332* (.07076)
Not_appropriate	3.20871*** (.73628)	.39182*** (.07992)
Experience of wind farms		
Not_see	-1.58848* (.85084)	-.15394** (.07238)
See_daily	.50932 (.52788)	.05463 (.05691)
Demographics		
Young	-1.18931* (.61981)	-.12306** (.06036)
Low_inc	-2.21989*** (.64992)	-.20692*** (.04741)
Mid_inc	-3.53394*** (.72356)	-.38349*** (.05711)
High_inc	-1.09326 (1.09670)	-.10807 (.09935)
Unemployed	2.92243** (1.34978)	.31501** (.12559)
Male	-.85678* (.48256)	-.09164* (.06723)
Retired	.87695 (.61895)	.09484 (.06723)
Choice set difficulty and attribute disagreement		
Diff_ans	-1.40138* (.77212)	-.14149** (.07169)
Ignore_turbines	1.48904** (.70445)	.16878** (.08067)
Ignore_height	-.34601 (.68514)	-.03575 (.06923)
Ignore_setback	-.45758 (.69269)	-.04685 (.06841)

Ignore_rep	1.15988** (.58718)	.12474** (.06179)
Ignore_discount	-.30560 (.56703)	-.03169 (.05764)
Too_close	-.00176*** (.00065)	-.00019*** (.69250)
Low_comp	-.23429 (.72341)	-.02449 (.07488)
Log-likelihood	-66.994	
AIC	.920	
McFadden Pseudo R-squared	.508	
Number of observations	200	
Number of respondents	200	

Notes: Level of significance, ***=p<1%, **=p<5%, *=p<10%

5.5.7: Experience of wind farms:

2 dummy variables were selected to represent different experiences of wind farms, outlined in Table 5.5. The results in column 2 indicate that those who never or rarely see wind turbines (*nsee*) are less likely to select *ALL_SQ*, whereas those who see turbines once a day or more (*see_daily*) are more likely to select *ALL_SQ* however the latter is insignificant.

The partial effects in the third column show that experience does influence the probability of selecting the SQ, with those who rarely see turbines being 15% less likely to select ALL_SQ. Those who see turbines on a daily basis are 5% more likely to select ALL_SQ, though this is insignificant. These results correspond with those of Swofford and Slattery, (2010) and Kontogianni et al. (2014) who found that those living near or with daily viewing of turbines are less accepting of new wind farm then those without such experience.

5.5.8: Demographic variables:

7 dummy variables were selected to reveal the impact of demographic factors on the probability of selecting *ALL_SQ*. The key significant results in column 2 suggest that respondents aged 30 and under (*young*), those with an income below €24,000 per annum (*low_inc*) and €63,000 per annum (*mid_inc*) and male respondents (*male*) are less likely to select *ALL_SQ*. Unemployed individuals on the other hand (*unemp*) are more likely to select *ALL_SQ*. Though the results indicate that those with an income above €63,000 per annum (*high_inc*) are less likely to select *ALL_SQ* and retired individuals (*retired*) are more likely to select *ALL_SQ* these results are insignificant.

The partial effects in column three illustrate that those below the age of 30 are 12% less likely to select ALL_SQ. The effect of income is significant, with those on lower and middle incomes being 20% and 38% respectively less likely to select ALL_SQ. Though those on high incomes appear less likely to select ALL_SQ, this effect is insignificant. Unemployed respondents are 32% less likely to select ALL_SQ and male respondents are 9% less likely to select the SQ for each choice set.

The partial results reveal that the largest demographic predictors of *ALL_SQ* selection are income and unemployment. As the choice set was designed in a willingness to accept framework, economic theory suggests that those on lower incomes should have a greater utility for higher levels of compensation. This is the case in my results, with those on lower and middle incomes appearing less willing to forgo the compensation that arises from development by selecting the SQ option. The results for age and gender correspond with those of Boxall et al. 2009; Kosenius and Ollikainen, (2013) and Borcher et al. (2007) who find that males and younger respondents are more willing to accept a renewable project. The unemployed result is a contradiction to the expected result; it was predicted that unemployed individuals would be less willing to forgo the financial compensation associated with the wind farm; however this does not appear to be the case. Being unemployed appears to significantly increase the probability of rejecting a wind farm and selecting the SQ in each scenario.

5.5.9: Choice set difficulty and attribute disagreement

6 dummy variables were chosen to determine if those who found the choice sets onerous to complete are more likely to choose *ALL_SQ* for each answer. Looking first to column two, the first variable indicates that this is not the case, those that found the choice sets difficult were less likely to have selected *ALL_SQ*. Those who did not ignore the height, setback or compensation attributes (*ignore_height; ignore_setback; ignore_discount*) were also less likely to have selected *ALL_SQ*, though these results are insignificant. However, the *ALL_SQ* respondents were more likely to have ignored the number of turbines (*ignore_turbines*) and the community rep attribute. (*ignore_rep*). These results show that the *ALL_SQ* respondents did not select this option due to choice task difficulty, however they did ignore key attributes in the decision making process.

To explore disagreement with the presented attributes or levels, follow up questions were asked after the choice sets. These results illustrate that *ALL_SQ* respondents are less likely to believe the setback distances provided were too close (*too_close*) or to believe that the compensation provided was too low (*low_comp*) though the effect of the latter is insignificant.

Looking to the third column, the probability of selecting ALL_SQ reduced by 14% if the respondent found the choice sets difficult to answer. Though the effect of considering the distance levels too close is also negative and significant, the effect is very small. On the contrary, those who ignored the community rep attribute are 12% more likely to have selected *ALL_SQ*. The effects of ignoring height, setback and compensation on the likelihood of selecting *ALL_SQ* are negative but insignificant.

These results suggest that respondents did not select *ALL_SQ* due to the difficulty in completing the choice sets though they ignore crucial elements of the choice task such as the number of turbines and the amount of community interaction.

5.5.10: Model fit:

The model fit appears to be sufficient. As the log-likelihood is maximised a higher value is better, though the log-likelihood cannot be used alone as a goodness of fit because it is a function of sample size. The AIC is a measure of the relative quality of models for a given set of data. In general, a lower number implies a better fit. These two indicators are generally used to compare models and as only one is used in this paper, the pseudo R^2 is the most appropriate representation of goodness of fit. McFaddens pseudo R^2 treats the log likelihood of the intercept model as a total sum of squares and the log likelihood of the full model is treated as the error sum of squares. Though the pseudo R^2 is not the exact same at the R^2 of a linear regression, there is a relationship between the two (Domencich and McFadden, 1975). A pseudo R^2 of 0.30 represents a “good” model fit for a discrete choice model. Pseudo R^2 values between 0.30 and 0.40 are equivalent to an R^2 between 0.60 and 0.8 in a linear model (Hensher et al. 2005). As the R^2 provided is 0.50 this suggests a very robust and well explained model.

5.6: Conclusions:

The principal aim of this paper was to examine the factors that may influence a respondent's decision to select the SQ in analysis study analysing wind farm preferences. 43% of the survey sample always selected the SQ and the analysis provides some crucial insights into the perspectives of those unwilling to accept wind farm development. I evaluated a number of hypotheses including attitudes, experience with wind farms, demographic factors, choice set difficulty and attribute disagreement in terms of their influence on the SQ alternative.

The wind farm externality results indicate that though both groups have similar concerns with regards to the possible negative effects of wind farms, SQ respondents consistently view the impacts of wind farms as being more detrimental than their non-SQ counterparts. This suggests that, as with Firestone et al. (2015), D'Souza and Yiridoe (2014) and Kontogianni et al. (2014), the perceived externalities associated with wind farms have a significant influence over acceptance.

Binary logit results identify attitudes, exposure to wind farms and demographic factors as important issues influencing whether individuals choose the SQ alternative. Respondents that exhibited a preference for the SQ held the view that their area was not appropriate for wind farm development, that there were too many wind farms in Ireland, were not interested in environmental issues and did not support wind farm construction for export. This corresponds with Johansson and Laike (2007) who found that attitudes towards the environment and wind energy in general determined opposition and Ek (2005) who found that those who were interested in environmental issues were more likely to be in favour of wind farms. The findings also suggest that individuals who do not know how they feel about wind farms are likely to be cautious and select the SQ option of no new wind farm compared with their WF counterparts. Other studies have emphasised the importance of information provision in terms of wind farm acceptance (Jobert et al. 2007; Gross, 2007) and the status quo literature indicates, in cases where individuals are uncertain about an outcome they may have a preference for inaction to avoid regretful outcomes (Bell, 1982; Chernev, 2004).

Prior experience of wind turbines does appear to influence respondent choices, those who rarely see wind farms are 15% less likely to select the SQ in each scenario. Though the literature on this topic is divided, these results are in consistent with those of Swofford and Slattery (2010) and Kontogianni et al. (2014) who found those with less experience of turbines are more accepting of a new project compared with residents with a high level of exposure to wind farms.

Individuals under 30 years of age, who are male and on lower and middle incomes are less likely to serially select the SQ. Unemployed respondents however, are significantly more likely to select the SQ. It is possible that these respondents spend more time in their place of residence and are likely to be more affected by wind farms then those who work outside the home, though this is speculative. The results for income, age and gender are consistent with both the SQ literature (Boxall et al. 2009; Lanz and Provins, 2015) and the wind farm choice modelling literature (Ladenburg and Dubgaard, 2007*;* Groothuis et al. 2008; Ek and Persson, 2014).

The logit results indicate that choice task difficulty does not influence whether respondents choose the SQ or not. However, this result comes with a number of provisos since it is possible that SQ respondents found the choice tasks easy simply because they selected the SQ option in every choice card. I do find that SQ respondents were more likely to ignore crucial elements of the choice set compared with their counterparts such as the number of turbines or the community interaction attribute. This suggests that these respondents may not have been fully engaging with the choice task. The presence of the interviewer may have also decreased the difficulty in completion as each option was carefully explained and clarified.

I do accept a number of shortcomings in the work including a limited number of respondents surveyed and that the data is not nationally representative. Due to a lack of appropriate follow up questions it could also not be conclusively determined if some of the SQ responses were protests. Despite these limitations, I believe the results can be of relevance to policy makers and land managers concerned with wind farm development and spatial planning.

