Public acceptance of wind farm development: Developer practices and review of scientific literature

Wind2050 WP3 Deliverable 1

DTU Wind Energy E Report 2015

Tom Cronin, Bonnie Ram, Jim Gannon, Niels-Erik Clausen, Christian Thuesen, Esmir Maslesa, Melanie Kreye & Joana Geraldi

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Authors: Tom Cronin, Bonnie Ram, Jim Gannon, Niels-Erik Clausen, Christian Thuesen, Esmir Maslesa, Melanie Kreye & Joana Geraldi

Title: Public acceptance of wind farm development: developer practices and review of scientific literature

Summary (max 2000 char.):

This report is the first deliverable of Work Package 3 of the Wind2050 project.

The Wind2050 project is about the public perception of wind power in Denmark, its role in the planning and development of wind farms and, ultimately, the meaning it has for reaching the Danish government's targets for wind power in 2050.

Work Package 3 looks specifically at how private developers handle the public's perception of wind power and what it means for their projects.

This report firstly outlines the common stages found in wind farm development and then discusses what manner of interaction the developer commonly has with the public at each stage.

The report then shifts focus to what scientific literature says about two important topics in this realm: public risk perception and the NIMBY concept.

Finally, the report concludes with suggested topics for research questions and highlights the next steps necessary for WP3 to take.

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Technical University of Denmark
Department of Wind Energy
Frederiksborgvej 399
Building 118
4000 Roskilde
Denmark
Phone 46 77 50 24

bcar@dtu.dk
www.vindenergi.dtu.dk

Preface

The Wind2050 project seeks to better understand the public's perception of wind energy, and Work Package 3 is investigating the subject from the wind farm developer's point of view.

Much evidence suggests that public opinion is hardening towards wind power in Denmark, particularly on-shore wind power. Some point the finger at the attitudes and methods used by wind farm developers. Are there good grounds for this viewpoint? Others say that the government sets targets, the municipalities award/reject planning proposals but it is left to the developer to face whether the local public want to live with wind energy or not. Is this really fair?

Currently, the general public in the western 'advanced' world has the democratic right (some call it 'luxury') to object to wind energy. Can developers affect these objections? Presenting 'the facts' about wind energy has long been the default policy of developers to try to gain support for a project. However, the signs are that this is not really having the effect that is desired. What can be done to enhance the approach to wind farm development and what can be learnt from the academic realm concerning public engagement and other areas of development?

These are the questions that WP3 will try to address over the project period. This report is the first deliverable that lays out the basis for the further research.

DTU Wind Energy, Risø Campus, Roskilde, April 2015.

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Introduction

This report is Deliverable 1 of Work Package 3 (WP3) of the Wind 2050 project.

The Wind 2050 project and WP3

Wind 2050 is a “multidisciplinary study on the local acceptance and development of wind power projects”, with the overall objective of identifying and analysing the key factors that drive the local acceptance of wind power. The aim is then to develop or adjust policy measures as well as project design and planning procedures that are necessary to meet the Danish renewable energy targets.

Work Package 3 is entitled “Local acceptance and private project development practices” where the focus is very much on the developer. The aim is to provide a deeper understanding of the practices and investigate relevant scientific literature that may help the project team and the developer community learn more about stakeholders and development practices. The hope is that this research will shed light on how to reduce potential conflicts and better understand the elements of local acceptance for wind siting decisions on land in Denmark.

For the purposes of this work package, the focus of these varied decision processes is where the developer comes into contact with the local communities, members of the public (e.g. landowners, stakeholders, interested parties) and/ or public authorities (at the municipality and national levels). This contact occurs throughout the life cycle of wind power projects but it is perhaps at the planning and construction stages where very important decisions are taken that affect the rest of the life cycle. For example, the proposed location of a wind farm is an essential contact point between the developer and the local public. This work package, therefore, looks at how and when this is communicated between the developer and the public and whether the scientific literature can offer some insights into these engagement and communication approaches. The intent of this report, then, is not to give any locational or design criteria for where and how to site a wind turbine project but to focus on the how the decisions for public interaction are made, as this is where there may be some important insights to be gained.

Purpose of the report

This report describes in general the current wind farm development practices and the common instances where the developer interacts with the public or public authorities. This deliberately attempts to take its standpoint from the developer’s perspective. To help understand this interaction, and to ensure that the work package uses the latest knowledge, a literature study of this field has also been undertaken. The report thus serves three main purposes:

1) To gather the basic knowledge in order to formulate the appropriate research questions that will be addressed during the ongoing work in WP3.
2) To bring the level of knowledge and expectations of the multi-disciplinary team in WP3 to a common point so that the work that follows is based on a shared understanding.
3) To compliment a similar process being undertaken by WP2 that focuses on the local authority’s processes, including regulatory instruments and compensation packages.

It is *not* the main purpose of this report to recommend any specific improvements to the current development process (this will be the focus of later deliverables) but beneficial methods suggested by the literature will, naturally, be highlighted.

The language of acceptance

It should be noted already at this stage that there is significant discussion concerning the language used in the wind energy community and, indeed, concerning the use of the word "acceptance" itself. It has been suggested that the use of "increasing acceptance and reducing conflicts" to describe the goal of the Wind2050 project presents this effort as an extension of national political goals of reaching 100% fossil free by 2050. This raises issues of advocacy vs. independent research approaches. Whilst acknowledging this, the Wind2050 project team is aware of these sensitivities and will continue striving to achieve transparency if not neutrality. This report, however, will continue to use the word acceptance with the understanding that acceptance depends upon notions of community values and risk perceptions, as well as developer goals.

Developers and the interaction with the public

Another key concept to be defined better within WP3 is that of the inter-relationship between social acceptance and individual project delivery. Using the nomenclature from Wüstenhagen et al (2007), the key interface for individual project delivery would rest within the "Community Acceptance" domain, while acknowledging that individual project delivery certainly interacts with the "Socio-political" and "Market domains" – for example, framing national policies adopted by regulatory authorities for encouraging wind energy development (for more on Wüstenhagen see Section 3).

In this context, the consideration of the developer's perspective becomes critical, as on the one hand developers naturally tend to experience aspects of wider social acceptance only as they successfully site specific projects, yet on the other hand the way developers engage with individual projects plays a major influencing role in broader social acceptance issues - on the local, regional, and national levels. Developer perspectives of these stakeholder and institutional relationships are particularly important as they frame developer behaviour towards individual projects being considered, perhaps in isolation from the context of wider aspects of national and, perhaps, international social acceptance of wind energy. This perspective has the potential to mask, for a developer, both the influence that wider social acceptance can have on their project and the impact that their project can have on wider social acceptance (and ultimately the achievement of national climate targets).

Acknowledging that developer perspectives therefore naturally orientate to short-term, site-specific decision processes (rather than those of more complex social acceptance dynamics over time and space) is key to understanding the dynamics inherent in different levels of community and national acceptance issues. Researchers are already recognizing that a no-decision and/or controversial results on single projects in the community (local) acceptance domain may have a greater influence on wider social acceptance than a positive or successful two-way engagement on a project. Indeed, this suggests that one of the key objectives of this work package is to gain a strategic understanding of developer practices and community concerns whilst exploring how to achieve higher levels of social acceptance.

With this in mind, both the perspective of developers with regard to these interactions, and any empirical experiences (or pre-conceived notions) they have in relation to the citizens in the community and decision makers, will be considered during case study analysis and/or any canvassing of views from developers and their communication practitioners during the course of

the study. In addition, a better understanding of stakeholder views of the diverse developer community may help in building a scientific basis for improved interactions and define the decision making processes more clearly. An important consideration during this research is to define current developer roles whilst identifying roles that they cannot fill – for example, providing independent, peer reviewed scientific information regarding potential risks and benefits of siting wind projects. In cooperation with the other WPs of this project, it is hoped that these research approaches will contribute to building a robust knowledge base around wind energy siting on land.

The wind farm development process

In the wind farm development process, all the project phases and components are intended to increase the likelihood of having a successful wind farm project throughout its operational lifetime (or in other words: limiting the risk of a failed project). Any (or all) of these components can be contracted out to a third party where the company does not have the right competences in-house and/or wants to delegate risk.

The development process is a complex and varied one, dependent on a multitude of factors many of which are driven by aspects that are very particular to the site/region/country the project is located in. The local context of siting is a critical theme throughout any public and/or private development process. Context, for example, may consider the local community's culture, values, and experiences with wind energy or consider the history and reputation of wind energy developers. The context of siting has a bearing on whether the community and/or the developer is willing to "accept" or tolerate" the risks and benefits associated with the project and these perceptions may change during the different project phases as well. Since siting is such a locally-based process development practices and experiences are quite diverse and nuanced. These varied nuances cannot be captured completely herein, but the notion that community engagement and social acceptance processes need to consider local contexts and subtle cultural differences that may change over time is important. This is reflected in the topics selected for the literature review and referred to throughout the document wherever appropriate (see literature review below).

Literature Review

Drawing upon the issues above, this WP has developed a literature review as part of this deliverable. As noted in more detail in Section 3, a literature review on "social acceptance," community engagement, and decision making process could involve a myriad of topics, including: effective siting strategies, public engagement strategies, risk communication, and environmental risks and benefits, socio-economic impacts, etc. There is also a vast literature stemming from other energy siting experiences as well as the social sciences.

In the light of this WP focusing on private developers the team has narrowed down the list of possible topics for this literature review that may resonate particularly for the private developer community. It is hoped that this targeted scientific discussion of the some of this rich literature will bring a deeper understanding of two important areas to understand in the wind arena (see also Figure 1):

- Better understanding of communities and citizen concerns that do not want wind turbines in their backyards (the NIMBY concepts) - Why was the NIMBY concept discredited decades ago as inaccurate and not helpful; how should these concerns be addressed over time and by whom?

- Public perceptions about risks and benefits of wind projects - How may well-established psychological concepts of risk as emotion help to better understand and address public concerns and potential local conflicts?

These issues are played out frequently by industry and community feedback that influence the way in which we perceive the multi-level scope of planning and siting wind turbines in our communities (as noted above in the discussion about social acceptance at the project level as well as acceptance at the national or global levels). Some of these developer (and other stakeholder) views can be pejorative, e.g., "opponents are just selfish NIMBYS, people (and developers) just want more money from the state, wind nomads are moving in." Some developer views may be misconceptions of values and emotions that run deep in communities in Denmark and other European countries, such as "sense of place," protection of endangered species or habitat, and fears of unknown health impacts or uncertainties. These misconceptions (or perceptions of risk) can give rise to conflicts and to misunderstandings about how to site turbines effectively, how to communicate with citizens, and who engages in this dialogue.

It is accepted that people that may not want wind in their community for many reasons, but it is also acknowledged that lumping these reasons into just selfishness is not helpful. This could lead to missed opportunities at sites with good wind resources that will not contribute to a sustainable pathway for the electricity system. Alternatively, the conflicts and negative experiences at one local wind site could affect the neighbouring communities and the next region. As noted above, there is a complex web of interrelationships between developers, local towns, and how to meet national goals for GHG reductions. This WP3, in collaboration with the other efforts on this project, hopes to shed some light on these complex behaviours and practices erring on the side of transparency and scientific discourse.

Figure 1 Context of WP3

Outline of the report

Section 1 of this document aims to capture the mechanics of wind farm development that are common for most developers and thus many details are intentionally left out. It is written with one site in mind but many developers have a portfolio of potential sites under development. The points at which there is general interaction with the public and public authorities are mentioned but are further elaborated in Section 2, as this is the focus area of the Wind2050 project. The literature review is presented in Section 3 and, finally, the conclusions and further work are presented in Section 4.