Previous studies, including the results of chapter 3 and 4, have indicated the importance of wind farm externalities on community acceptance (Caporale and De Lucia, 2015; D'Souza and Yiridoe, 2014; Liu et al. 2013; Van Rijnsoever et al. 2015; Strazzera et al. 2012; Westerberg et al. 2015; Dimitropoulos and Kontoleon, 2009; Ek and Persson, 2014; Koundouri et al. 2009; Ladenburg and Dubgaard, 2007; Mirasgedis et al. 2014) and the results provided in this chapter indicate that fears over potential health, financial and environmental impacts are felt most by those who oppose wind farms. Developers and policy makers need to work with communities surrounding new wind farm projects on interventions to lessen impacts, alleviate fears and internalise these non-market costs. As those who are unsure about their perspectives on wind energy appear more likely to select the SQ, arguably a case could be made for addressing this uncertainty through improved information provision on potential house price, landscape and health impacts in order to allay any potential concerns these individuals may have. For individuals that have greater exposure to wind farms it may also be prudent for a developer or policy makers to provide and clearly outline compensation schemes available to local communities. These schemes could specifically target those likely to experience the new development on a daily basis. There may also be a need to promote the benefits of wind farms to older people, wealthier individuals and females due to their increased likelihood of opposition.

Conclusions:

6.1: Introduction:

This chapter summarises the key results obtained from the research referring back to the initial project objectives outlined in chapter 1. Some limitations of the study and potential future avenues of research in relation to wind farm preferences and community consultation are also discussed. Finally, some concluding remarks and policy recommendations are presented.

6.2: Summary of thesis and key findings:

This thesis provides a detailed analysis of the factors that influence the social acceptance of wind farms in Ireland. More specifically, it examines community preferences for wind farms using stated preference methodologies and deliberative approaches. The key national and international policy drivers outlined in chapter 1, namely the ambitious renewable energy targets required by Directive 2009/28/EC; the continuation of the REFIT scheme and the Strategy for Renewable Energy 2012-2020 have ensured the rapid growth of wind farm construction in Ireland, from 16 GWh (gigawatt hours) in 1995 to 5,534 GWh by 2016 (SEAI, 2016). Despite recommendations from several political parties and government departments, the Irish Wind Energy Association and the International Energy Agency to actively involve the local community in the planning and operation of projects, the vast majority of the wind farms in Ireland are currently owned and operated by private developers (IWEA, 2016). Many policymakers and stakeholders have called for economic assessment of the costs and benefits of wind farm production, including possible community impacts

(Britton, 2014; Wind Aware Ireland, 2014a; Boyd Barrett, 2015; Pringle, 2015). This thesis contributes to this debate.

To begin, chapter 2 aimed to establish the main theories and techniques used in this thesis evaluate wind farm acceptance. This chapter established that there can be non-market costs associated with wind farms which can exert a toll on society in the form of externalities. These costs may be significant and failure to account for these can result in their oversupply. This chapter also introduced the concept of 'non-use' value which can be substantial for wind farm projects. Utility theory was outlined, establishing the role of preferences in decision making and the measurement of these preferences using WTA. The use of choice experiments as a methodology was explained. Next, the notion of NIMBYism was introduced, and various theories of community engagement were outlined including Arnstein's ladder of citizen participation, Walker and Devine-Wright's (2008) concept of community involvement and Walker et al.'s (2011) framework for community engagement. The benefits of the use of triangulation in mixed methods research was highlighted and the theory of focus groups and the various approaches used in their analysis of wind farm preferences, namely the exploratory and clinical approaches, were then discussed. As concluded in chapter 2, stated preference techniques allow researchers to assess the demand for environmental services and, unlike revealed preference techniques, this can capture non- use value. Once a thorough pilot testing phase has been conducted choice experiments overcome many limitations associated with other stated preference techniques, such as strategic and hypothetical responses (Hanley et al. 1998; Adamowicz et al. 1998; Alpizar et al. 2003). Chapter 2 also outlined how the combination of qualitative and quantitative techniques can strengthen research and provide new ideas.

Disagreement with wind farm projects may be due to externalities, demographic factors and attitudes towards environmental issues. Many wind farm preference studies have availed of choice experiment techniques to establish preferences for projects, offering the choice between two hypothetical wind farms and a status quo of no new wind farm. In these studies, the decision to select the status quo may be motivated by wind farm issues; that is; externalities and attitudes; or survey issues, namely choice task complexity and attribute disagreement. Though the reasons underlying serial status quo selection have been examined in other areas, no study has examined this topic in regards to wind farms despite the fact that many respondents reject development by selecting the status quo (Kermagoret et al. 2016; Borchers et al., 2007; Kosenius and Ollikainen, 2013). As indicated in chapter 3, 43% of respondents selected the status quo in each situation. As with Westerberg et al. (2013); Vecchiato and Tempesta, (2015) and Kermagoret at al. (2016) these respondents were removed from the analysis in chapter 3, leaving only those who were WTA a wind farm in at least one choice set. In chapter 3 therefore I was only interested in the trade-off between attributes and the difference this makes on the acceptance of wind farm developments, specifically with the inclusion of a community representative attribute. However, unlike these previous studies, in chapter 5 these status quo respondents were returned to the analysis in order to understand their motivations. While it is crucial to understand the characteristics that may influence wind farm acceptance, it is also vital to establish to reasons that determine wind farm opposition. The first thesis objective therefore analyses the factors that influence respondent’s preference for the status quo of no new wind farm. To analyse this, the sample was split into two, with a wind farm (WF) cohort representing those who selected at least one wind farm and a status quo (SQ) group who always selected the SQ. The analysis in chapter 5 indicated that while both groups rank the importance of various externalities, like health, visual and environment impact etc. similarly, the SQ group view the externalities as being much more detrimental than the WF cohort. A binary logit model found that attitudes, exposure to wind farms and demographic factors were important influencers over the probability of SQ selection. Respondents that displayed a preference for the SQ held the view that there were too many wind farms in Ireland, were not interested in environmental issues, did not believe their area was appropriate for development and did not support wind farm construction for export. Those who were unsure about their feelings were also more likely to select the SQ. Respondents who rarely see turbines, those under 30, males and those on lower and middle incomes were less likely to serially select the SQ. However, survey issues such as choice task difficulty and attribute levels did not exert an influence over SQ selection. This chapter concludes that as fears over externalities are felt most by those who oppose wind farms, developers and policymakers need to work directly with those in the surrounding area on methods to lessen impacts and internalize these externalities. Increased information provision may prevent those who are unsure about their viewpoint from deviating to an opposition perspective. Finally, it may be beneficial to promote the benefits of wind farms to those residents most likely to oppose, namely females and older, wealthier individuals.

Chapter 3 considers the externalities associated with wind farm development and the related impact on communities, determined by the attributes of the project. While internationally other studies have analysed the externalities associated with wind farms (Ladenburg, 2009b; Heintzelman and Tuttle, 2012; Jensen et al., 2014; Alvarez-Farizo and Hanley, 2002; Bergmann et al., 2006), no stated preference study has been conducted on wind farms in Ireland and there is an absence of economic data nationally on the key drivers of acceptance. The first policy objective of this thesis therefore was to eliminate this knowledge gap by identifying the most important attributes of wind farms as determined by those residing next to a potential development, providing the first stage in an economic assessment of wind farm impacts. The final attributes of wind farm projects are presented in chapter 3. These attributes were established through the use of a two stage process that involved an initial scoping exercise followed by three public focus groups. During the pilot stage, which involved a survey of 36 residents and 3 focus groups, respondents were presented with a range of attributes and were asked to rank those which they considered to be the most crucial for a new wind farm project. These included noise, impact on flora and fauna, wind farm size, setback distance and ownership structure amongst many others. Following a semi structured moderation approach; focus group respondents discussed a whole host of issues including environmental impacts, development for export and information provision. The pilot surveys had indicated that community ownership of the wind farm development was not an important attribute and the focus groups clarified this perspective, adding that residents believed it to be an expensive and difficult approach to achieve community involvement. Instead, all respondents in both the survey and focus groups reacted positively to the notion of enhanced consultation through information provision and interaction. This, it was suggested, could take the form of a community representative. The presence or not of a community representative therefore became the first crucial attribute of development. Chapter 3 also provides a discussion of the call for increased setback distance from opposition politicians in Ireland (Seanad Éireann, 2012). Setback distance was defined by the pilot respondents as vital in terms of acceptance, with all respondents preferring greater distances from their home. The other essential attributes which were defined in this chapter included the number of turbines, with increased numbers of turbines being regarded as more detrimental and turbine height, with a preference for smaller turbines. With regards to the cost attribute, all respondents were unanimous in selecting subsidised electricity from a list of four options. Chapter 3 therefore provides these five attributes as the most important features of wind farms in terms of community acceptance.

The impact of these attributes was then analysed through the use of multinomial logit (MNL) and random parameters logit (RPL) models. The influence of all the attributes was statistically significant, with strong preferences for fewer and smaller turbines, greater setback distances, compensation and the presence of community representation. The next thesis objective was to evaluate the impact of a community interaction and information provision on the acceptance of wind farms. As stated above, while nationally there have been calls from industry members, policymakers and government bodies to increase the levels of community interaction and information provision, there are no mandatory requirements for this. The UK has recently enacted strict community consultation requirements to ensure that any impacts on local residents have been accounted for and that the new project has the full backing of the local community. Internationally, choice experiments have been used to establish wind farm preferences however; none of these have measured the influence of a community representative. In chapter 3, the sign on the representative attribute in the analysis was positive and highly statistically significant in all models, suggesting that respondents gain positive utility from the presence of a representative. The marginal WTA estimates provided suggest that respondents require between €363 and €631 less in compensation per annum if a community representative is present.

The policy simulations provided also indicate that the inclusion of a representative in a development can prevent utility losses. Community representation could provide policymakers and planners with flexibility in terms of planning in the way that fixed setback distances cannot. Therefore chapter 3 concludes that the existence of a community representative to provide information and interaction with residents in a development area can significantly increase the acceptance of a wind farm project.

While several international studies have found that residents have positive preferences for greater setback distances (Ladenburg and Dubgaard, 2007; Westerberg et al. 2013; Mariel et al. 2015) and there have been calls for mandatory regulations on this topic in Ireland (ECLG, 2013; Fianna Fáil, 2014; Sinn Féin, 2014), nationally no regulatory decisions have been made and no study has analysed community preferences for increased turbine distances from residences. Currently in Ireland, guidelines suggest a minimum separation distance of 500m between and commercial scale wind turbine and residential properties. Chapter 3 provides a discussion of the proposed wind turbine bill which would restrict many new turbines to at least 1.5km from homes, and which the Irish Wind Energy Association have implied would be detrimental to the industry. While the UK and Germany do not have mandatory setback distances, other European countries like France and Denmark have enacted strict minimum setback distances of up to 4 times the turbine height. Consequently, the third policy objective in chapter 3 is to evaluate the impact of increased setback distance on wind farm acceptance. The setback attribute was categorized using three distance levels: 500m, representing the current guideline level; 1000m, representing medium distance; and 1500m, indicating the minimum distance required by the Wind Turbine Regulation Bill. The MNL and RPL results in chapter 3 imply that respondents gain positive utility if the hypothetical wind farm were to be moved further from their residence.