1. Common components of the wind farm development process

This section is intended to guide the reader through the wind farm development process as seen from the private developer's point of view. It is not exhaustive but rather serves to outline the common components that are frequently found in developing a wind farm. Likewise, it does not attempt to cover all types of developer (e.g. wind co-operatives or individual land-owners).

1.1 Phase 1: Finding the "right" project

1.1.1 Initiation

The company/organisation decides that they may generate value for their business by taking the development of a wind farm project through one, or more, of the conventional wind farm project phases. ("I know what we'll do today; let's see if we can start building a wind farm….")

1.1.2 The search for sites

The company looks around for geographical areas that are likely to have a sufficient wind resource and would fit in with their business strategy, i.e. a preliminary screening process. ("Right, where's a good place for a wind farm?" "Brazil." "Yes, but, we're two people in an office in Jutland…let's look closer to home.")

PUBLIC INTERACTION:

At this stage the developer is likely to assess the general level of public acceptance or opposition in an informal manner, perhaps by looking at the progress of any existing wind farms in the area , media reports and the general level of 'activism' for/against large projects in the region.

1.1.3 Investigations and screening

Geographic areas are investigated for possible: wind resource, grid connection, environmental issues, planning consent processes, planning precedence, possible/likely size (capacity) of wind farm, revenue per unit electricity produced, impact of national/regional wind policies, logistics for construction, likelihood for favourable contracts with suppliers, land ownership issues, locations of dwellings and possible impacts on local communities. Overall, this phase is a more detailed screening process to weed out those locations that are not promising. ("Who's good with data, GIS, researching regulations, knows about electricity and the environment, has a knowledge of turbine manufacturers and can make good judgement calls…anyone?")

1.1.4 Obtaining sufficiently bankable wind data

Deciding on how to get wind data that is sufficiently accurate, reliable, appropriate and of sufficient duration to be able to produce an expected energy yield calculation that investors will believe in. ("Can we use a wind atlas? Has someone else measured the wind? Can we buy the data? Should we set up our own masts?")

PUBLIC INTERACTION:

A significant point about this phase is that it can also be a very public/apparent indication of intent to explore wind and will most likely involve the developer interacting with the public.

The consideration of setting up meteorological masts is a serious one: in itself this needs planning consent in most jurisdictions, is expensive and takes time but, for the moment, is the most commonly used method of

obtaining site-specific wind data. Alternative methods such as ground-based LiDAR (a measurement technique using lasers where installation of a mast is not necessary) are gaining traction, but nevertheless the impact on the development programme can still be significant, so the decision to commence a wind measurement campaign needs to be made early in the process. For these reasons, a developer will have to have strong confidence in the viability of a site before committing to a measurement campaign and may well wait until after the final site has been selected (section 1.1.6).

1.1.5 Ranking

Taking all the information about the various candidate sites in the previous sections and evaluating them in terms of cost/time/uncertainty. This process ranks the candidate sites in order of preference for the company. ("Is a site in complex terrain with difficult access and an expensive grid connection but good wind resource preferable to a lowland site with less wind but easier access?")

1.1.6 Selection

Making the decision about which site to develop. This can depend on many factors and certainly not just the quality of the wind resource. Fundamental to the decision will be the economic analysis that will try to predict how profitable the project will be for the company and the risks associated with proceeding with the most preferable sites. ("We're going to select the Evergreen Hill Top site: positive net present value (NPV) and the internal rate of return (IRR) is greater than the rate we're able to borrow at.")

1.2 Phase 2: Project planning, obtaining consent and progressing the design

1.2.1 Planning

The selected project is planned with many activities in parallel and many are dependent on results of previous activities. The objective is to obtain the necessary consents in a timely manner whilst in parallel developing the design to the extent necessary – but no further in case consent proves impossible/too expensive.

PUBLIC INTERACTION:

This is often the phase with the most frequent contact with the public and where they can have the most influence and leverage. Some large projects may make special presentations to the public and many projects will involve a public hearing and give opportunity for comments and complaints.

Consents (sometimes known as permits or licenses) required:

- Planning
- Environmental
- Grid connection ('license to generate')

Planning consent: usually application made to a local/regional authority to obtain the legal consent to build a wind farm. Involvement/interaction with members of the public dependent on many aspects: often legally required, may be handled by the local authority, may only involve a few local landowners, etc. Much also depends on the size of the development.

Environmental permit: needs an Environmental Impact Assessment (EIA) to be done by (or usually on behalf of) the developer. The extent very much depends on what initial surveys find and the regulations concerning rare species of flora and fauna. Key factors to be considered first will include any formal environmental designations (of EU Directive origin) that may be present at, or nearby, the site. Additional significant activities will include: baseline studies, considerations of local heritage and archaeology, geological and hydrogeological characteristics. Furthermore, the assessment of potential impact on the local public will focus on aspects of local value including landscape and visual amenity[1] and the proximity of human activity with regard to noise, shadow flicker etc. It is here, within the EIA, that the public's perception of the wind farm is most commonly calculated with regard to the regulations.

Grid connection: permission needed from the system operator (the actual authority may depend on voltage level of connection) to feed power into the grid. Adherence to the grid codes must be demonstrated (a detailed electrical engineering exercise).

Additional 'consents' include, of course, permission to build on the land and agreements for the sale of the energy produced.

1.2.2 Design

The wind farm design [siting (location) of turbines, type of turbine, cabling, sub-station, grid connection, internal access roads, upgrading of public roads, etc.] needs to be done to the extent necessary for gaining consent. This involves significant communication between the environmental and engineering disciplines working on a project, usually through the medium of a GIS (Geographic Information System) environment. The array layout will change due to environmental considerations (including the impact on local dwellings) and geotechnical conditions, subsequently re-evaluated by the wind modelling team for impact on the investment, and then brought back to the design team for further iteration. This process from initial concept to design freeze can take a significant amount of time as and when new information comes to the attention of the project team, through environmental analysis or through consultation exercises. It is a process that is rarely articulated well to those not involved directly in scheme design.

PUBLIC INTERACTION:

This development-by-iteration nature of the design presents a challenge to the developer with regard to interfacing with the public and public authorities: how much detail should be made available and when, if there is likelihood it will change?

1.2.3 Financing of the project

Until this point, most of the development work is commonly financed in-house but very few organisations can (or find it advantageous to) finance the construction of a wind farm of any size themselves. So, the developer looks for financing elsewhere. Commonly, for project financing those providing debt financing (e.g. banks) will require 30% of the project to be equity financed (e.g. shareholders). According to the investors' requirements

PUBLIC INTERACTION:

Few financiers will ever meet the public directly but the general level of public acceptance can influence the perceived risk of a project from a financier's point of view. Of course, the national political scene for the support of wind technology will influence any investment decision.

[1] Visual amenity: the pleasant or normally satisfactory visual aspects of a location which contribute to its overall character and the enjoyment of residents or visitors.

the project will be subjected to a review (some more thorough than others). The reliability of the energy production estimate, the experience and track record of those involved, and the readiness of the project for construction are key aspects. Again, how much design work needs to be done at this stage and how many contracts are required to be signed with suppliers can vary greatly (and sometimes this depends on the general market conditions for borrowing). Contracts may, however, be agreed pending funding and planning approval.

Completing this jigsaw of funding – or achieving "financial close" – is a major milestone of wind farm development, though rarely observed by those not directly involved.

1.2.4 Legal advice

Throughout the process, legal matters need to be considered carefully not least when negotiating with land owners but also when assessing compliance with regulations, arranging contracts with suppliers, etc.

1.3 Phase 3: Establishment of the wind farm

1.3.1 Specification writing, tendering process, award of contract(s)

Once the consents and financing are in place then what is remaining of the design, specifications, tendering, negotiating and contracting can be completed. The contract for the turbines is the crucial element in this phase and commonly takes longer to negotiate than for the civil/mechanical/electrical balance of plant (BOP) (e.g. main transformer, roads within the wind farm, etc.) Contracts will also need to be in place early for the maintenance of the wind farm, although in most cases the initial period of maintenance will be part of the contract negotiations with the turbine supplier. Other BOP equipment will also need maintenance but may not, however, be part of the turbine manufacturer's contract.

1.3.2 Construction

Wind farm construction is usually a relatively short part of the overall project although it is where most of the capital expenditure takes place. Roads need to be made, foundations for the turbines and buildings poured, cables dug in trenches, turbines delivered and erected, sub-stations built and equipped and the grid connection constructed. All this may be subject to restrictions imposed as part of the consents granted (working hours, working seasons, protection of some areas, etc.) and will certainly be subject to weather-related impacts.

PUBLIC INTERACTION:

For communities not accustomed to wind farm development, this phase is often where the most significant impacts are felt locally (albeit temporarily) with regard to transportation, noise, vibration etc. There is also often a significantly greater risk of environmental impact (with regard to uncertainty) at this stage of the process – with operational risks, such as that of avian impact, being more predictable.

1.3.3 Testing and commissioning

The turbines and associated equipment all need to undergo tests to ensure that they are operating as they were contracted to do. Following this, the wind farm is commissioned by

setting the relevant control parameters of the equipment and checking that everything operates together according to the operational procedures, applicable regulations, grid code constraints and the manufacturers' recommendations. Most of this can only be done with the wind farm connected and a partial connection licence is usually given. Once all is satisfactory to the authorities then the full licence is granted.

1.4 Phase 4: Operation

This is, hopefully, the longest phase of the project. How the wind farm is operated will very much depend on the developer, who may even sell the project on to a separate operating company. Some companies will take on the operations and maintenance (O&M) themselves (this is normally reserved for utility-type companies that have a lot of experience and resources in equipment O&M) or some may choose to contract the whole process out to either the turbine supplier or an independent company. The balance to be found in the operational phase is to maintain the equipment so that it performs as required for the design lifetime whilst keeping the costs under control. It should also be noted that with technological advancement in turbine design, the 'active' management of the wind farm with respect to environmental impact, is more frequently practiced. Control over the turbine and blades in response to varying conditions can mitigate against adverse noise and shadow-flicker impact and is becoming more commonplace. Communicating this to both statutory bodies and to local communities is becoming increasingly more important.

PUBLIC INTERACTION:

The public may well interact with the wind farm (i.e. notice it visually) on a daily basis, see maintenance vehicles driving around the vicinity and, in some cases, experience some sound from the turbines. Some studies indicate that opposition to a wind farm decreases significantly once the wind farm is built. In some cases, however, there are local members of the public who continue voice their opposition throughout the operational period. Indeed, some opposition may only arise once the local public have experienced the turbines operating.

1.5 Phase 5: Decommissioning or re-powering

All components of the wind farm have a finite operational lifetime. For the design lifetime to be met then the components will need the correct maintenance, which sometimes can include replacement of sub-components. At some stage the cost of maintenance compared to the revenue generated will become unfavourable. In some cases, re-powering (i.e. using the same site but installing more modern turbines) will be attractive before the design lifetime of the components has been reached. If not re-powered, then the turbines will be taken down and the foundation tops removed so that the foundations can be covered over.

The recycling of turbine components themselves (especially the blades) is still in its infancy but will become more proficient as more and more turbines reach the end of their useful lifetime.

1.6 Summary

A diagram summarising these phases and steps is shown in Figure 2 . (Please note that the overlapping of the phases shown is not intended to demonstrate a timeline.)