However, the difference in utility between the medium and maximum setback distance was not statistically significant, indicating that there would be no utility gain to be achieved by moving the wind farm to 1500m over 1000m. The welfare estimates suggest that respondents require between €388 and €963 less in compensation per annum for setback distances of 1000m or between €403 and €784 less in compensation per annum for setback distance of 1500m. The policy simulations indicate that welfare improvements can be achieved by combining community representation with greater setback distance. The policy recommendations in this chapter include the combination of community representation with mandatory setback distances of 1000m for moderately densely population communities. This would offer a cost effective solution to developers and communities and one which would not restrict the future of wind farm development in Ireland in the way that greater mandatory setback distances would. This chapter therefore concludes that increased setback distances can improve the acceptance of wind farms in Ireland, however those distances suggested by policymakers are overly restrictive and unnecessary from a utility perspective.

Directive 2009/28/EC allows for the importation of renewable energy to count towards renewable energy targets. This led to the Irish Wind Energy Association's publication of an export policy document which laid out Ireland's comparative advantage in wind energy and outlined the potential for export and benefits in terms of job creation and tax revenue. In January 2013 Ireland and the UK signed a Memorandum of Understanding (MoU) to allow for the exportation of wind energy from Ireland to the UK, and while this project was endorsed by the Irish state (IWEA, 2012b; DCENR, 2012; Scheer et al. 2014) residents in the development areas were strongly opposed to the project (O'Brien, 2013; Westmeath Examiner, 2013;

Clifford, 2014) and it did not go ahead. Chapter 4 outlined that this proposed wind farm would have involved the construction of at least 1500 turbines across rural areas in the midlands of Ireland, and while the benefits of this project were clearly outlined by the developers, the non-market costs in terms of externalities were not accounted for. One of the greatest challenges to the future of large scale developments like the midlands project is public acceptance and it is crucial for policy makers to identify reasons behind local opposition in order to avoid objections to future projects. No study, nationally or internationally, has analysed the public acceptance of wind farm development for export. Therefore the final thesis objective was to establish the Irish public's opinion on this topic. Chapter 4 outlined the methodology behind this research, which involved the combination of community and developer focus groups as well as survey responses from 200 members of the public. The acceptance of wind farms for export was established from the outset of the research as an important avenue of investigation and was included as a section in the pilot survey research as well as the focus groups and a specific question on the topic was included in the final survey. Three focus groups were held with members of the community and two with wind farm developers. The survey results found that 59% of respondents were opposed to wind farm construction for export. The community focus group respondents elaborated on this, indicating that the absence of local benefits and detailed non-biased project information as well as the perceived lack of fairness in the process bolstered this opinion. Community participants proposed that local employment, financial benefits and state ownership would increase their acceptance of export projects. The community and public findings from chapter 4 emphasise that issues related to information provision, distributional justice, externalities and local participation hinder the acceptance of export projects. The results from this chapter indicate that community respondents are not satisfied with the amount of information and consultation provided by developers and there is a general mistrust around the motivations of developers. The majority of the developers, on the other hand, were in favour of export projects; however did concede that a lack of information and exaggerated local benefits hindered the midlands proposal. While developers were keen to extol the virtues of wind farm benefits, local residents had anxiety over negative externalities, mainly due to health and quality of life concerns. This research also found that both residents and developers are supportive of co-management schemes, however local residents have concerns over the practicalities of such an endeavour. This chapter concludes that the Irish public is not currently prepared to accept wind farm construction for export. If policymakers wish to pursue this avenue in the future then, as with domestic wind farms, improved information provision, consultation and trust building is required as well as methods to account for externalities and the implementation of co-management regimes.

6.3: Limitations of the research:

Chapter 2 outlined several of the limitations of the core research methodologies used in this thesis and their associated weaknesses. The small and deliberative nature of focus groups mean that their results are not generalizable to the wider population, the groups that are created are unnatural and can place restrictions on the type of interactions that emerge, the analyst can introduce bias through their interpretation of results and they cannot be used alone to establish non-market value. These focus group weaknesses were minimised through careful moderation allowing for a wide range of perspectives in an informal and familiar setting; direct transcription of the focus group discussion by different analysts and by combining these results with quantitative methods which measure non-use value.

Choice experiments can suffer from hypothetical bias, where the respondent does not believe the presented choice set scenario. This effect was minimised by presenting a simple familiar scenario of a new wind farm, with realistic attributes in terms of size and setback distance, in an area with the potential for development. Framing effects can occur when the choice set scenario is presented in an overly positive or negative light. Through careful survey design, the scenario was presented in a neutral, factual way. The scenario was not offered in terms of possible positive or negative attributes but instead as a sum of its attributes, namely number of turbines, electricity discount, community representative, turbine height and setback distance.

Payment vehicle bias can occur when the WTA depends on the method of payment. Careful prior measures can prevent this, and both pilot surveys and focus groups gathered perspectives on four different compensatory mechanisms: a community fund, an individual one off cash payment, a one-off recreational public amenity and an annual electricity discount. The vast majority of both survey respondents and focus group participants selected the electricity discount as the appropriate compensation method.

The omission of a status quo can cause inaccurate welfare estimates, so the decision was made to include a status quo represented by the option to select 'no new wind farm'. Choice task complexity can occur due to large numbers of attributes with various levels. Through pilot testing and consultation with colleagues, the attributes were narrowed down to five attributes; three of which had 3 levels, one had two levels and one which consisted of four levels; the payment vehicle. These choice sets were then presented to focus group participants, who agreed that the presented options were understandable. In the main survey, a practice choice card was presented to all participants prior to beginning the full task. This card was repeated as the third choice task in order to test for continuity and understanding. All respondents answered the same way for both the practice and third 'actual' choice scenario. Follow up questions concluded that the majority of respondents did not find the task difficult.

Protest responses can be problematic with choice experiments. It is difficult to establish from this research if the SQ respondents were "protesting" the presented scenario or whether they represent true zero bids. However, from the follow up questions that were used it can be established that SQ respondents did not find the choice task difficult and did not disagree with the payment amounts or the setback distances provided. These respondents are studied in detail in chapter 5. Finally, heterogeneity can be difficult to analyse using Standard Random Utility Models. This was counteracted through the use of a Random Parameters Logit Model which allows for model parameters to vary over individuals. Despite these attempts to overcome the methodological issues that can emerge from these approaches, there are some limitations to the work in this thesis.

In chapter 3, it is possible that the externalities of wind farm development were lessened somewhat by the positive benefits associated with green energy. In this sense, those who had a positive value for green energy may have required less compensation and the variables estimated may have contained a wind energy value element. At the pilot stage of this research the reduction in CO_2 emissions was included as a possible attribute of development. Though this was regarded as important to many respondents, due to the limitations of choice experiments in terms of their size and complexity, it was not included as an attribute and priority was given to attributes that were consistently ranked as vital. In order to establish if some individuals did have positive 'green' preferences, chapter 3 analysed the probability that respondents had opposite preferences to the mean; that is positive preferences for more turbines, greater heights etc. The results suggest that preferences do vary across individuals with a probability of between 0.20 and 0.36 that individuals have positive values for additional turbines and a probability of 0.14 that individuals have negative preferences for greater setback distances. The prospect of positive preferences for wind energy could present an interesting avenue for future research, incorporating the attributes of larger wind farm projects. Research may also include a follow up contingent valuation question to establish WTP for renewable energy.

The number of respondents in this survey was small and not nationally representative. Despite this limitation, results are statistically significant and robust in the models used in chapter 3 and 5. The survey was vigorously tested through the use of pilot surveys and focus groups. The final sample contains an equal gender balance, although the sample is older than the national average. This is primarily due to the rural areas designated for surveying, selected due to their potential for wind farm construction, which was essential for this research. This work may be expanded upon by implementing a national survey to establish wind farm preferences.

The results presented in chapter 3 may also have been influenced by the fact that those who selected the SQ in each situation were omitted from the analysis. However, the trade-off between attributes with the inclusion of a community representative was the important policy aim of this chapter and, in the literature, the exclusion of serial SQ respondents is not unusual (Westerberg et al. 2013; Vecchiato and Tempesta, 2015; Kermagoret at al. 2016) with others choosing not to include a SQ option at all (Ek and Persson, 2014; Ladenburg and Dubgaard, 2007) and as the SQ respondents were analysed in detail in chapter 5, this was not considered to be an issue.

In chapter 4 the sample size was small with 3 community and 2 developer focus groups taking place. These studies were not geographically representative with only one community focus group being held in the midlands area. However, segmentation of these focus groups by geographical location was not the primary aim of this research and attitudes to exportation were sought from the population as a whole as opposed to the development region in question. Small groups are also considered to be appropriate and more effective than larger groups when seeking a high level of participant involvement (Morgan, 1996). For chapter 5 again the sample size of the survey was not nationally representative. However, this chapter still provided important information from a policy and theoretical perspective, outlining the statistically significant influencing forces behind opposition to all wind farm development for this sample and insight into serial SQ responses instead of simply dropping this cohort from the analysis.

6.4: Future work:

The work and results contained in this thesis present several new avenues for further investigation. Firstly, chapter 3 offers the concept of a community representative as a means to increase acceptance of onshore wind farm projects. It is possible that this could also apply to other renewable energy developments, such as offshore wind farms, solar farms and tidal and wave energy projects, all of which have their own associated externalities (Ladenburg and Dubgaard, 2007; Frid et al. 2012; Tsoutos et al. 2005). With offshore wind farms, for example, similar visual and environmental externalities may occur, placing a cost on those who reside in coastal areas or tourists who wish to visit these regions. The inclusion of a community representative into the planning phase of such a project may aid in alleviating resident's concerns through interaction with the developer and the provision of information. How the representative would best engage with tourists is an interesting opportunity for further examination. Early pilot work from this thesis offered respondents the option of paying for increased information and interaction with the developer through a website. The results found that the majority of respondents in this small study were WTP at least €3 for this improved consultation. This may provide a method to engage with a wider audience that are not directly located around the project site. The concept of a community representative may also apply to non-renewable energy research, such as investigations into the acceptance of fracking and gas projects, the development of which have previously proven controversial (Castelli, 2015; Gilmartin, 2009).

Similarly, the results and methodologies used to analyse the impact on acceptance of setback distance provided in chapter 3 could be extended to include an examination of offshore wind farm acceptance. While the impact of setback distance for offshore wind farm developments has been economically analysed internationally, no such study has been undertaken in Ireland. As the The National Renewable Energy Action Plan and Strategy for Renewable Energy 2012-2020 has outlined its aims to increase the number of offshore wind farm projects, it may be prudent to investigate the implications in terms of project acceptance of distance to shore.