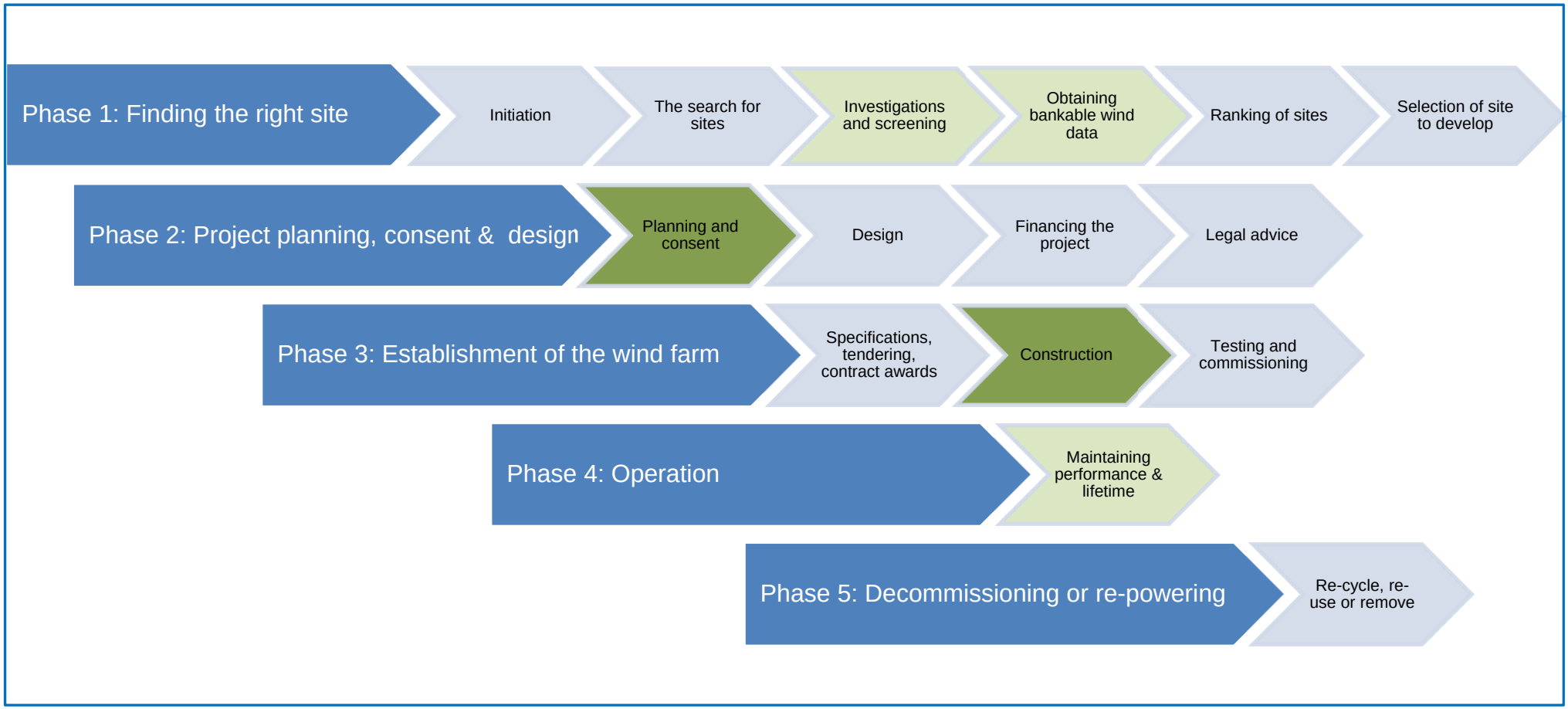


Figure 2 Summary diagram of the Phases and Steps of wind farm planning and development

2. Interaction between the developer, the public authorities and the public

This section focuses on the stages at which the developer commonly interacts with either the public authorities or the general public themselves. In the sections that follow, the interactions identified in Chapter 1 are expanded with some examples of what might be called “standard” engagement methods and with the above elements in mind. The aim of this is twofold:

- To describe what might be called a ‘basic’ approach upon which WP3 can build on and develop the right ‘research questions’ for the rest of the Wind2050 project.
- To suggest aspects that can be used to identify wind farm project case studies that will be useful and informative for WP3.

It is recognised that the current approaches used by various developers are many and varied and it is a significant challenge to try to present them in a succinct and meaningful manner. Nonetheless, this is what is attempted in this section, with the acknowledgement that inspiration has been taken from the following documents:

Ireland

- Best Practice Guidelines 2012 (Irish Wind Energy Association)

UK

- Community Best Practice Guidance 2014 (Renewable UK & IWEA)

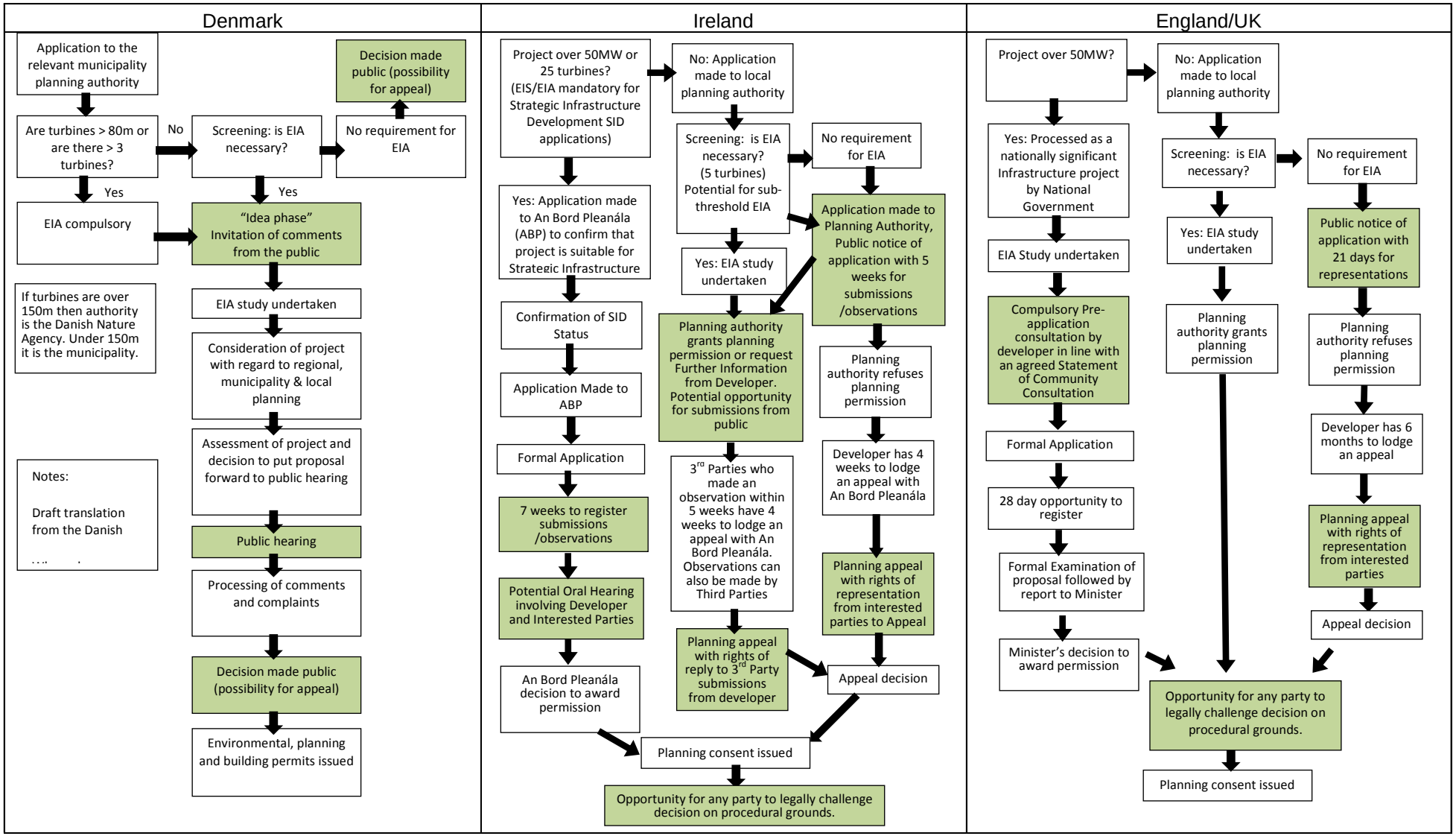
Denmark

- Den gode proces 2009 (‘The Good Process’) (Danmarks Vindmøllerforening et al)
- Borgerinddragelse i vindmølleplanlægning (‘Public involvement in wind farm planning’) (The Danish Nature Agency)

2.1 The legal requirements

Most countries have planning consent processes in place to try to balance the aims of political policies, society’s desires and the interests of individual developers, whether the developments are office buildings, industrial facilities, roads, power stations, etc. The three jurisdictions being considered in the Wind2050 project (Denmark, Ireland and the UK) all have specific processes relating to obtaining the necessary permission to construct and operate a wind farm. Table 1 shows the outline for these processes in each of the three countries. The opportunities for public interaction are shown in the green boxes.

Table 1 Planning and public consultation processes required by law to be followed by the developer



Green box = public engagement

*This is a generalised process for the UK as it consists of four separate planning systems (England, Northern Ireland, Scotland and Wales), who have slightly different processes.

It can be seen that whilst the processes appear to have different structures there are relatively few material differences in the overall processes, with all three making a distinction between which authorities are responsible depending on the size of the project. A generic planning process can be represented as follows in Figure 3:

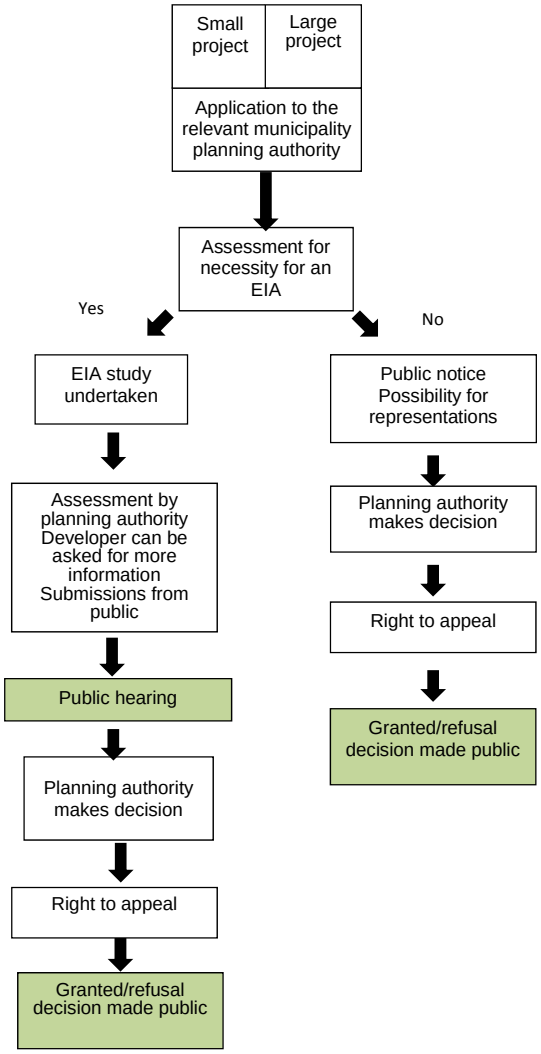


Figure 3 Generic wind farm planning approval process

The IWEA Best Practice Guidelines states that, “It can be considered that the planning process meets the minimum requirements of community engagement required to satisfy current legislation.” So, a key question that a developer is faced with is whether or not to do more than the statutory minimum in order to obtain the necessary permission. The Guidelines go on to say, “However, current best practice in wind energy development is that direct engagement between the developer and the local community in some form should be undertaken.” The challenge is, then, what form this engagement should take?