The attribute values which emerge from chapter 3 could also be useful in a cost benefit analysis of wind farm developments both nationally and internationally. Bergmann and Hanley (2012) provide a detailed methodological framework to measure the costs and benefits of both on and off-shore wind energy projects including negative impacts. The resulting values in chapter 3 indicate the non market costs of additional turbines, greater turbine heights, setback distance and community interaction, all of which are important determinants of wind farm impact.

Chapter 4 delivers a unique insight into the acceptance of large scale wind energy development for export. The benefits of such projects in terms of jobs, CO_2 reduction and government revenue can be significant, however as the work contained in chapter 4 outlined, there are also significant local costs. This work could be expanded on by including a dedicated non-market valuation analysis of the impact of projects for export using choice experiments. As this chapter also established, an analysis of all stakeholder perspectives enables the researcher to establish possible areas of conflict. An interesting possibility for future research would be to include the other stakeholder in an exportation project; the importing nation. As wind farm development in the UK has faced resistance and new legislation has made the construction of large scale onshore developments more difficult, it may seek to import wind energy from Ireland again in the future. However, the examination of UK citizen perspectives on the prospect of importation; where the UK receives the benefits of production and the residents of development areas in Ireland face the costs; would provide a novel analysis.

The work contained in chapter 4 proposes that many residents have fears over negative property price impacts, with developers remaining divided on the subject. The results from chapter 3 outline that residents have strong preferences for moderate increases in setback distance, which suggests that properties located slightly further from a wind farm may be valued higher than a similar property located near turbines. This is further emphasized in chapter 5, where the property price impacts of a large visually represented wind farm were deemed to be significant in comparison to a wind farm located at a greater distance. Future work could incorporate other methodologies, such as a hedonic analysis to provide economic data on this topic. While previous hedonic studies have concluded mixed results on the subject of wind farm impacts on property prices, no such study has been undertaken in Ireland.

Finally, the data obtained from this work could be incorporated into a GIS database to provide a detailed map of the least-cost areas of development in Ireland in terms of externalities. This database could integrate the preference data contained in chapter 3 and model wind farms of varying height, size, setback distance and community representation from actual locations in Ireland taking into account wind speed, special areas of conservation and physical barriers. This would provide a unique database to guide planners, policymakers and developers for future wind farm projects.

6.5: Concluding remarks and recommendations:

The main aim of this paper was to address the principal determinants of community acceptance for wind farms in Ireland. This thesis addressed a comprehensive range of questions on this issue. This was achieved through the use of qualitative and quantitative techniques, namely focus groups, surveys and choice experiments. The findings of this thesis provide an insight into all aspects of wind farm acceptance and opposition in Ireland, including development for export. The methodologies applied have proven useful in explaining community perspectives, but are not limited to the topic of wind farm preferences. It is possible to apply these techniques to other renewable energy projects or large scale developments to deepen understanding.

Given national and European policy commitments which primarily rely on wind energy, the promotion of wind farm construction in Ireland is necessary. These policies have encouraged the increased development of wind farm projects in Ireland, with approximately 177MW per annum being installed in the past five years (SEAI, 2016). This rapid construction has taken place largely in the absence of mandatory regulatory guidelines. Unlike other European countries, Ireland has no legal requirements for minimum setback distance or community consultation; two of the most contentious issues in terms of development. Several bills have been proposed by various political parties calling for strict setback distances, though these have not been based on any real evidence or research. While government planning guidelines have suggested that developers interact and consult with community members as early as possible, this is not mandatory. Updated revisions to government planning documents include a minimum setback distance of 500m and maximum noise limits, though these changes have not been implemented since they were proposed three years ago (ECLG, 2013).

The impacts of wind farms on local communities, particularly large scale privately owned projects, can be costly in terms of externalities and these non-market costs are not accounted for in any sense prior to a wind farm construction. The Irish Wind Energy Association has published a document which acknowledges potential impacts of development including visual impact, noise, shadow flicker and socio-economic effects. This document also recognizes the role that early community interaction plays in creating a positive local perspective of a project (IWEA, 2012a). Despite this, their website is partially dedicated to rebuffing any claims that wind farms harm birds and other wildlife, that turbines are noisy or that there are any tourism impacts accountable to wind farm construction (IWEA, 2008a). This suggests that, from the developer’s perspective, there is a conflict. On the one hand they identify that minimizing local impacts and providing community benefit schemes can be useful for acceptance, but on the other, they realise that outlining the negative attributes of development may create opposition.

The results from this research suggest that the majority of local residents are willing to accept some form of wind farm in their area. However, most respondents do not trust wind farm developers to cooperate, provide information or financial support to local communities. This mistrust is centered on a lack of local benefits and previous experience of developer conduct. Though improved information provision has long been suggested by policymakers and politicians, no attempt has been made to improve the mandatory requirements on developers beyond an advertisement in a local or national newspaper. The industry itself encourages developers to engage with community members as early as possible. They outline forms of engagement including, face to face interaction with residents, information flyers and public meetings. Despite this, it is clear that developers are not interacting with communities in an effective manner. The results from the research in this thesis emphasize the dismissive nature of many wind farm developers when it comes to externalities. It is perhaps unsurprising that these stakeholders are keen to stress to benefits of wind farm development in terms of reduced CO_2 emissions, but there also appears to persist the notion that community members are exaggerating negative impacts for financial gain. Developers view information provision as an advocacy programme, with less factual information on the project and more figures on the benefits of wind energy in general. As the focus group results suggest, residents are skeptical about wind farm projects that promise a whole host of local benefits, so exaggerated claims by developers may not be the best tactic in terms of acceptance. Instead, residents have strong preferences for interaction and information provision in the form of a community representative. It is a recommendation of this thesis that a community representative be made a mandatory requirement for medium to large wind farm projects. Local communities do not trust wind farm operators to provide non-biased information, and as developers prefer advocacy to true information, a community representative could act as an effective go-between for the two groups. This representative would provide planning permission details, maps, scientific studies and the potential negative effects of the project on local residents, wildlife and landscape as well as the potential benefits in terms of jobs, compensation and CO_2 reduction. Taking the conservative WTA estimate from this research, the value for a representative to a local resident is €363 P.A. This signifies the reduced compensation a resident is WTA if a representative is present. The results from this work suggest that the provision of a representative could be a cost effective method to increase community acceptance of wind farms.

Setback distance has also been a controversial issue in Ireland, with several proposed bills to impose mandatory restrictions. Increasing minimum setback distances in Ireland as set out in the wind turbine bill could place strict restrictions on the possibility of future onshore development hampering the possibility of achieving renewable energy targets. The results in this work indicate that moderate increases in setback distance could improve the acceptance of wind farms. The policy simulations outline how more conservative increases in setback distances can be combined with community representation to provide an effective instrument to address wind farm externalities. Many issues related to turbines; noise, visual impact, shadow flicker, property price impact etc., are inextricably linked with location and so are lessened with greater distance. This work indicates the strong preferences residents have for moderate increases in setback distance from the current guideline level of 500m to the medium level of 1000m. It is recommended that prior consultation involving a community representative between potential stakeholders and the wind farm developer be made a legal requirement for all commercial wind farms and that the guideline minimum setback distance is increased from 500m to 1000m for moderately densely populated communities. This would provide policymakers and planners with a more flexible approach to achieving renewable energy targets.

National policy has also outlined the comparative advantage Ireland has in terms of wind energy, and so has explored the possibility of development for export. Researchers have argued that the flexibility associated with energy trade could be beneficial to both the UK and Ireland, resulting in increased energy security, lower electricity prices and system efficiencies (Gullberg et al, 2014). The thesis findings on preferences for development for export, however, echo those for domestic use. The lack of local benefits and mistrust of developers underpinned opposition to this exportation project. Developers blamed a lack of state support and community resistance for the failure of the project. The findings from this work suggest that, given the current regulatory regime, the large scale construction of wind farms for export is not advisable. The recommendations above regarding community representation and moderate setback distances need to be put in place to deal with the current absence of information provision, consultation, trust building and externality accountability. Local benefit schemes are vital for large scale exportation projects and must be adequately promoted and fairly appointed to those most likely to be affected.

Finally, the results also specify the characteristics and attitudes of individuals most likely to oppose development. Residents may disagree with the construction of turbines in their area, regarding it as unacceptable for their region. This opposition may be due to fears over potential externalities or due to disinterest in environmental issues. Those who experience wind turbines frequently may suffer from ‘turbine fatigue’ and wish to restrict future development. Demographic factors may be an issue, with older, wealthier respondents being less likely to accept a new project. The provision of information and interaction with community members could again lessen fears over potential impacts. Those who reside close to turbines should receive the benefits of a compensation scheme over a local community group, many of whom may be unaffected by development. Specific promotion schemes could be designed to outline any project benefits to older, wealthier individuals and female residents who may be more likely to oppose development.

However, any information and interaction with local residents should be honest and make clear the downsides of wind farms as well as the positives. Many developers are keen to suggest the many local benefits of a project but are less likely to make clear the true scale of the development including its potential impacts on those living nearby. This work has outlined the factors that influence wind farm acceptance in Ireland, but it should be emphasised that any educational or promotional policy for wind farm development must be transparent, allow and respect opposing perspectives, and should not take the form of an exercise in persuasion.

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Appendix I:
Wind Farm Development Survey

NUI Galway
OÉ Gaillimh

Full Name____

Address ____

City/Town____

County____

Telephone Number_________________________________

Interviewer Use:

Interviewer ID: ___________________________________

Location of survey______________________________(Nearest town)

Date of survey____________________________________

Start time of interview____________________________(use 24 hr. clock)

GPS Coordinates of respondents residence X_______________ Y_______________

Gender of Interviewee M F (Please Circle)

Willing to Do Focus Group Yes No (Please Circle)

Office Use:

Block no 1

Respondent ID: ___________________________________

Hello, I'm from NUIG and I am carrying out an independent survey on behalf of the National University of Ireland, Galway regarding people's views and attitudes towards the environment
The survey will take you about **25** minutes and you should find it interesting. The answers that you provide will be kept **completely confidential** and will not be used for anything else. Please read each question carefully and answer as accurately as you can.

Section A: Attitudes towards the environment:

In this section we would like to know about your opinions on environmental issues.

Question 1: A1:

How important are environmental issues to you? (E.g. pollution, recycling, climate change etc.) **Circle your response from a scale of 1 "Very unimportant" to 10 "Very important" (One answer)**

Statement	Very Unimportant				-					Very Important	Don't Know
How important?	1	2	3	4	5	6	7	8	9	10	0

Question 2: A2:

How important are these other Irish national issues in relation to tackling climate change (global warming) **(Please circle the importance for each issue, one answer for each)**

	Issues	More important than tackling climate change	As important as tackling climate change	Less important than tackling climate change
A	Reducing crime	1	2	3
B	Developing protected environmental areas	1	2	3
C	Improving education	1	2	3
D	Developing rural areas	1	2	3
E	Reducing unemployment	1	2	3
F	Improving the health service	1	2	3
G	Increasing tourism	1	2	3
H	Improving public transport	1	2	3

Question 3: A3:

Do you think there are enough wind farms in Ireland? **(Circle beside your answer)**

Answer	Circle
There are not enough wind farms in Ireland	1
The number of wind farms is about right	2
There are too many wind farms in Ireland	3
Don’t know	4
Don’t care	5

Question 4: A4:

Are you in favour of building wind farms in Ireland specifically to export wind energy to other countries? **(Please circle beside your answer)**

Answer	Circle
Yes	1
No	2
I don’t know	0

Section B: Information on local wind farm:

In this section we would like to know more about your relationship with wind farm development in your area.