The elements that are often considered include:

- Is it financially viable to put additional effort into public acceptance?
- What is the risk of public opposition de-railing the project?
- How can interaction with local communities help to allay people's concerns and, indeed, might it enhance support for a project?
- What impact does an adverse reaction have on the developer's company (name, reputation, image, etc.) and what might be the consequent effect for future projects?
- What can the company gain from a dialogue with the local public? What do they know that would be useful to the company and difficult to find out otherwise?
- What level of 'social conscience' does the company have?
- Is the company concerned about the wider image of the wind power sector?
- How much time & effort should the developer put into the relationship with the planning authority?

2.2 Informal assessment of the temperature of public opinion in the area

Prior to any official contact with either the public or the planning authorities, the developer may make investigations as to the general level of public opinion: for, against, undecided or uninterested.

Factors to be reviewed:

- Previous projects in the area by other developers
- Is there employment in the area due to wind energy?
- How experienced is the local planning authority in dealing with applications?
- What is the local political opinion on wind energy?
- Are there active anti-wind groups in the area?
- Who are the likely members of the public that will be living in the vicinity of the wind farm?
- What might they perceive as a gain or loss from the project?

It is likely that the developer's research will involve reading the local press, searching web sites and preliminary enquiries to the appropriate planning authorities. Generally, there is no direct contact with members of the public.

On the basis of this and their other experience the developer will now form a 'public engagement strategy' which could be either a formal project document or, less formally, a basic project approach. According to the NIRIG Best Practice Guidance, "A higher level of community engagement that is properly documented will also enhance the quality of any planning application". The strategy will, of necessity, be different according to each project and also the size of each individual project.

2.3 Interaction with the public during measurement campaigns and site investigations

As soon as any unknown or outside presence is seen in an area then the interest of the members of the public may be aroused. It is inevitable that a developer will need to investigate and carry out work on or near a site, either with their own staff or through sub-contracted experts.

How is this situation best handled?

- Carry out information campaigns prior to any presence in the area even though this runs the risk of alarming people at a stage when the developer actually has little information and this information may well change?
- Attempt to do the work as secretively as possible?
- Just do the work necessary and try to ignore any interaction?
- Should sub-contractors be educated to handle the public on the developer's behalf?

A standard technique used here is to visit the immediate neighbours to a potential mast to explain this stage of development, the purpose of the mast and emphasise that the planning process will need to be followed before any further decision can be made. The neighbours are then given a named contact person who can be contacted in case of any enquiries.

When a project progresses to an EIA then usually the developer will use more targeted techniques to make contact with local groups that may have an interest, most notably community and environmental groups. Direct neighbours will also be visited and provided with information packs. A home page can also be set up to give easily-accessible information.

2.4 Public interaction during planning consent phase

There are at least three stages at which developers need to consider the interaction with the public:

- Information campaigns prior to any public hearing
- Official events where the public has an opportunity to be involved
- Dealing with objections after the planning decision has been made

Interaction with the planning authority is obviously of utmost importance in this phase and will, officially, be dictated by the planning process. Over and above this, there can be the following considerations:

- Are there other contacts and processes that can assist the planning authority other than those officially prescribed?
- Changes to designs need to be considered carefully here because whilst they may be perfectly permitted by the planning authority, they may appear to look devious from the public's point of view.
- What about compensation to members of the public (legal/voluntary)?
- What about financial involvement (e.g. shares) in the project?
- Should some contribution to public services be made through the local authorities or maybe directly to the community ('community benefit schemes')?

It is common that developers will put up a temporary public exhibition where members of the public can visit and find out more, pose questions and meet employees of the developer. This can be advertised in local shops, community centres, local papers, etc. Typically an exhibition may consist of:

- Display boards with maps and photo-montages
- Information about the project plans, construction techniques and community benefits
- Environmental information, including the EIA if possible
- Staff from the developer and/or consultants being on hand to answer questions
- Information leaflets for people to take away

If significant concerns arise then some developers can arrange visits to existing wind farms to give people a first-hand experience of wind turbine(s).

Public hearings may be required to be held by law but the developer may also decide to hold extra meetings as a means of engaging with the public. These would usually be held locally and at a publically-accessible venue e.g. a school hall or community hall. They are often organised as follows:

- Introduction of the project
- Explanation of the planning process and the progress to date
- Expert opinion from a specialist
- Question and answer session

As an example, “Den gode process”, states that - in Denmark - the developer is obliged to “hold a meeting whereby the public are informed about the four financial schemes for wind turbines which, amongst other things, give a possibility to buy shares in the wind farm and to apply for compensation related to any loss in value of a property”.

2.5 Construction of the wind farm, roads, sub-station, etc.

What is the best way in which to minimise the unavoidable adverse impact that construction will have on the local surroundings and its inhabitants?

- How to handle protests that attempt to physically stop construction?
- Informing the public with suitable notice boards and signs?
- Ensuring roads are kept clean of mud and construction debris.
- “Out-of-hours” activities. Sometimes, large components need delivery at times when there is little or no traffic but these are likely to be times when the local public will be disturbed.
- Construction noise and dust – employing methods to reduce these?
- How to best secure the site? Public safety is very important but a wind farm will, by its very nature, spread over a wide area. How is public access to the site controlled?
- Can the public be invited to view the site works?

All developers will erect an information board informing people of the nature of this activity and, by this stage, developers will have already made contact with local groups and this continues throughout the construction phase. An identified contact should be displayed in the event of

members of the public wanting to complain. Information as to progress will also be given on the project website.

2.6 Operation of the wind farm

When the wind farm is built and operating, how might the developer/owner interact with the public?

- Is the wind farm a (visitor) attraction? Or is this just dreaming/wishful thinking?
- Can the wind farm be used for educational purposes e.g. school visits?
- There will be operation and maintenance vehicles and personnel going to the site every now and then. Does this pose an irritation to the public?
- This is the stage where those who are uncertain about whether they are for or against living near wind turbines will finally make up their minds. Experience shows that most people accept but a few may continue to object.
- How to handle the remaining objectors?

The developer will have a contact person available to handle the public's interest in the project, either positive (requesting a visit) or negative (raising a complaint). Once again, it is usual to have an information sign at the boundary of the wind farm and also a website where the public can visit to get more information.

2.7 Decommissioning

There have not been that many wind farms that have been decommissioned yet, although there are a growing number that are being re-powered. The rules will almost certainly have changed since the original turbines were erected. The challenges that re-powering brings with respect to public interaction are similar to that of a new wind farm.

2.8 Summary

The standard practice for engagement with the public is difficult to define as there are almost as many approaches as there are developers. Following the legal requirements for the planning process will involve a measure of public engagement but it is recognised that most developers are currently putting more resources into this than the legal minimum.

Current techniques involve:

- Direct visits to local residents near to potential met masts and wind turbines
- Contacting community groups
- Holding exhibitions
- Distributing information leaflets
- Arranging public meetings
- Handling direct enquiries from members of the public
- Planned contact with opposition groups has, anecdotally, been met with mixed success.

It is often said that the earlier the public is involved the better it is for the overall process. However, the questions as to "How early?", "How to involve?" and "Involved in what?" currently still remain without a clear universal answer.

3. Perspectives on the public and communities: Concerns and risk perceptions

Wind power projects are increasingly confronted by local opposition which delay or block implementation despite the fact that the level of general public support for wind energy is high and stable'. Breukers and Wolsink (2007, p. 2738)

This section presents the results of the literature review conducted as part of WP3. These results are presented in themes, exploring some of the issues involved in the above quote: risk perception, framing social acceptance, and (briefly) offshore issues.

3.1 Introduction

The scientific literature related to local acceptance and the planning process involves a myriad of issues ranging from siting strategies to public engagement approaches. Since this WP focuses on private developers, we have narrowed down the list of possible topics for this literature review that we believe resonate particularly for the private developer actors (for more on this please refer to Appendix A Purpose and process"). We have focused on a number of key issues that are important to wind developments and that emerge from the literature. This is not, however, a comprehensive review of the literature and not a prescription of steps to be taken.

The project team understands that private developers can be very knowledgeable about local concerns as they identify a potential project and they may well know how to communicate effectively with local politicians and citizens about the risks and benefits of wind power. The published evidence, however, is thin and our notions of developer approaches are based upon impressions from industry interactions and workshops in Denmark and in other nations around the world. This task and the accompanying literature review is not intended to forge a new set of best practices or recommendations for private industry – these initiatives are clearly in the realm of developer associations and industry groups. The intentions of the WP3 team are to bring some insights from science – both from the wind experience and also from the non-wind specific research relating to siting energy facilities and public perceptions. The team also appreciates that peer reviewed literature may not be discussed readily in the developer communities and scientific approaches may be not communicated effectively between academics and practitioners. From this perspective we hope to highlight selected implications for the development process as well as frame some questions for the forthcoming research work in this project.

One particular demonstration of the distance between the latest literature and the general developer community is in the terminology used (and the attitude behind it) when handling opposing viewpoints. Some developer comments about public views, particularly opponents, may be pejorative when these opinions express discontent over a proposed single turbine or a utility-scale wind plant. Some opponents state that they do not want wind turbines anywhere in their view and thus get labelled as espousing not-in-my-backyard (NIMBY) opinions (see section 3.4.3). We know that people may not want wind turbines in their community for many reasons, but we also know that lumping these reasons into a "they are just selfish" or

"emotional" categories is not helpful. This could lead to missed opportunities at sites with good wind resources. In addition, as noted in section 3.4.3, the conflicts and negative experiences at one local wind site could affect the neighbouring communities and the next region. There is a complex web of interrelationships between developers, local citizens, other interested and affected parties, and national politicians that want to achieve national climate goals and reduce greenhouse gas emissions. These relationships need to be better understood if more effective siting strategies are to move forward.

We know that the NIMBY label and concept symbolizes a much more complex phenomenon about how public concerns of risks are shaped and change over time. Significantly, although the NIMBY concepts were discredited decades ago as inaccurate and not helpful, the label persists in the wind developer communities in Denmark and around the world. We therefore discuss the NIMBY hypothesis in relation to social acceptance and try to open the 'black box' of NIMBY and understand some of the opinions and feelings therein.

Some of these community concerns may be misconceptions of values and emotions that run deep in local communities and so the project team believes that "the feeling of risk" is a concept that needed some exploration. Strong public concerns about risks may give rise to conflicts and to misunderstandings about how to communicate with citizens and who might be better suited to engage in this dialogue. We believe that this brief discussion of some of the vast scientific literature on these topics will set the stage for a deeper understanding of social acceptance and how developers and/or decision makers may be able to address public concerns more effectively.

"We hope that a vastly improved understanding of the feeling of risk will enable us to integrate feelings with technical analysis so that we can communicate about risk more effectively and make wiser decisions, even when dealing with people of different world views and cultures" (Slovic 2010, page xxvii).

3.2 Objectives of the literature review

The objectives of this literature study are to:

1) Identify selected scientific literature that resonates with wind planning practices and processes, particularly in relation to the publics' and the developers' perceptions of risks and benefits.
2) Highlight the finidngs of critical literature sources (and not to attempt to prepare a comprehensive literature review on the dozens of topics idenitifed as relevant - see themes and subtopics considered in Appendix A).
3) Suggest research questions for the WP3 team.