Question 5: B1:
How far (approximately) is the nearest wind farm (either built or in construction) to your home?: **Circle your answer(One answer)**

Distance	Circle
500m or less (0.31 miles or less)	1
1Km (0.62 miles)	2
1.5Km (0.93 miles)	3
2Km (1.24 miles)	4
2.5Km (1.55 miles)	5
3Km (1.86 miles)	6
3.5Km (2.17 miles)	7
4Km or more (2.48 miles or more)	8
I do not live near any wind farm **(go to Section C)**	9
I don't know	0

Question 6: B2:
Did you move into your home: **Circle your answer (one answer)**

Answer	Circle
Before the wind farm was built	1
During construction of the wind farm	2
Shortly after the wind farm was built (<1 year) **GO TO Q8**	3
After the wind farm was built (>1 year) **GO TO Q8**	4
I don't know or not relevant	0

Question 7: B3:
Think back to the time when the wind farm was being constructed. How did you feel about the development? **Circle your response from a scale of 1 "Very Negative" to 10 "Very Positive" (One answer)**

Statement	Very Negative				-					Very Positive	Don't Know
How did you feel?	1	2	3	4	5	6	7	8	9	10	0

Question 8: B4:
If you had been given the opportunity to purchase shares in the wind farm would you have been interested? **Circle beside your answer (one answer)**

Answer	Circle
Yes	1
No **(go to Q10)**	2
I own shares in the development	3
I don't know	0

Question 9: B5:
How much would you have been willing to spend on the shares? (If you already own shares approximately what was the cost?) **Circle beside your answer (one answer)**

Payment Type	Circle
€0-€99	1
€100-€399	2
€400-€699	3
€700-€999	4
€1000-€1499	5
€1500-€2999	6
€3000-€6000	7
€6000-€10,000	8
More than €10,000 (write in amount):	9
I don't know	0

Question 10: B6:
Did/does your **community** benefit in any way from this development? **Circle beside your answer (one answer)**

Answer	Circle
Yes	1
No **(go to Q12)**	2
I don't know	0

Question 11: B7:
How did/ does the development benefit your community: **Circle beside your answer (circle all that apply)**

	Payment Type	Circle
A	Reduced electricity for some members of the community	1
B	One-off cash payment to some members of the community	2
C	On-going cash payment to some members of the community	3
D	Non-cash benefit (new building, facility, park etc. for the community)	4
E	Shares in the wind farm for some members of the community	5
F	Jobs for some members of the community	6
G	Rent to some members of the community for land used for the wind farm	7
H	Other (please specify):	8
I	I don't know	0

Question 12: B8:
Did/do you **personally** benefit in any way from this wind farm? **Circle beside your answer (one answer)**

Answer	Circle
Yes (please specify the benefit):	1
No **(go to Q14)**	2

Question 13: B9:
What is / was the nearest monetary value of this benefit: **Circle beside your answer (one answer)**

Amount	Circle
€10 per month (€120 annually, €3,000 total over 25 years)	1
€25 per month (€300 annually, €7,500 total over 25 years)	2
€50 per month (€1,200 per year, €15,000 in total over 25 years)	3
€100 per month €1,200 per year, €30,000 in total over 25 years)	4
Other (please specify) :	5
I don't know	0

Question 14: B10:

How do you feel about the development now? **Circle your response from a scale of 1 “Very Negative” to 10 “Very Positive” (one answer)**

Statement	Very Negative			-				Very Positive			Don’t Know
How do you feel?	1	2	3	4	5	6	7	8	9	10	0

Section C: Valuation of Wind Farm Development:

This survey examines your value for new wind farms in your area. To do this, we will present you with some choice cards, describing a hypothetical new commercial wind farm for your area. This wind farm would be IN ADDITION to any wind farms already in place.

Each of the options for the wind farm will be characterised by different features. Each feature will have different levels.

These features include:

Electricity discount: This refers to compensation **paid to you** for this wind farm development, in the form of a discount in **your electricity bills each year** over the project lifetime (20 years). The potential discounts could be: €110 per year, €280 per year, €450 per year or €620 per year.

***No of wind turbines*:** this indicates the maximum amount of turbines in this wind farm for the project lifetime (20 years). The potential number of wind turbines could be 8 turbines, 20 turbines or 40 turbines.

Community representative: This refers to the presence or not of a community rep to act as a negotiator for the community. This rep meets with local residents who are likely to be affected by development and organises public meetings for those interested. This rep provides information and updates about the development and meets with the developer to present community concerns and negotiate on behalf of the community. “YES” means there is a rep, “NO” means there is no rep.

Setback: This refers to the minimum distance that these new turbines will be required to be spaced **from your home.** The potential distance of the nearest turbine in this farm from your home could be: 500m (0.31 miles), 1000m (0.62 miles) or 1500m (0.93 miles)

Turbine Height: this indicates the maximum height of the turbines from base to blade tip in this wind farm. The potential heights of these turbines could be 80m, 130, or 180m.

Question 15: C1:
Here is a practice choice card representing three possible options for wind farm development in your area. Read down through each option carefully. Bearing in mind what you could spend this electricity discount on, please select your preferred option, either Option A, Option B or Option C:

Circle the number under your preferred choice in the table **(one answer)**
Practice choice card:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€450	€280	
No of wind turbines	20	20	
Community Representative	YES	NO	No new wind farm
Setback	1500m (0.93 miles)	500m (0.31 miles)	
Height	180m	130m	
Choose	**1**	**2**	**3**

Question 16: C2:

In the pages that follow you will be shown 12 choice cards representing three possible options for wind farm development in your area. Bearing in mind what you could spend this electricity discount on, please select your preferred option from each card:

Circle the number under your preferred choice in the table **(one answer)**

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€450	€280	No new wind farm
No of wind turbines	40	8	
Community Representative	NO	YES	
Setback	500m (0.31 miles)	1500m (0.93 miles)	
Height	130m	80m	
Choose	**1**	**2**	**3**

Choice card 2:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€280	€450	No new wind farm
No of wind turbines	8	40	
Community Representative	YES	NO	
Setback	1500m (0.93 miles)	500m (0.31 miles)	
Height	130m	180m	
Choose	**1**	**2**	**3**

Choice card 3:

Features	Option A	Option B	Option C
Electricity Discount	€450	€280	No new wind farm
No of wind turbines	20	20	
Community Representative	YES	NO	
Setback	1500m (0.93 miles)	500m (0.31 miles)	
Height	180m	130m	
Choose	**1**	**2**	**3**

Choice card 4:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€620	€110	No new wind farm
No of wind turbines	20	20	
Community Representative	NO	YES	
Setback	1500m (0.93 miles)	500m (0.31 miles)	
Height	130m	80m	
Choose	**1**	**2**	**3**

Choice card 5:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€450	€280	No new wind farm
No of wind turbines	40	8	
Community Representative	YES	NO	
Setback	1000m (0.62 miles)	1000m (0.62 miles)	
Height	180m	80m	
Choose	**1**	**2**	**3**

Choice card 6:

Features	Option A	Option B	Option C
Electricity Discount	€280	€450	No new wind farm
No of wind turbines	40	8	
Community Representative	NO	YES	
Setback	1500m (0.93 miles)	500m (0.31 miles)	
Height	80m	130m	
Choose	**1**	**2**	**3**

Choice card 7:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€280	€450	No new wind farm
No of wind turbines	20	20	
Community Representative	YES	NO	
Setback	500m (0.31 miles)	1500m (0.93 miles)	
Height	180m	130m	
Choose	**1**	**2**	**3**

Choice card 8:

Features	Option A	Option B	Option C
Electricity Discount	€280	€450	No new wind farm
No of wind turbines	8	40	
Community Representative	NO	YES	
Setback	1000m (0.62 miles)	1000m (0.62 miles)	
Height	80m	130m	
Choose	**1**	**2**	**3**

Choice card 9:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€110	€620	No new wind farm
No of wind turbines	8	40	
Community Representative	YES	NO	
Setback	1000m (0.62 miles)	1000m (0.62 miles)	
Height	80m	180m	
Choose	**1**	**2**	**3**

Choice card 10:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€620	€110	No new wind farm
No of wind turbines	20	20	
Community Representative	YES	NO	
Setback	1000m (0.62 miles)	1000m (0.62 miles)	
Height	180m	80m	
Choose	**1**	**2**	**3**

Choice card 11:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€450	€280	No new wind farm
No of wind turbines	8	40	
Community Representative	NO	YES	
Setback	500m (0.31 miles)	1500m (0.93 miles)	
Height	80m	180m	
Choose	**1**	**2**	**3**

Choice card 12:

Features	**Option A**	**Option B**	**Option C**
Electricity Discount	€110	€620	No new wind farm
No of wind turbines	40	8	
Community Representative	NO	YES	
Setback	500m (0.31 miles)	1500m (0.93 miles)	
Height	130m	180m	
Choose	**1**	**2**	**3**

Question 17: C3: How easy did you find it to choose your preferred option from the choice cards? **Please circle beside your answer (one answer)**

How easy was it?	Circle
Very easy	1
Fairly easy	2
Neither easy nor difficult	3
Fairly difficult	4
Very difficult	5
I don't know	0

Question 18: C4:

Thinking about the choices you have made, and the information presented earlier, please circle whether the following statements are true or false.