This section is structured by the following topics:

3.3 Risk Perception: Key findings and considerations

The traditional view of risk perception involves "getting the numbers right" (e.g., the effects of energy supply options on death and health related issues) and that should suffice for what the experts and the communities need to know (NRC 1983). Some scientists even thought that all risks could be compared at one-in-a-million risks related to hazardous threats. This led to figuring out what are the big risks and what do we need to work on primarily to understand and reduce the risks wherever possible. In general, some risks are sought out, for example: the thrill of danger, desired risks, including hand gliding and mountain climbing. Studies began to examine why certain people can seek out risks and other avoid it: was it based on the facts or perceptions and qualitative issues? The scientific discourse and studies eventually arrived at the underlying idea that risk perceptions are anchored in values and world views, not quantitative approaches (NRC 1996, Boholm 1998). In short, the general public did it differently to scientists: they considered qualitative aspects of risks as important. It is also important to recognize that the early years of the risk field was closely linked to the regulation of the nuclear and chemical industries -- involving potential high-hazard accident risks and public fears of exposure (low probability/high consequence). This section hopes to show how the wind community may learn lessons from these studies although the accident risks and public fears of wind power are quite distinct (high probability/low consequence).

3.3.1 The "public" versus the "experts"

It is important to recognize that numbers can conceal some of the truth as well as the uncertainties. These concepts of risk led quickly to the "deficit models", the idea that the public lacks information and analysis and they need to know what the scientists and engineers know. Therefore, the public must be educated to think like the experts. This is clearly a discredited view of scientists and engineers that has been documented by a range of studies and peer reviewed studies (NRC 1996, Aitken, 2009*)*. The central premise of the deficit model was that in instances where the public is hostile to new technologies this is a result of ignorance or lack of understanding, and as such this can be 'corrected' through better dissemination of knowledge According to Jasanoff (2005, p. 249), "Failure to understand science then becomes a meaningful dimension of difference among individuals and communities." As Irwin (2001) observes, the public receives scientific information and (conflicting) 'facts' from a wide variety of sources and as such 'understanding' is not a simple process through which individuals receive the 'correct' knowledge. In many cases increased knowledge of science, or scientific processes might in fact lead to lower acceptance, especially when this means that one becomes aware of competing and conflicting scientific theories (Aitken, 2010). So we learn that there is a discrepancy between the experts and the public, particularly with a decline in social trust (Gregory and Miller, 1998). The various risks involved are different and there are certain risks the public does not want and will not tolerate no matter what. Risk acceptability hence becomes

the dominant notion of social acceptance. These concepts seem particularly relevant to the wind communities.

Thereafter a new concept of risk emerged in relation to how the public perceives risks and uncertainties (which is further explored in Section 3.3.4). It was reasoned firstly that the assumption of the "public" is not homogeneous: there are many "publics" (See NRC 1996 and more recently, Deitz and Stern 2008). Factors such as age, gender, education, profession and culture can form strong impacts on the perception and understanding of communicated risks. Secondly, it was articulated that the public(s) perceive and evaluate risks very differently than experts. Qualitative aspects of risks are important in public perceptions, including issues concerning the processes involved and not just the end product. There are many such qualitative aspects, but using factor analysis they reduce all these qualitative aspects to two major factors: dread and newness of hazard. Some risks are really feared (e.g. people don't want to die from cancer) and newness means they do not have much experience or knowledge. (Slovic et al. 2000). In other words, risks that have big uncertainties are different and the public(s) do not like them. Risks have a range of consequences that translate as "harm" to people and what they value, including ecological aspects, privacy and civil liberties.

In the case of wind power, until recently, fear and dread were not recognized as possible feelings or harmful threats, since wind is relatively benign compared to fossil, nuclear and some other renewables. There is no air pollution hazard from operations, no dangerous spills on land, no radioactive releases, etc. The perceived risks of wind to local communities may stem from uncertainties and unknown risks of this relatively new technology. Also there are uncertainties about whether more wind on the grid will actually lead to affordable clean energy independence, mitigate climate impacts as well as phase out the use of fossil fuels. In addition, conflicting views of sustainability in Denmark need to be better understood and considered (Christensen and Lund, 1998).

Some of the most common perceived risks relate to environmental effects from bird and bat collisions, land-use trade-offs for landowners, and the potential for habitat fragmentation. Raptor collisions were the early and most visible environmental threats of wind power sites (e.g. Altamont, CA and Spain) and the perceived risks persist until today – mostly due to governance related issues in North America. There was limited interest from the traditional risk community regarding wind power, since the roots of their scientific risk tradition related to low probability, high consequence threats usually involving significant numbers of human deaths, health risks, and ecological disasters (Ram 2011). Although the type of risks and their consequences are quite different with wind, we hope to show that the scientific contributions of the risk community are quite relevant to wind technologies.
The large consequence hazards research led to a deeper understanding of the difference between technological hazards and natural hazards. This, in turn, led to a new conceptual framework of social amplification of risk to technology hazards and attenuation to natural hazards (Pidgeon et al.2003). Social amplification is another area that might be quite relevant to the wind industry in relation to the 'ripple effects' of the media, but is beyond the scope of this literature review (See also Wind 2050 WP1 Social media analysis).

Early on in the history of the commercial wind turbine industry, there did not seem to be a panoply of risks to the local citizens until large scale wind power began to unfold in the 1990s.

Until then, wind presented high probability, low consequence impacts and this did not lead to detailed analyses of a range of potential human effects – only those impacts that were raised by the public authorities, non-governmental organizations (NGOs), and environmental groups through the consent process. In Denmark, the risks and benefits of wind power has a different history than North America and most other European nations, as a significant portion of early, single turbines were owned by local citizens and multiple turbines by cooperatives and/or neighbouring farmers. In these cases, the need for wind was clear and the benefits seemed to far outweigh any perceived environmental risks. Most of the risk literature to date in Denmark focuses on ecological effects of utility scale offshore wind facilities with a limited focus on social acceptability. It was only later in the 90's as land-based wind turbines became larger in size and more expensive, and local and cooperative ownership declined, that the profile of human risks and uncertainties became more of a concern. Over the last decade, other analysts have examined how financial arrangements may affect the outcomes in planning and social acceptability in the UK (Toke 2003).

Environmental and human effects are closely related to the values of individuals, communities, and institutional objectives (e.g., NGOs and public authorities). (Deitz et al. 2005) The high probability, low consequence aspects of environmental and human effects are linked to scientific uncertainties and it is difficult to determine whether these issues are 'significant' risks, particularly with a lack of empirical data (e.g. low frequency noise).

Beyond environmental and human effects, wind siting may present a list of potential concerns raised by the community that relate to process issues, siting, and planning. Factors such as perceived equity and fairness (Gross, 2007, Tuler et al. 2014), place attachment (Devine-Wright, 2009a, 2009b) and impact on visual amenity (Gipe, 1990; Johansson and Laike, 2007; Thayer and Freeman, 1987; Toke et al., 2008; Wolsink, 2007a, 2007b) all seem to play important roles in local developments (Haggett and Toke 2006). Empirical research on public perceptions of wind farms indicates that complaints usually focus on visual, acoustics, socio-economics, environmental and technical aspects (Devine Wright, 2006 and 2005a). Jones and Eiser 2010) observe in the literature that it is the aesthetics of wind power that primarily drive both positive and negative public opinions on wind turbines and has visual impacts as one of most problematic issues relating to wind farm siting. In general, it is not the wind turbines that people don't like – it is the wind turbines in a certain landscape that creates part of the debate (Wolsink 2000).

"… *while some objectors appear to oppose the project primarily over its specific location, others are more motivated over the very principle of wind farms. Furthermore, while some objectors are most concerned about potential visual impacts, others are motivated by a wider range of reasons, such as local economic concerns. There also appears to be a difference of timescales applied, with some objectors most concerned about long-term impacts, and others more focused on more immediate effects. In terms of process, some objectors appear more sensitive than others on how they are perceived by the wider public and while some objectors accept that both sides of the argument will resort to propaganda, others see this as a tactic used by the developers alone. A further difference amongst the objectors is the way they engage with the broader types of environmental discourse, with some stressing economic rationalism, while others engage in more aesthetic or emotive language*" (Ellis et al., 2007, p. 530).

Now moving into the second generation of wind turbine technology and global businesses, we are still dealing with *risks du jour* – yesterday it was land-based risks to birds, today it is noise pollution. Are these risks significant? Can we reduce them? Are they just linked to uncertainties rather than potential negative impacts? These risks can be both legitimate public concerns and possibly issues that get raised as a method to oppose or delay the project (Ram 2011). Distinguishing between these categories is difficult. Of course, we must continue to invest in research and mitigation strategies for the range of impacts raised, but we may also want to recognize that scientific studies will not resolve all of the possible questions – as many of these issues are qualitative, political, and/or involve risk governance structures (Renn 2008). Moreover, the literature shows that scientific studies do not necessarily address public concerns. Studies of risks and uncertainties are needed, but an assessment of how we build this knowledge base and a clearer definition of the roles of the experts and the developers is needed. Developers prepare EIA documents and associated environmental studies that are directly related to the local siting issues and potential risks. These studies are generally made public (in Denmark) and shared within the wind community but this still raises issues of transparency, independent peer reviews, and the roles of government agencies. Still, however, the public is not convinced. No doubt because the studies do not address their broader concerns but 'only' follow the consent process. Public hearings and comments submitted concerning EIAs do not substitute for understanding the public's concerns. Some scientists advocate for collaborative studies and citizen science to enhance the perception of independence and focus on community priorities (Irwin 1995).

Previous studies (i.e. Devine-Wright, 2006; Woods, 2003) have also demonstrated that different groups interpret aspects of wind power (for example issues relating to intermittency, or to the 'fit' of a wind farm within particular landscapes) in different ways so as to support their own position (i.e. in favour of, or in opposition to, wind power). As such, particular issues are interpreted in different ways to fit with particular arguments, and importantly this means that similar arguments are made by individuals who both support and oppose particular projects (Aitken, 2010).

Also a more robust risk approach would include comparative perspectives, unpack issues that have links to risk perceptions as well as citizen, community, and cultural values. We would argue that we do not know a lot about issues of values and aesthetics – issues that are central to risks perceptions about wind including, visibility, industrialization of the oceans, and sense of place (Kempton 2005, Devine Wright 2009a and 2009b, Haggett 2011).

An added dimension to risk perceptions of wind energy is the complex web of local vs. global impacts related to CO_2 reductions. Does wind make a difference in climate change mitigation? Do individuals believe that wind turbines contribute to sustainability? How are these messages delivered to communities that might be candidates for repowering or new, larger turbines? Are messages related to climate mitigation believable? As municipalities develop climate plans relating to energy portfolios, are different options presented or is wind the only possibility offered? These questions demonstrate the multi-dimensionality of perceived risks and benefits as they relate to wind energy siting decisions.

3.3.2 Risks are not value and emotion-free

Another important area of risk perception is that risk is not emotion free or a neutral subject (See Slovic 2010). Impacts are often emotion filled - people care about risks even when "the numbers" or the science sometimes says they are minor. Other risks (like to community or individuals) enter in. What can you do about it? As some industry partners state: 'Well, negative views of wind turbines are emotional responses, so there is nothing we can we do about it'. The community is either for or against. But we know from the literature that emotions depend upon what the perceptions of risk are and those perceptions have links to cognition - and cognition can be changed with access to knowledge. Indeed it is hard to change emotions about risk perceptions or about process related issues. But steps can be taken to change perception linked to cognition with a greater understanding of the issues of concern. However, emotion connected to the risk is still very difficult if not impossible to change. It might be helpful if developers understood the depth of public concerns raised and whether citizens are willing to accept or tolerate the risks. Some of the literature indicates that you would have to have a discourse about the risks and benefits in order to address the range of perceptions and emotions in order to move forward with an individual or community that might be uninvolved or against the wind project. This can be time intensive, demand early engagement strategies, involve creative decision making tools, and increase the cost of energy (all sensitive areas that delay siting decisions). The critical point is that the wind-based knowledge base is not emotion free, but cognitive understanding could lead to a change in risk perceptions over time.

The spatial scale of wind energy on land (and at sea) and the increasing rate of deployments raised some new issues that changed and continues to change risk perceptions. Lessons from the siting of other energy (and more controversial) facilities would have given the wind community a proactive approach for addressing potential costs and benefits, including how to address risk perceptions and uncertainties within the decision process (Tuler et. al. 2014). Instead, the wind community (developers, government agencies, NGOs, etc.) may have fallen into the trap (again) of the deficit model. Just get the public some facts about wind power and they will be more willing to accept wind! This notion continues to plague the industry and must be confronted head-on as a failed model of communication. In addition to disseminating facts, the decision makers and actors need to find ways to engage the public(s) and individual citizens in an honest dialogue about energy choices and transitions.

At the national and international political levels, people consider that the risks of wind energy are "low" compared to the fossil and nuclear infrastructure. At the global and national level, we need wind to address climate change. At personal and local levels, some see a "NIMBY effect"—which can be translated into letting someone else have the risk**.** As section 3.4.3 below outlines in detail, the NIMBY effect assumes that people are selfish and only want the benefits and not the risks. On the other hand, people do sometimes accept risks, especially if there are also benefits or people view the need for mitigating climate change and reducing energy use. In other words, they see themselves as doing their share. This NIMBY notion also plagues the wind industry and other actors thereby preventing a more sophisticated view of citizen opposition and public concerns that are real and need to be addressed. For example, if noise from turbines is a widespread annoyance, let's face the facts and not only with more sophisticated noise modelling exercises, but with a direct dialogue with some of those affected and design studies that involve the communities and do not simply convey the results of the

study. The ongoing study by the Danish Cancer Society examining wind turbines and cardiovascular disease is an important initiative that could provide an insight into noise impacts. In fact, some municipalities are postponing wind siting decisions until this study is completed. However, is this another example of a quantitative/ expert study that may or may not answer public concerns? Is it another example of focusing on *risk du jour?* That is, is it picking one or more potential risks to delay decisions rather than engaging the publics in a dialogue that examines the underlying cause related to annoyance? There are possible directions in noise research that might forge a different pathway, one that designs and carries out interviews with individuals and communities that are affected to better understand "annoyance and nuisance". The recent Canadian study (Ontario Health 2014) stands out as one that could help shape our next steps on noise related risks.

3.3.3 Public trust

Again numeracy between experts and the public are not perceived in the same way and the public may not trust experts who generate the results even if they are credible science. Do scientists really understand the risk they query? Is this a new venture where we do not have much experience? Do they really care about "little me" on the way to achieving 50% wind energy for our electricity system? We have seen this with the "wind turbine syndrome" phenomenon – each country has prepared highly credible, peer viewed studies dismissing the WTS as highly unlikely and or not credible, but it continues to be raised by communities all over North America, Australia, and the EU. Also each locale may choose their "targets of opportunity" or their issues that generates controversy or opposition, but this does not reveal what is driving their opposition or dislike. Public concerns need to be recognized as important and not dismissed with quantitative studies that demonstrate no risk at all or large uncertainties. This does not seem to quell opposition, but actually could entrench the issues as well as the conflicts (Dietz and Stern 2008).

The local and cultural contexts can also affect risk perception and each location is different (e.g. small rural communities, rich seaside resorts, brown field sites, small fishing communities, etc.). How is the place I love going to be changed? What about visibility? What are the effects on nature? How will our community change? The noise annoys me. This place I chose to move into will never be the same. What about all these trucks and new people in town? Place identity is a central concept of why local citizens do not necessarily want changes to their town even though there are prospects of jobs and economic developments. So the decision process interacts with risk perceptions. For example, do we trust people to really be concerned about us? Who will look after our best interest? Who makes the decision? Do they care what I think?

People have lower risk perceptions for risks they take on voluntarily and don't like risks that are imposed on them (NRC 1996). The scientific literature indicates that it can be more effective if the decision or siting process provides opportunities for input so that the toleration of risks is more voluntary. Benefits can be important in this equation. The literature shows that we accept higher risks where the perceived benefits are higher (NRC 2009). So, what are the benefits of wind turbines and who gets them? I take the risks--do I also get the benefits? And has the process of allocating benefits been fair? How are these things distributed? These questions are interrelated with the Danish national compensation packages (a subject being dealt with by WP2 of Wind2050).

The more risks are imposed (decided by someone else), the more social trust is required. In Denmark, the social trust of government bodies is much higher than other EU and certainly US agencies. However, it might be important to ask whether the reservoir of social trust is declining in Denmark as in other countries. Social trust is intricately related to how the process of making decisions is judged and how the siting strategies for turbines unfold. So, as most developers already know, the techniques of consulting with communities and citizens need to take their concerns seriously, even if the science has proven some of their concerns as "ridiculous" or incorrect.

Although this sounds fairly elementary, and most sophisticated developers do take into account the community concerns at some level, one must be aware that the primary goal of the developer is to site a turbine(s) efficiently and to minimize the costs. This raises legitimate concerns and perceptions of whether the developer can be trusted and can execute promises and benefits, whether stemming from government compensation or developer packages. This process of community engagement that may consider wind turbines may require a more "neutral" actor to develop and communicate scientific literature as well as address perceptions and uncertainties. This is a tall order in any industry rife with challenges.

In the academic literature, much focus is on psychological aspects of decision-making. But some argue that culture is critical: how you perceive risk really depends upon your world view (Raynor and Cantor 2006). So there are entrepreneurs who say the risks are there and people decide if they will have or "tolerate" them. Egalitarians assume the market imposes risk on people who have no say. The cultural theory, however, has not gained traction against the psychometric paradigm on perceptions.

The next section highlights some of the concerns about uncertainties and how that may influence public views.

3.3.4 Uncertainty and the public(s)

The literature typically differentiates two fundamentally different types of uncertainty, classified based on the nature of their occurrence. These are aleatory and epistemic uncertainty. Aleatory is the common uncertainty and is related to statistical relationships where there is a small percentage chance of it occurring, but this constitutes an uncertainty. The epistemological category is related to basic scientific phenomenon that we just do not understand and/or cannot predict (NRC 2009).

In the wind area, there is much written on the uncertainties related to technology and resource assessment approaches. There is less available on the social consequences of risks and uncertainties, e.g. civil liberties and the decision processes. Environmental consequences and potential risks have a larger literature related to habitat fragmentation, bird and bat mortality, and endangered species. However, the level of discussion on uncertainties is still evolving and does not apply a comparative approach to assessing those risks and uncertainties (Ram 2011). In addition, the cumulative effects of turbines on land and at sea are often not well understood on the regional level.

Much scientific information includes some degree of uncertainty about the applicability and validity of the findings. Communicating this uncertainty to the public to enable understanding and informed decision making has been the focus of much research with contradictory findings and suggestions (Tversky and Kahneman, 1974, Morgan and Henrion 1990, de Bruin et al. 2000; Klima et al. 2012; Johnson & Slovic 1995; MacGregor et al. 1994). Issues relating to the trustworthiness of the information as conveying uncertainty can be interpreted as a weakness of the researcher or scientist and thus ignorance of the information (Goodwin 2014). Another issue is the acceptance of information that contains uncertainty. Prediction intervals that are too wide may be rejected based on the view that it is not very informative. For example, a level of risk between 5 and 55% may be discarded as uninformative, even if it accurately conveys the true level of uncertainty (Yaniv & Foster 1995; Goodwin 2014). In addition, uncertain information may be misinterpreted as people may understand a phrase like “the probability of precipitation today is 30%” as that it only rains in 30% of a specific region or 30% of the day (Murphy et al. 1980; Klima et al. 2012).

In contrast, recent research has also shown that including uncertainty in forecasts resulted in better decision making (Ramos et al. 2012) and can lead to more decisive behaviours (Savelli & Joslyn 2013). Thus, the information given needs to match the information needed in the decision-making context to be both accurate and informative (Yaniv & Foster 1995; Goodwin et al. 2010). Useful guidelines from research are still missing on which information and which level of uncertainty to communicate to the general public (Faulkner et al. 2007; Visschers et al. 2009; Klima et al. 2012).

In summary, there are a few points to highlight:

1) If the uncertainties are large or many at a particular location, then the level of trust of the experts or the developers might need to be high in order for people to understand and accept the uncertainties put forward.
2) Social impacts are typically included in the conversation about risks and hazards, if it relates to health and safety or harm and death related risks. Although health and safety is an issue at the community level (e.g. ice throws from blades), these risk categories may not be the major concerns of the community. But the uncertain social categories that might capture what people value, e.g. sense of place and visual effects and local institutions associated with turbine siting are categories not generally discussed. These categories may be an important part of the whether local communities are willing to accept turbines or not.
3) People do not like uncertainties and this may require more public engagement and communication with the communities from different actors in the decision making process, particularly two-way communication.

3.4 Framing social acceptance

The team believes that a general framing of the term 'social acceptance' is needed albeit the term is laden with values and beliefs regarding how to define acceptance. Acceptability is about acceptance or toleration of risks. In tandem, the risks will change over time and likely will be affected by the range and magnitude of benefits offered (as noted above). Some of these issues were also raised in the introductory section to this report where the perception of national climate goals are discussed in relation to the sum of activities at the local community level and arguing that the decisions may influence one another.

Many authors have defined social acceptance and the nuances of how acceptance is defined and by whom, how social acceptance changes over time and how the process of interacting with the stakeholders influences the outcome. Framing the definition would involve exploring the decision making process: the complicated pathway involving many actors, stakeholders, public, decision makers, politicians, etc. Therefore the developer community is only one piece of this puzzle.

We do not explore the decision making process in this report although we believe this needs to be discussed as a project team as a whole to understand all the parts of the process – private actors, public authorities, and local stakeholders. But without this broader framing, you cannot consider the public perspectives adequately. For example, people often don't have an opinion, but if they feel neglected or excluded from the decision process that might have an impact on their life, they can easily change their mind and become more interested in the on-going dialogue. These important principles of public engagement make for a robust decision process.

Moreover, we know from the literature that most citizens are not well-informed about the electricity system or wind energy technologies so their opinions and perceptions are framed by experiences and the 'need to know'. The evidence about what the public(s) know may affect whether they accept, tolerate, or reject wind power and this requires more research that is expected in the second half of this research program. More importantly, the project team is debating the reality that if a community bases their decision on available knowledge of wind and rejects the project, this is considered a success. After all, we know that wind power is not suitable for every site and for every community. With this backdrop, the team selected one notion of social acceptance to begin this research. (Note: for more complex social acceptance, risk analysis, and decision making concepts, see NRC 2009).

According to Wüstenhagen et al. (2007, p. 2684), there are three dimensions of social acceptance: socio-political acceptance, community acceptance and market acceptance (Figure 4). Socio-political acceptance is social acceptance on the most general level. Both policies and technologies can be subject to societal acceptance or its refusal. Community acceptance refers to the specific acceptance of siting decisions and renewable energy projects by local stakeholders, particularly residents and local authorities. This is the place where the local debate unfolds. Market acceptance, or the process of market adoption to an innovation, is a third dimension of social acceptance (Wüstenhagen et al., 2007).

Figure 4 Three dimensions of social acceptance

Factors influencing community acceptance, according to Wüstenhagen et al. (2007, p. 2684) are: distributional justice (how are costs and benefits shared?), procedural justice (is there a fair decision making process giving all relevant stakeholders an opportunity to participate? Does the local community trust the information and the intentions of the investors and actors from outside the community? (Huijts et al. 2007, Tuler et al. 2014).