	Statements	True	False	Don't Know
A	I ignored the number of turbines	1	2	0
B	I ignored the height of turbines	1	2	0
C	I ignored the setback distance	1	2	0
D	I ignored the community rep option	1	2	0
F	I ignored the electricity discount amounts	1	2	0
G	I ignored some elements of the choice situations to make them easier and quicker to complete	1	2	0

Question 19: C5:
Thinking about the choices you have made, and the information presented earlier, please circle your level of agreement with the following statements from 1 (completely agree) to 5 (completely disagree) **One answer for each.**

	Statements	Completely Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Completely Disagree
A	The setback distances provided were too close	1	2	3	4	5
B	Wind energy is not the best form of renewable energy	1	2	3	4	5
C	The compensation provided was too low	1	2	3	4	5
D	I do not trust wind farm developers	1	2	3	4	5
F	It is not appropriate to build wind farms in my area	1	2	3	4	5
G	Wind farms can damage the appearance of the landscape	1	2	3	4	5

Question 20:C6:

How do these alternative compensation methods compare in relation to an electricity discount? **(Please circle the rating for each compensation, one answer for each)**

	Issues	Better than electricity discount	As good as electricity discount	Worse than electricity discount
A	Personal shares in the wind farm	1	2	3
B	Community fund	1	2	3
C	A new sports/ recreational facility for the community	1	2	3
D	One off personal cash payment	1	2	3
E	Regular personal cash payment	1	2	3

Question 21:C7:

Suppose a wind farm is to be located close to your residence (within 2 km) On a scale of 1 to 5 (with 1 having no confidence and 5 having full confidence), how much confidence do you have that the following will occur: **(Circle your response for each on a scale from "No Confidence" to "Full Confidence", one answer for each)**

	Statements	No confidence	◄──	──►		Full confidence
A	The wind farm developer will cooperate with the community.	1	2	3	4	5
B	The wind farm developer will provide information to the local community	1	2	3	4	5
C	The wind farm developer will provide financial support to the local community	1	2	3	4	5

Question 22: C8:

Below is an image of a hypothetical house situated near wind turbines:

To what degree do you think the area represented in the picture might be negatively affected due to the wind turbines in each of the following aspects **(circle your response for each on a scale from "Not at all" to "Extremely affected", one answer for each)**

	Issues	**Not at all**	**Mild**	**Moderate**	**Severe**	**Extremely affected**	**Don't Know**
A	Mental health of residents	1	2	3	4	5	0
B	Physical health of residents	1	2	3	4	5	0
C	Property value	1	2	3	4	5	0
D	Livestock health	1	2	3	4	5	0
E	Bird health	1	2	3	4	5	0
F	Visual pollution	1	2	3	4	5	0
G	Happiness of members of the community	1	2	3	4	5	0

Question 23: C9:

Below is an image of a hypothetical house situated near wind turbines:

To what degree do you think the area represented in the picture might be negatively affected due to the wind turbines in each of the following aspects **(circle your response for each on a scale from "Not at all" to "Extremely affected", one answer for each)**

	Issues	**Not at all**	**Mild**	**Moderate**	**Severe**	**Extremely affected**	**Don't Know**
A	Mental health of residents	1	2	3	4	5	0
B	Physical health of residents	1	2	3	4	5	0
C	Property value	1	2	3	4	5	0
D	Livestock health	1	2	3	4	5	0
E	Bird health	1	2	3	4	5	0
F	Visual pollution	1	2	3	4	5	0
G	Happiness of members of the community	1	2	3	4	5	0

Question 24: C10:

What are the most important concerns you have related to the development of a new wind farm that may impact you personally?
Write in the rankings of the following concerns from 1 being the most important concern to 4 being the least important concern.

Personal Concerns	Rank
Concerns about my personal physical and mental health	
Concerns about my surrounding environment	
Concerns about a decline in the value of my property and my principal private residence	
Concerns about a decline in my quality of life and well being	

Question 25: C11:

What are the most important concerns about issues about development of a new wind farm that may impact your community?
Write in the rankings of the following concerns from 1 being the most important concern to 4 being the least important concern.

Personal Concerns	Rank
Concerns about the physical and mental health of my community	
Concerns about the environment surrounding my community	
Concerns about a decline in the value of the properties of individuals that live in my community	
Concerns about a decline in my quality of life and well- being of my community	

Question 26: C12:

It may sometimes be easier for a wind farm developer not to provide all of the information about a wind farm prior to construction. In order to compensate for this lack of information the developer may increase compensation. Please choose your preferred combination of information and compensation.
Circle the number under your answer (one answer)

Information Payment	No information 100% increase in compensation	20% Information 80% increase in compensation	50% Information 50% increase in compensation	80% Information 20% increase in compensation	100% Information No increase in compensation
Choose	1	2	3	4	5

Section D: Demographics:

Information that you provide in this section will remain strictly confidential.

Question 27: D1:

How often do you see wind turbines? **(Please circle your answer, one answer)**

How often do you see wind turbines?	Circle
Never	1
Rarely	2
A few times a year	3
Once a month	4
Once a week	5
Twice a week or more	6
Once a day or more	7

Question 28: D2:

Have you ever put in an objection to the planning authorities about a wind farm? **(Please circle your answer, one answer)**

Objected	Circle
Yes	1
No	2

Question 29: D3:
Are you connected with any group/ business/campaign related to wind farms? **(Please beside circle your answer)**

Member of a wind farm group	Circle
Yes (please provide details):	1
No	2

Question 30: D4:
In your opinion, what is the level of carbon emissions (air pollution) in your area? **(Please circle beside your answer)**

Level of air pollution	Circle
High pollution	1
Medium pollution	2
Low pollution	3
No air pollution	4
I don't know	0

Question 31: D5:

What is your average electricity bill for two months? **(Write your answer in the box)**

Electricity bill	Write
Write in amount in box	

Question 32: D6:

Do you own land in this area? **Circle beside your answer (one answer):**

Land owner	Circle
Yes	1
No	2

Question 33: D7:

What is your marital status? **Circle beside your answer (one answer):**

Marital Status	Circle
Married or living with a partner	1
Single	2
Widowed/divorced/separated	3

Question 34: D8:

Write in the number of people in your household that are:

	Household Age	Write
A	Below 5 years old	
B	Between 5-15 years old	
C	Between 16-60 years old	
D	Over 60 years old	

Question 35: D9:

What is your date of birth **(Please write your answer)**

Age	Write
Write in date of birth (DD/MM/YEAR)	________/__________/___________

Question 36: D10:

What would you say is your level of general physical health? **(Circle beside your answer)**

Level of physical health	Circle
Very good	1
Good	2
Fair	3
Poor	4
Very poor	5

Question 37: D11:

What would you say is your level of general mental health? **(Circle beside your answer)**

Level of mental health	Circle
Very good	1
Good	2
Fair	3
Poor	4
Very poor	5

Question 38: D12:

Which of the following best describes your level of education to date. If still studying, which level best describes your level of education obtained up until now? **Circle beside your answer (one answer)**

Education	Circle
Primary	1
Secondary	2
Leaving certificate	3
Third level and higher	4

Question 39: D13:

Please indicate your current work status. **Circle beside your answer (one answer):**

Work Status	Circle
Working full-time (30 hours or more per week)	1
Working part-time (30 hours or less per week)	2
Unemployed	3
Student	4
Home maker	5
Retired	6
Unable to work for health reasons	7

Question 40: D14:

If working, what is your occupation? If retired, what was your previous occupation?

Question 41: D15:

Please tick the option that best represents your total income per year, whether from employment, pensions, state benefits, investments or any other sources) before the deduction of tax.) **Circle beside your answer (one answer)**

Per week	Per year	Circle
Less than €150	Less than €7,800	1
€150-€299	€7,800-€15,599	2
€300-€449	€15,600-€23,399	3
€450-€599	€23,400-€31,199	4
€600-€899	€31,200-€46,799	5
€900-€1,199	€46,800-€62,399	6
€1,200-€1,499	€62,400-€77,999	7
€1,500-€2,249	€78,000-€116,999	8
€2,250 and over	€117,000 and over	9

End Time:______________________________________

Focus Group Question.

We will be hosting a focus group at a later date involving a small meeting with members of your community and a follow up survey similar to the one you completed. We are interested in your opinions on wind farm development. This type of feedback is very important in the design of future surveys of this type. Would you be willing to participate in a focus group? **PLEASE CIRCLE**

YES **NO**

We hope you have enjoyed completing this survey, and we thank you very much for your time and interest in this study – it is greatly appreciated

THANK YOU

National University of Ireland (NUI),
Galway,
Ireland.

__________________________**END OF INTERVIEW**__________________________________

Interviewee Notes/ Comments:

____

____

____

____

____

____

Interviewer Notes/ Comments:

____

____

National University of Ireland, Galway
Ollscoil na hÉireann, Gaillimh

Appendix II:
Wind Farm Development Pilot Survey

Full Name______________________________

Address ____

City/Town____

County________________________

Telephone Number__________________________________

Respondent ID: _________________________________

Location of survey________________(Nearest town)

Date of survey_____________________

Start time of interview_________________(use 24 hr. clock)

Willing to Do Focus Group Yes No (Please Circle)

Hello, I'm ……. from NUIG and I am carrying out an independent survey on behalf of the National University of Ireland, Galway regarding people's views and attitudes towards wind farm development.

The information you provide will help us promote desired wind farm development practices for your future needs and the needs of future generations. The survey will take you about **25** minutes and you should find it interesting. The answers that you provide will be important for decisions about wind farm development. They will be kept **completely confidential** and will not be used for anything else. Please read each question carefully and answer as accurately as you can.

Section A: Opinions on Wind Energy:

In this section we are interested in your opinions on wind energy in Ireland.

Question 1: A1:

Do you think at present there are enough wind farms in Ireland? **Tick the box beside your answer (one answer)**

		Tick
1	There are not enough wind farms in Ireland	
2	The number of wind farms is about right	
3	There are too many wind farms already	
4	Don't know	
5	Don't care	

Question 2: A2:

Approximately how far do you live from the nearest wind farm? **Tick one answer**

		Tick
1	Less than 250m	
2	250m-500m	
3	500m-1Km	
4	1Km-3Km	
5	3Km-5Km	
6	5Km-10Km	
7	More than 10Km	
8	I don't know	

Question 3: A3:

There is no current strict ruling in Ireland on what the set-back distance of turbines from homes should be, though the councils tend to follow a distance of about 500m. What do you think the minimum set-back distance should be? **(Tick one answer)**

		Tick
1	There should be no set-back distance	
2	Less than 300m	
3	500m	
4	700m	
5	1Km	
6	1.5Km	
7	2Km	
8	More than 2Km	

Question 4: A3:

What is your relationship with wind farms? **Tick either true, false or don't know for each statement.**

	1	2	3
	True	**False**	**Don't Know**
I am in favour of all wind energy			
I plan to set up my own wind farm			
I own/ work on a wind farm			
I am against all wind energy			
There are no wind farms near me but I would like there to be			
I would not accept a big wind farm being built near me			
I know of close family/ friends that own/work on a wind farm			
There is at least one wind farm near me and I would be in favour of more			
I agree with wind energy but disagree with some wind farm projects			
I have protested against a wind farm project			
There is at least one wind farm near me and I don't want any more			
I have objected to a wind farm project			
I agree with wind energy but don't want a wind farm near me			
There are no wind farms near me and I don't want any			
I don't care if a wind farm of any size is built near me			
I am part of a community wind farm group			

Question 5: A4:

What are your preferred energy options? **Rank the following energy options from 1 to 8; 1 being the best and 8 being the worst**.