Some of the important points that are missing from this conception involve the following:

- The process implies that elicitation of siting issues is based purely on local concerns where we have seen national scope issues being brought into siting conflicts. Socio-political acceptance can be shaped by project-specific conflicts, as is happening in the UK with the government shift against wind power (Gordon Walker personal communication).
- The graphic does not clearly demonstrate that a process of communication and engagement between and across the groups takes place early and throughout the decision process.
- We know quite clearly that decision making processes are indeed a complex process that needs further clarification in the wind arena with regard to roles and responsibilities of communicating risks and benefits and other aspects for defining acceptance (NRC 1996). The nuances of these roles and who communicates them is central to the planning process in Demark where the socio-political level is a varied group of local politicians at the municipality level and the local councils in addition to the ministries and the civil service staff supporting the political objectives.
- The market issues are changing quite dramatically across Europe so that consumers are also producers of distributed energy, owners of turbines are also stakeholders.

Likewise, investors can also be consumers. The ongoing notions of market acceptance need to understand better the institutional structures and notions of governance (Renn 2008).

3.4.1 Public Opinion Polls: One tool in the toolbox

Public opinion polls are a common tool utilized by industry associations and political organizations in relation to renewable energy technologies and public views. Learning from the literature, it is important to understand that these polls are only one tool in a very large toolbox of methods to better understand the public views on renewable energy and wind siting in particular. This toolbox may include: semi-structured interviews, focus groups, consensus conferences, deliberative polling, citizen advisory committees, etc. (Dietz and Stern 2008). These techniques seek to establish more constructive and proactive decision-making mechanisms in order to identify a range of “acceptable” solutions (Loring, 2007, McGowan and Sauter 2005) But relying solely on public opinion polls is considered a very narrow approach to this wide field of science.

Since the 1970’s and more often in the last decade, international public opinion polls and surveys generally show a high percentage of people in favour of wind however, a critical discussion of opinion polls is lacking. (Wolsink, 2000, Barry et al., 2008; Bell et al., 2005). There is typically no discussion of important factors such as who commissioned the polls, how and when they were conducted, how the samples were selected, how the questions were delivered or how and by whom the answers were analysed (Aitken, 2010). Opinion polls can only provide a snapshot of public opinion and are unable to reflect the dynamic, changing character of public opinions. Thus, as Devine-Wright (2005b, p. 135) notes, qualitative methods are better suited for ‘investigating’ how turbines are symbolically represented across different social groups, within and across communities’. Another area that is well documented in the literature is that opinions change over time whether it is in relation to a specific site, construction project, or a national decision. For decades, we have known from the non-wind literature that the uncertain and ephemeral nature of ’attitudes’ as expressed in surveys are a poor guide to how people actually act.

Public opinion should not be presented as something static which can be measured once, but rather as highly flexible, transitory and adaptable (Aitken, 2010). Many studies of nuclear power debates have shown repeatedly the changing nature of public opinion based upon information, experiences, and perceptions (Rosa and Dunlap 1994). The recent Fukishima nuclear meltdown, a catastrophic hazard in conjunction with a severe natural hazard (typhoon), changed the perceptions of the Japanese public(s) and turned a majority to oppose an energy source with a long history of community, socio-political, and market acceptance. Scientists have observed ‘a transitory quality’ to local public acceptance of nuclear power plants and noted that public attitudes are not stable but rather adapt and change in relation to events or changing situations. Perhaps there are lessons here for the wind communities and the need for longitudinal studies of opinions and debates.

3.4.2 The U-Shaped Hypothesis

As noted above, public perceptions change over time and this can refer to different stages of the life cycle of a wind project. We summarize some of these studies below, but there is also a note of caution that this notion of acceptance may be changing with recent evidence of longer term opposition once a project is operational.

Damborg and Krohn (1999) contend that local community acceptance of wind farms typically increases once construction is completed and the wind farm is operational. There is some evidence to support this argument (Warren et al., 2005) and it has been suggested that 'the majority of people who live in a community close to a wind farm live quite happily with it' (Ebert, 1999, p. 46). Other surveys examined local attitudes to wind farms in 'affected' areas found that whilst many people were concerned about issues related to the development of a wind farm in their local area, very few people actually experienced problems once it had been completed. These surveys indicate that greater experience of wind power leads to greater acceptance, and consequently that negative opinions or reactions may be taken as reflections of ignorance or uncertainty (e.g. Aitken, 2010; Warren et al., 2005).

On the other hand, some analysts argue that it is not simply that public acceptance increases after construction, but rather that public opinion is 'U-shaped'. This 'U' shape represents the range of public opinion which changes over time in relation to a person's experience with wind farms: 'These attitudes range from very positive (that is when people are not confronted by a wind power scheme in their neighbourhood), to much more critical (when a project is announced), to positive again (some reasonable time after construction)' (Wolsink, 2007b, p. 1197). However, he does not suggest that the return to a positive opinion is inevitable and instead proposes that this will only occur where 'the existing environmental impact is adequately dealt with, in the eyes of the local population.' In addition, the nature of the risks, benefits, and uncertainties may change over time and this has a significant effect on public acceptance and perceptions over time. It is obvious that developer management style and maintenance of the turbines would also influence local community relations over time. The notion of social acceptance at a particular site taking on this U-shaped dynamic needs further exploration and analysis.

3.4.3 The Not-In-My-Backyard (NIMBY) mythology

The NIMBY myth is that people are in favour of something as long as someone else experiences the risks and/or the potential impacts. Thus the general population is for green energy, but just not in my town or in backyard. But this persistent notion of why there is opposition to wind sites exists without clear evidence. Thus groups of people that are not in favour of wind power are often characterized as selfish and irrational.

NIMBY is used to describe opponents of new developments who recognize that a facility is needed but are opposed to its siting within their locality. It can also refer to the protectionist attitudes of and oppositional tactics adopted by community groups facing change and new developments in their community. Some residents may even be supportive of wind power generally to address climate, but not near their homes or residential neighbourhoods.

Of course, there are indeed some people that are for or against wind that are self-serving (e.g. “wind nomads” who change their address to gain shares offered by some developers), but the NIMBY category is clearly an inadequate explanation for community or individual responses to wind siting decisions. The literature has indicated that the use of this acronym is very unhelpful in understanding what is going on in a community. The issues raised are much broader and need much more attention. We would argue that the use of the term NIMBY demonstrates that we really do not understand who are the local publics and the roles that various actors play in the decision process. The NIMBY myth has been misused across other energy technology siting and construction projects, particularly the nuclear industry, where nuclear power plants have created ongoing public debates for the past 40 years.

When it comes to NIMBY in relation to local opposition to wind turbines, various empirical studies show clearly that referring to protests as NIMBY is opaque, inappropriate and unhelpful (Devine-Wright 2009a, Devine-Wright and Howes 2011, Wolsink 2007b). Also other researchers (see Burningham et al. 2006) indicate that NIMBY is oversimplification of complex responses to land use decisions. Its use obfuscates understanding of the contexts, processes and motivations at stake and threatens to exacerbate conflict and misunderstanding between parties involved. The implicit assumption that opponents are ‘wrong’ or self-serving in their views prevents analysts from understanding the true basis of local concerns, including ethical, social, political or personal rationales. Without acknowledging that objectors might have legitimate and valid concerns one can never gain insights into the true nature of the events and people under examination. More important, actors in the decision making process may never understand the dynamics of local acceptance without a deeper view of their concerns and values. Developers need to understand what is happening in the community and listen and talk with people about their concerns before the NIMBY labelling occurs.

Sociological studies (Wynne 1996, Irwin 1995, Petts 1997) have demonstrated that members of the public are able to weigh the usefulness and relevance of scientific information, if they can see the practical gains from doing so, and conversely may choose to ignore information if they do not trust those who are giving it, or if they see not advantage to be gained from understanding it.

According to NIMBY explanations of opposition to wind power developments, individuals or communities ‘*favor wind power as an abstract concept but oppose wind power projects in their area*’ (Warren et al., 2005, p. 857). Some analysts argue that the NIMBY paradigm ‘*misses the multitude of underlying motivations*’ for public opposition to wind power developments (Wolsink 2000, p. 57). Haggett (2010b) explains that opponents tend not to be stupid, selfish or stubbornly ignoring the public good, but they often oppose a wind farm on the basis of detailed knowledge of their area, the development, and the issue more generally.

Ebert (1999, p. 45) contended that supporters ‘*know the environmental and community benefits of wind energy. These people have “equity” in such a project or believe there is a benefit to them and the community from a wind farm which can go beyond financial concerns*’. Supporters are viewed as being aware of the benefits of wind power, and objectors are therefore implicitly cast as ignorant (Aitken, 2010). More balanced descriptions of wind farm opponents and supporters are provided by Barry et al. (2008), Ellis et al. (2007) and Bell et al. (2005). Barry et

al. (2008) conducted a rhetorical analysis of documents written by both supporters and opponents of wind power and confirmed that: *there are not two homogenous and undifferentiated discourses of ''pro'' and ''anti'' facing one another; but a (not unlimited) variety of pro- and a variety of anti-windfarm discourses, linked together in, and under, what may be termed as a ''discursive coalition''*(Barry et al. 2008, p. 92).

Mostly projects are planned first and third party acceptance requested later, according to the *decide-announce-defend model O'Hare et al. 1983)*. This practice was the typical siting strategy for large corporate actors that had not yet learned the essential needs for public engagement early and often. Perhaps the wind community can learn some lessons from the previous decades of siting literature related to these dynamics (Tuler et al. 2014).

Following from this, Haggett (2010b, p. 504) simplifies previous research into five key reasons for support or opposition on onshore wind:

1) The ascribed aesthetic value of the particular landscape where a development is planned may form the basis of concern
2) Protests may also have roots in the social, political, and historical context of any particular location, and the emotional attachment that people have to that place.
3) Renewable energy conflicts can epitomize a disjuncture between the local and the global. While issues of global warming may be far removed from everyday life, fears of local impacts are not.
4) The role of the ownership of a development and relationships that people have with developers.
5) The decision making processes, trust in decision-makers, and opportunities to meaningfully are critical in forming support and opposition to a development.

3.5 Offshore issues: Out of sight, out of mind?

Moving wind turbines offshore, far away from the locals on coast, may seem as a quick and easy way to solve the issues of local acceptance on land, but just because offshore wind farms are out of sight, it is not sure that they are also out of people's mind. While some research (Ladenburg, 2008) suggests that people have less knowledge and interaction with offshore windfarms, others (Haggett 2011) claim that this theory is only valid if they are installed a very long way out to sea, which often is not possible because of the financial or technical problems involved. The effect of moving turbines further offshore in order to reduce the risk of local opposition is therefore not shown in the literature and needs to be studied further.

The acceptability of wind power offshore has a different set of potential risks, stakeholders, and decision making processes. Marine spatial planning involves a different group of people using the sea and the coast. Far from the coast other impact characteristics become dominant, such as impact on marine life (Firestone and Kempton, 2007). Offshore parks, located far away from populated areas, are often assumed to be less problematic alternatives to on-shore wind farms, and even if policy makers, decision takers and developers seem to agree on that, examples on local resistance on offshore parks did occur. According to several sources wind farms off the coast in the UK have not proceeded without opposition or conflicts (O'Keefe and Haggett 2012, Devine-Wright and Howes 2010; Ellis et al. 2007).

The role of the public and key stakeholders groups and users may be just as important to consider in relation to offshore wind as land-based wind projects. The first offshore wind farms in the UK and elsewhere around the world have not been free from opposition. In the UK, wind farms off the coast of England, Wales, Scotland, and Northern Ireland have not proceeded without opposition or conflicts (Toke 2005). These protests have in most cases led to long delays, public inquiries, and ongoing disputes.