		Rank
1	Bioenergy/ biofuels	
2	Oil	
3	Wind energy (on land)	
4	Gas	
5	Wave energy	
6	Wind energy (at sea)	
7	Hydro energy	
8	Tidal energy	

Section B: Wind Farm Attributes:

In this section we are interested in what you think are the most important factors regarding wind farm development.

Question 6: B1:

Please indicate how important the following considerations are to you if a wind farm were to be set up in your area. **Please tick the box that indicates the importance for each statement**:

	1	**2**	**3**	**4**	**5**	6
	Very Important	**Important**	**Neither Important Nor Unimportant**	**Unimportant**	**Very Unimportant**	**Don't Know**
Size of wind farm						
Who owns it						
Visibility of turbines						
Compensation provided to local community						
Amount of information provided						
Job opportunities						
Amount of influence local people have regarding the project						
Impact on birds						
Noise from turbines						
Proximity to houses or minimum Distance to settlement/houses						
Amount of energy exported						
Landscape damage						
Shadow flicker from blades						
Maximum height of turbines						
Number of turbines						
Type of landscape being used						
Impact on animals						
Effect on tourism						
Opportunity to buy shares in Wind farm project						
Avoided carbon dioxide emissions						

Other? Please list:

Question 7: B2:

Wind farms could be developed and run by different groups: local/ non-local, Irish/ non-Irish, state-owned/ private. We are interested in your opinions as to who would be the best at establishing and running wind farms and at dealing with the concerns you found important in the previous question.

Please rank the following groups **from 1 to 5; 1 being the most preferred and 5 being the least preferred** in terms of who you think should be involved.

		Rank
1	Irish private companies/developers	
2	Irish farmers local to the area	
3	Irish semi state companies (Bord an Mona, ESB)	
4	Foreign private companies/developers	
5	Local community (not just farmers)	

Question 8: B3:

Please rank what you think might be the best ways to address local community concerns, **1 being the most preferred option to 8 being the least preferred option:**

		Rank
1	Public Meetings	
2	Newspaper Notice	
3	Face-to-Face Meetings with the Most Affected Residents	
4	Online Updates on the Development	
5	Independent Assessment of the Effects of Development	
6	Local Input into Development	
7	Government Assessment of the Effects of Development	
8	Local Ownership of Development	

Section C: Compensation:

In this section we are interested in your opinions about the best way to compensate communities for wind farm development in their area. Currently there is no requirement for developers to compensate communities.

Question 9: C1:

Suppose there was a wind farm being set up in your area. In order to compensate for wind farm development in your area, developers can offer you or your community one of the following options. Each of the columns in the table below represents a different option in terms of who is being compensated and by how much: **Tick the option below your preferred compensation package (please tick one option only)**

	1	*2*	*3*	*4*
	Subsidised electricity	***Community fund***	***Private compensation***	***Public amenity***
Who is it paid to?	You	Local committee/council	You	Local committee/council
How much?	10-55% discount	€250,000-€1,000,000	€1,000-€6,000	€250,000-€1,000,000
How often?	Every bill during project lifetime	Every year during project lifetime	One-off Payment	One-off Payment
Any conditions?	No	No	No	Yes: Must be spent on recreational project for whole community
Tick				

Please state the reasons for your answer:

Section D: Information on Development:

In this section we are interested in your opinions regarding the provision of information to the public about wind farm development.

Question 10: D1 :

Suppose that new wind farm projects throughout the country were required to design a website to provide information about development to those in the area. This website is made up of 3 levels, each providing a different amount of information, and each level is associated with a different cost.

Bearing in mind your own household budget and other things you can spend this money on, which access level would you choose for a development in your area? **Tick the box under your choice:**

	1	*2*	*3*
Information provided	*Bronze*	*Silver*	*Gold*
No. of turbines	✓	✓	✓
Location	✓	✓	✓
Name of applicant	✓	✓	✓
MW of development	✓	✓	✓
Maps	No	✓	✓
Environmental impact statement	No	✓	✓
Distance to houses	No	✓	✓
Timeline information	No	✓	✓
Information on likely disruption dates	No	✓	✓
Interaction with developer through website	No	No	✓
Cost per development searched	Free	€3.00	€5.00
Tick			

Please state the reasons for your answer:

Section E: Wind Energy Exportation:

In this section we are interested to know your opinions about whether Irish wind farms should be used to supply a domestic market with electricity or whether it should be exported.

Question 11: E1:

If Ireland does choose to export wind energy, this will mean a greater number of wind farms being built. Ireland will receive a number of benefits including: increased employment, additional revenue to the government, and local communities. However, there are likely to be a number of possible disadvantages for the community in the development area including: potential landscape impact, potential impact on birds, potential tourism impact etc.

The revenue generated from possible exports could either be invested by the Irish government across the country (in schools, hospitals, roads etc.) or it could be given to the local community in which the wind farms are being built.

The table below presents 5 options for the future of wind energy exportation. It indicates the number of new wind farms required for different export levels and the benefits to the country from this new development (jobs, revenue etc.)

It also shows how benefits may be allocated, either 100% to government to be spent on any number of things including hospitals, schools, training programmes etc. or split 50:50 with the community in the new wind farm areas to compensate for development. The benefits to Ireland that arise from wind farm energy exports are in terms of **per Irish household per year** (for example high export level generates €1000 per household per year).

Please read the options carefully and choose the option you prefer. **Tick under one option.**

	1	2	3	4	5
	A: High Export Level	**B: High Export Level**	**C: Medium Export Level**	**D: Medium Export Level**	**E: No New Exports**
No of new wind farms	High	High	Medium	Medium	No New Exporting Farms
Benefits to Ireland	€1000	€1000	€500	€500	€0.00
Share of benefits	100% to government	50% to government 50% to local community	100% to government	50% to government 50% to local community	n/a
Tick					

Please state the reasons for your answer:

Question 12: E2:

Are you in favour of exporting renewable wind energy from onshore wind farms in Ireland? **Tick the box beside your answer (one answer)**

		Tick
1	Yes	
2	No	
3	I don't know	

Please state the reasons for your answer:

Question 13: E3:

Who do you think should decide how much wind energy Ireland should export? **Tick the box beside your answer (one answer)**

		Tick
1	The Wind Farm Developers	
2	The Irish Government	
3	The Local Community	
4	The European Union	
5	The Irish Public	
6	A Combination (Please Write Which Ones) :	
7	Other (please state):	

Section F: Demographics:

Information that you provide in this section will remain <u>strictly confidential.</u>

Question 14: F1:

I see/ have seen wind turbines **(please circle your answer)**

1. Never   2. Rarely   3. A few times a year

4. Once a month   5. Once a week   6. Twice a week or more

7. Once a day or more

Question 15: F2:

If your home is near a wind farm, did you move in: **(please circle your answer)**

1. Before it was built   2. After it was built   3. During construction

4. I don't know   5. N/A

Question 16: F3:

Are you a member of an environmental organisation **(Please circle your answer)**

1. Yes   2. No

If Yes, please list the environmental organisations to which you belong:

Question 17: F4:

Are you a member of any social group/s in your area (e.g. club, local organisation, local political group etc.)? **(Please circle your answer)**

1. Yes   2. No

If YES, please list the groups to which you belong:

If YES, how many people (best estimate) in total do you interact with from this group/these groups? If some people are in several groups, count them once**. (Please circle your answer)**

1. Less than 10	2. 10-20	3. 20-40
4. 40-60	5. 60-80	6. 80+

Question 18: F5:

Are you a member of a community wind farm organisation? (Please circle your answer)

1. Yes	2. No

Question 19: F6:

Please circle all of the characteristics that describe the area in which you live:

1:City	2:Near a river	3:Near a national park	4:Large town
5:Less well-off	6:Small town	7:Near a protected area	8:Village
9:Isolated	10:Mountainous	11:Tourist spot	12:Hilly
13:Run-down	14:Flat	15:Scenic	16:Near a lake
17:Historic	18:Near a forest	19:Coastal	20:Un-scenic
21:High crime	22:High unemployment	23:Well-off	24:Agricultural
25:Family-friendly	26:Boggy	27:Lively	28:Quiet

Question 20: F7:

What is your marital status? **Tick the box beside your answer**

		Tick
1	Married or living with a partner	
2	Single	
3	Widowed/divorced/separated	

Question 21: F8:

Write in the number of people in your household that are:

		Number
1	Below 5 years old	
2	Between 5-15 years old	
3	Between 16-60 years old	
4	Over 60 years old	

Question 22:F9:

What is your age **(Please circle your answer)**

1. 18-25 years 2. 26-40 years 3. 41-60 years 4. 60+ years

Question 23: F10:

Are you **(Please circle your answer)**

1. Female 2. Male

Question 24: F11:

Which of the following best describes your level of education to date. If still studying, which level best describes your level of education obtained until now? **Tick one only.**

		Tick
1	Primary	
2	Secondary	
3	Leaving certificate	
4	On the job training	
5	Certificate/diploma	
6	College/ undergraduate degree (BA, BSc)	
7	Postgraduate degree (MA, PhD etc.)	

Question 25: F12:

Please indicate your current work status. **Tick one only.**

		Tick
1	Working full-time (30 hours or more per week)	
2	Working part-time (30 hours or less per week)	
3	Unemployed	
4	Student	
5	Home maker	
6	Retired	
7	Unable to work for health reasons	

Question 26: F13:

If working, what is your occupation? If retired, what was your previous occupation?

Question 27: F14:

Which of the following best describes the occupation of the chief income earner in your household? Please tick one:

		Tick
1	Professional	
2	Employed by a private firm	
3	Civil servant	
4	Self-employed	
5	Housewife/ homemaker	
6	Student	
7	Retired	
8	Unwaged	
9	Other	

Question 28: F15:

Please tick the option that best represents your total income per year, whether from employment, pensions, state benefits, investments or any other sources) <u>before</u> the deduction of tax.) **Tick one only:**

	Per week	Per year	Tick
1	Less than €150	Less than €7,800	
2	€150-€299	€7,800-€15,599	
3	€300-€449	€15,600-€23,399	
4	€450-€599	€23,400-€31,199	
5	€600-€899	€31,200-€46,799	
6	€900-€1,199	€46,800-€62,399	
7	€1,200-€1,499	€62,400-€77,999	
8	€1,500-€2,249	€78,000-€116,999	
9	€2,250 and over	€117,000 and over	

Focus Group Question.

We will be hosting a focus group at a later date involving a small meeting with members of your community and a follow up survey similar to the one you completed. We are interested in your opinions on wind farm development. This type of feedback is very important in the design of future surveys of this type. Would you be willing to participate in a focus group? **PLEASE CIRCLE**

YES **NO**

We hope you have enjoyed completing this survey, and we thank you very much for your time and interest in this study – it is greatly appreciated

THANK YOU

National University of Ireland (NUI),

Galway,

Ireland.

__________________________**END OF INTERVIEW**__________________________________

Interviewee Notes/ Comments:

Interviewer Notes/ Comments:

Appendix III:

Focus group topics

COMMUNITY FOCUS GROUP DISCUSSION DOCUMENT

Housekeeping:

1. Participation is voluntary, there are no consequences for not taking part or answering certain questions
2. Explain how information taken from the focus group might be used.
3. Any personal information will be kept confidential. Only we will know their name and only other researchers will have access to their information. No information will be publicly reported that will identify them as a participant in the study.
4. Let the participants know we are here to learn from them.
5. Best if only one person talks at a time. It's very important not to have side conversations because it interferes with your full participation in the focus group and it poses a problem for recording.
6. It's important to hear everyone's ideas and opinions. There are no right or wrong answers, just ideas, experiences and opinions, which are all valuable.
7. It's important for us to hear all sides of the issue, both the positive and negative.
8. Explain the research topic and the reason for this focus group.
9. Structure: Discussion for about 50 minutes followed by a group activity for about 10 minutes. There will be a short break for about 15 minutes followed by a feedback session on our new survey for about 45 minutes.
10. Free to leave at any time, make us aware if you need a break at any stage.

****

Wind farms can take many forms. They can come in a range of sizes, have different ownership structures and can have a positive or negative impact on communities in the area of the wind farm.

Question 1: Imagine a new wind farm development was to be established between 500m and 1Km of your home.

a) What characteristics, if any, could this wind farm have that would make you feel more positive towards this development. *(**Probe:** what is it about these characteristics that would make you feel more positive)*
b) What characteristics, if any, could this wind farm have that would make you feel more negative towards this development. *(**Probe:** what is it about these characteristics that would make you feel more negative)*

****

Wind farms could be developed and run by different groups: local/ non-local, Irish/ non-Irish, state-owned/ private. We are interested in your opinions as to who would be the best at establishing and running wind farms.

Question 2: Here is a list of options for groups that can establish wind farms. **GIVE LIST**

- Irish private companies/ developers
- Irish farmers local to the area
- Irish semi-state companies (Bord na Mona/ ESB)
- Foreign Private companies/ developers
- Local community (not just farmers)

a) What group, if any, would make you feel most positive about a new wind farm development *(**Probe:** what is it about this group that would make you feel positive)*
b) What group, if any, would make you feel least positive about a new wind farm development *(**Probe:** what is it about these characteristics that would make you feel positive)*

****

In the survey you completed for us, we asked how important certain aspects of wind farms were.

Question 3: Here is a list of characteristics of wind farms that people from our survey in **AREA** found to be the most important, on average, when considering a new wind farm. **GIVE LIST**

a) Which characteristics, if any, do you agree with? *(**Probe:** what makes you agree with these characteristics)*
*b) Which characteristics, if any, do you disagree with? (**Probe:** what makes you agree with these characteristics)*

****

At the moment in Ireland, there is no legislation or guidelines on appropriate compensation amounts for payment to the community in wind farm development areas or the form this compensation should take.

Question 4: In what instances, if any, do you think it is necessary to provide compensation to residents in a wind farm development area? *(**Probe:** what is it about this instance that makes you feel that compensation is required)*

Question 5: Imagine you were to be provided with compensation for wind farm development in your area. Here is a list of the options you could choose. **GIVE LIST:**

- Subsidised electricity
- Community fund
- Private compensation
- Public amenity
- Share options

a) Which compensation, if any, would you find the most appropriate? *(**Probe:** what is it about this compensation that makes you think it is the most appropriate)*
b) Which compensation, if any, would you find the least appropriate? *(**Probe:** what is it about this compensation that makes you think it is the least appropriate)*

****

Question 6:

Suppose that new wind farm projects throughout the country were required to design a website to provide information about development to those in the area. ***GIVE LIST*** *This website is made up of 3 levels, each providing a different amount of information, and each level is associated with a different cost. The Bronze level provides the current legal minimum required level of information and this is free. The Silver level provides more information at a cost of €3.00 per development searched. The Gold level provided the same level of information as the Silver level as well as contact through the website with the developer at a cost of €5.00 per development searched. This payment would be used to maintain and run the website. Bear in mind your own household budget and other things you can spend this money on.*

a) If this was available to you, which level, if any, would you be prepared to pay for? *(**Probe:** what is is about this level that makes you prepared to pay?)/ (What is it about this website that makes you not prepared to pay?)*

****

Question 7:

There has been discussion recently on the possibility of building a large development across the midlands to export wind energy to the UK. If Ireland does choose to export wind energy, this will mean a greater number of wind farms being built. Ireland will receive a number of benefits including: increased employment, additional revenue to the government, and local communities. However, there are likely to be a number of possible disadvantages for the community in the development area in the midlands including: potential landscape impact, potential impact on birds, potential tourism impact etc.

a) What are the characteristics, if any, of export-only wind farms that would make you feel positive towards its development? *(**Probe:** what is it about these characteristics that would make you feel positive)*
b) What are the characteristics, if any, of export-only wind farms that would make you feel negative towards its development? *(**Probe:** what is it about these characteristics that would make you feel negative)*

****

Question 8:

Wind farm design game & survey testing.

****

Question 9:

Do you have any comments or questions about wind farm development based on our discussion today?

WIND FARM DEVELOPERS FOCUS GROUP DISCUSSION DOCUMENT

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- Let the participants know we are here to learn from them.
- Best if only one person talks at a time. It is very important not to have side conversations because it interferes with your full participation in the focus group and it poses a problem for recording.
- It is important to hear everyone's ideas and opinions. There are no right or wrong answers, just ideas, experiences and opinions, which are all valuable.
- It is important for us to hear all sides of the issue, both the positive and negative.
- Explain the research topic and the reason for this focus group.
- Structure: Discussion for about 50 minutes followed by a group activity for about 10 minutes. There will be a short break for about 15 minutes followed by a feedback session on our new survey for about 45 minutes.
- Free to leave at any time, make us aware if you need a break at any stage.

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1. **Competitiveness: Domestic & Export**
   How can Ireland better use its windy resources to its advantage, both to make the industry more competitive against other types of industry both for a domestic and export market.

2. **Allocation of grid nodes**
   There are a limited number of nodes available on the transmission/distribution grid to facilitate access from renewable energy generation. We are interested in your opinions as to which method of nodal allocation should be considered by the system operator.

   Here is a list of possible methods of nodal allocation:
   1. Auctioning
   2. Date order allocation
   3. Optimal site allocation (high elevation, high wind speeds)
   4. Grid need allocation

   (a) Which nodal allocation method, if any, would you find to be the fairest? (Explain why this method of nodal allocation is the fairest)

(b) Which nodal allocation method, if any, would you find to be the least fair? (Explain why this method of nodal allocation is the least fair)

3. Rent charging (payment) options to pay for the grid to accommodate renewables

To integrate renewable energy produced from wind farms on the Irish grid will require a significant investment. We are interested in your opinions as to which rent charging (payment) option is the fairest to fund the expansion of the grid to accommodate renewables.

Here is a list of possible payment options/rent charging options:

1. Super-shallow cost (generation investment is limited to the power plant)
2. Shallow cost (grid operator pays for the grid connection cost)
3. Deep cost (generators pay for the distribution connection and transmission reinforcement)
4. Zonal cost (generators pay a portion of the grid development depending on location)

(a) Which rent charging option, if any, would you find to be the fairest? (Explain why this rent charging option is the fairest)

(b) Which rent charging option, if any, would you find to be the least fair? (Explain why this rent charging option is the least fair)

4. Cooperation among wind farm owners to reduce wind generation intermittency

Congestion on the Irish grid is limiting the amount of wind which can be integrated on the transmission system at one time, and requires the system operator to balance energy demand with available capacity. It is expected that by the year 2020 that the renewable electricity contribution will be 37%. Wind farm developers could cooperate to increase this percentage. We are interested in determining what are the possible means of cooperation between developers to increase the level on the system?

Here is a list of different levels of cooperation:

1. Developing a pumped storage facility
2. Paying a fee for additional interconnection
3. Optimising the geographical spread of wind farms

(a) Which cooperation option, if any, would be the most appropriate? (Explain why this cooperation option is the most appropriate)

(b) Which cooperation option, if any, would be the least appropriate? (Explain why this cooperation option is the least appropriate)

(c) Are there any other option(s) where developers could cooperate? (Explain why these cooperation option(s) are more appropriate)

5. Attributes that affect the profitability of wind farms and the choice of their location

Optimising the location of wind farms is dependent on a range of variables. We are interested in determining what are the key variables which influence the location of wind farms?

Here is a list of variables.

1. Wind speed
2. Wind direction
3. Elevation
4. Height
5. Concentration (number of turbines)
6. Proximity to urban centres
7. Proximity to local housing
8. Proximity to a road network
9. Proximity to the transmission node
10. Land ownership
11. Landscape visibility (impact on the local community)
12. Planning constraints
13. Public opposition
14. Grid offer price
15. REFIT

(a) Which of these characteristics, if any, are important in terms of the profitability of wind farms and the choice of their location? (Explain why these characteristics are important in terms of the profitability of wind farms and the choice of their location)

(b) Which of these characteristics, if any, are not important in terms of the profitability of wind farms and the choice of their location? (Explain why these characteristics are not important in terms of the profitability of wind farms and the choice of their location)

(c) Are there any further characteristics that should be included on the list (Explain why these characteristics are important in terms of the profitability of wind farms and the choice of their location)

(d) Rank the list of characteristics in terms of the profitability of wind farms and their choice of locations on a reducing scale of importance, beginning with the most important characteristic.

6. Wind farm ownership perception

Wind farms are provided by a range of different groups and organisations. We are interested in in your opinions as to which ownership group would be the most positively received by the local community?

Here is a list of possible groupings

1. Irish private developers
2. Foreign private developers
3. Irish Semi-state developers (BNM, ESB, Coillte)
4. Local community
5. Local community (exclusively farmers)

(a) Which group, if any, would be the most positively received by the local community? (Explain why this group would be the most positively received)

(b) Which group, if any, would be the least positively received by the local community? (Explain why this group would be the least positively received)

(c) Rank the groups in terms of the most positively received by the local community on a reducing scale of desirability, beginning with the most desirable group.

7. Wind farm benefits perception

Currently, there is no legislation or advice as to the level of compensation might receive on foot of a wind farm development. We are interested in your opinion on the issue of compensation for the local community.

Here is a list of possible compensation options

1. Free electricity
2. Subsided electricity
3. Private compensation (private settlement)
4. Community compensation (community fund)
5. Public amenity
6. No compensation

In what instances, if any, do you think it is necessary to provide compensation to residents in a wind farm development area? *(**Probe:** what is it about this instance that makes you feel that compensation is required)*