Kempton et al (2005) analysed reasons underlying public support for and opposition to an offshore wind development off Cape Cod in the Northeast of the US and found that certain values and beliefs led to opposition. These included beliefs that the project was uneconomic, that it would not make a significant contribution to energy supply and would have negative environmental impacts. Analysis of concern about impact on 'the view' suggested that this concern is not only visual or aesthetic but 'is more importantly a gloss for the value that the ocean is special and humans should not intrude on it' (2005:146).

The local social and historical context is crucial; each location is different, and people will feel differently about it and any plans for change (Haggett, 2010a). Place attachment may differ from town to town, which is also well illustrated with the coastal towns Landudno and Colwyn Bay in North Wales. In Landudno, a seaside town with tourist industry, residents described the offshore wind farm as a significant threat to the town, and being "monstrously damaging". On the other side, approximately 9 kilometres away, residents of Colwyn Bay (a town described as "run down" and "dying" by its residents) had less negative opinion of the offshore wind farm and saw it as a possibility for "boosting employment and prosperity locally" (Devine-Wright and Howes 2010).

As the near shore offshore wind projects in Denmark proceed through the consent process, an analysis and strategy of when and how to involve the coastal communities would be important early steps for these priority national plans. The literature indicates that offshore projects may present public involvement challenges not anticipated with the earlier offshore projects sited farther from shore.

3.6 Summary of the literature study

The literature review process, in itself, has given rise to many important questions being discussed within WP3. The very nature of the social acceptance topic means that it covers a very wide range of subjects, from engineering risks to public perceptions to consent processes; subjects the wind energy sector is very aware of but do not tend to discuss in a multidisciplinary context. . The literature review attempts to highlight scientific subjects that might resonate with the developer community and are related to the range of public concerns over wind energy siting in Denmark and beyond.

Some of the important findings from the literature are:

1) "The publics" are many and so are the sites (or places); addressing the range of localities, citizen concerns, and associated risk perceptions is challenging. Furthermore, attitudes and perceptions are changing over time and need to be tracked.

2) Developer and other stakeholder statements about the NIMBY myth simply reinforce the view that they too often see the public as irrational and selfish when they oppose wind projects. The term neither explains these concerns nor assists in addressing how to deal with communities and siting challenges. Perhaps we are missing opportunities to engage and better understand when publics have legitimate concerns.

3) The public needs to feel and believe they are respected and that their concerns are addressed seriously in a two-way dialogue. Some evidence suggests that communication at the local level is rarely a two-way process.

4) The public(s) can be rational as well as emotional about many issues including wind energy. Indeed it is hard to change emotions about risk perceptions or about process related issues. But steps can be taken with a better understanding of public concerns to change public perceptions linked to cognition. However, emotion connected to the risk is still very difficult if not impossible to change

5) Where do the publics get information? How reliable is it? For the publics, the assessment must be done differently from the experts. Qualitative factors are important to define and communicate. Public perceptions are important to understand in terms of how to evaluate technical information and risk assessments. Various methods are in this tool box. Public opinion offers very limited insights.

6) Uncertainties matter and need to be communicated by the developer and other actors to the community in the decision process. They are more complex to address when public trust is in decline. The perception of, and trust in, experts and/or decision makers are central.

7) Offshore wind projects raise a different set of issues related to siting, consent processes, developers' roles, as well as the range of public concerns and perceptions. The near shore projects moving forward in Denmark may present interesting and different dynamics from the land-based wind siting that need further exploration in regard to social acceptance.

4. Conclusions and the way forward

The work carried out within WP3 to produce this deliverable has thrown up many questions, theories and hypotheses. The next task is to home in on those that we feel are important because further investigation has the potential to add value to the development process. This conclusion section sets out some ideas that can be taken up in the next stage of the work of WP3.

The aim of where we want the investigations to lead to is also very important: somehow we need to come up with better science than collecting a bunch of good ideas from the 'successful' developers and issuing it as a hand book. How do we do this?

The value to the team itself of the process that WP3 has been though to date should also be recognised. The work package contains professionals from a wide variety of backgrounds some including wind energy, some not. We have come some way towards co-ordinating a multi-disciplinary team, arriving at a common understanding of the development process and raising awareness of the issues and complexity of public engagement. This process emphasises the importance of WP3 making contact, and finding fruitful co-operation areas, with the other work packages in Wind 2050, most notably WP2.

4.1 Further research and discussion points

There have been many areas identified during the research so far where the latest science suggests that the wind farm development process could be enhanced but, as yet, it is not clear what can be applied in practice, by whom and when. What are our fundamental research questions that we're going to try to address at the next stage to focus our efforts? Here are some suggestions:

- Are some of our notions of how developers see the views and perceptions of the public(s) and stakeholders correct? How do developers interact with potential communities and sites—outside of the consent process? How do they view the publics? How do they interpret risk perceptions? Clarify with the design of the case studies upcoming. Interviews needed.
- What is the relationship between level of opposition and the size of a wind turbine project?

  Is the level of opposition increasing with the size of wind turbine project? (Note that "size" can be measured in different ways: turbine size, wind farm capacity, project investment, etc. A community that is new to wind energy may perceive 'size' differently to one that is already exposed to wind turbines.)
- Offshore vs land-based: do the different technologies affect perceptions? Does moving turbines offshore really address the public's opposition?
- How do different business models, patterns of ownership, size of the company doing the development effect affect public perceptions?

- Yes or no to a wind turbine project? When does a developer raise white flag and give up? When is it enough pushing up against the river of opposition? Which development practices bring local acceptance and why? Case studies of realized and cancelled wind turbine projects would be useful.
- NIMBY –. We want to dig deeper into the discredited concept of NIMBY in wind power projects to clarify the underlying issues of public opposition and concerns. As previous studies indicate, it is possible that some local reactions labelled as NIMBY are misunderstood by developers and that there might be other approaches to dealing with initial views of local opposition. In addition, it is certain that developers and their behaviour towards the planning process influence local residents too, which means that they also play an important role in local acceptance. WP3 intends to explore these dynamics further with case studies.
- How can public perception be influenced by the developers communicating information? What would suitable approaches to increasing local acceptance look like? What role does communication media (and the media in general) have in public acceptance?
- Is Danish trust in wind power development changing as in many other countries? Does is differ offshore from onshore? How is this effecting the decision making process?
- Do we understand the range of risks and how to mitigate them in wind energy? How shall we assess some of the neglected risks, such as annoyance and noise? How many people are affected, what are the actual effects, etc.? Need study design involving interviews. Match scientists with community risks and decide what is important to study---do not only use experts as the source for deciding what is important. Useful risk assessment topics come from the public and not just scientists.
- What means can be used to involve people and how might affected communities be effectively acknowledged, identified and engaged?
- Can we develop the idea of “touch points”, that is, a timeline of the development process where the public comes into contact with the process? Take Figure 3 and create three tracks:
  - The developer
  - The public
  - The public authorities

  This could show “The wind farm development experience” from the public’s point of view to help WP3 to understand where the developer can have an impact. This could also show an iterative element in the planning process.

In addition, much anecdotal evidence suggests that when a development goes wrong then it is the developer who is to blame. Is this really the case? Here are some theories that need to be tested and investigated:

- What are the developers and wind energy sector in general doing wrong?
  - Are they trying to address the wrong question?
  - How has the problem been misunderstood?
  - Why are people not convinced by facts, arguments and enthusiasm?

- The government has set targets; opinion polls show that people are in favour of green, sustainable, energy…..why don't they want turbines?
- Is the industry seen as untrustworthy? What's wrong with the image?
- What language should be used if, for example, using "public acceptance" gives an image of top-down, imposing and put-up-with-it process?

- It is not all the developer's fault! What suggestions are there for the improvement of:
  - The regulatory planning consent process
  - Relationships between the government – municipality – public
  - Is the vindmøllerejserhold the 'only' contact between central government and the municipality (and a bit with the public)?
- Is it really all about the business model?
  - Is the obligatory offering of 20% share ownership to locals not the answer to everything?
  - Should the business just go back to the co-operative model from DK in the 1980s? Grass roots and vindmøllelauge?
  - What's going on in other countries? For instance, community engagement is a fundamental principle in the development in South Africa. What models are being used?
  - Should developers be offering more to the local community over and above the "VE lov"? More school facilities, sports grounds, etc. etc. Can they 'take care' of the community more (e.g. Danfoss in DK, Cadbury's in UK)?
  - How is it best to balance the need for big companies (they're they only ones who have sufficient financial leverage to be able to put up large numbers of modern, expensive, turbines) who take the profit with the needs and desires of the local public who have to 'put up' with the turbines?

4.2 Case studies

The work plan for Wind 2050 and, indeed, WP3 envisages that the research will be carried out with the help of studying appropriate specific wind farm cases. What are the important attributes we would like the case studies to have and what do we hope they will tell/inform us? Here are some suggestions:

Projects in different phases:

a) In project preparation phase: how aware are the public of the project?
b) During planning consent process: what approach(es) are being used?
c) In operation: is there a long-lasting effect on public acceptance?

Projects with different outcomes:

a) Project implemented smoothly
b) Project implemented but required significant design changes / concessions to gain consent (as a result of public opposition)
c) Project stopped /withdrawn / put on hold, due to opposition

Projects by different manner of developers:

a) Large international developer with extensive resources (e.g. Vattenfall)
b) Medium Danish developer with some international experience (e.g. EuroWind)

c) Small local Danish developer with some local stake holding themselves (e.g. EnergiFyn)

Projects in different municipalities:

a) “Pro-wind” communities
b) Indifferent communities
c) “Anti-wind” communities

A word of caution: is it even realistic to set out trying to cover all these aspects with the case studies? Co-ordination with other work packages is essential if we are to avoid duplication of work on common case studies. Material developed from WP1 on the identification of activity on pro/con websites could help to identify practices that should be identified.

4.3 WP3 and contact with developers

We will want to have contact with developers and this can be done in many ways:

- direct discussions with those that are in the project (Vattenfall, EuroWind, EDF-EN)
- chosen case studies and interviews
- workshops and/or seminars that invite their participation

Which should we consider and what do we hope to get out of them?

4.4 The way forward

The next section of work in WP3 needs to build on the results of this deliverable and, specifically, address the following:

1) Agree on where we are heading – a handbook, a travelling work shop, a report?
2) How do we best work with WP2?
3) Which case studies should we choose and what are we going to do with them?
4) How do we test our understanding / notions that have formed so far?
5) Decide on the relevant research questions and how we are going to tackle them.
6) What form will our contact with the developers take and why?

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Appendix A Purpose and process

One of the purposes of the work leading to the first deliverable was to arrive at a consensus for just what the topic of “local acceptance seen from the developer’s viewpoint” contains and to have a common understanding across the multi-disciplinary team in WP3. It is, therefore, of value to document this process.

From the outset, the literature review of the subject and the documentation of current developer practices were carried out in parallel but with work package meetings to try to ensure that they stayed relevant to each other and converged to produce conclusions that would be useful for the further work.

Meetings were held as follows, and it quickly became apparent that there was great value to be gained from having regular reviews by Jim Gannon (input on developer practices) and Geraint Ellis (social science input), who joined in remotely by Adobe Connect when they could not participate in person.

- 10th April 2014
- 7th October 2014
- 6th November 2014

Furthermore, there were whole-project meetings in between these that served to update WP3 members.

Literature review process

As a point of departure, the literature study working group organized a workshop in July 2014. The workshop was arranged as a literature review session for the themes of project development and local acceptance of wind power. The review session had six academic participants with insights into wind power, project development, project management, sustainability and risk management. During the session, the project group discussed relevant issues and probable themes that might be of interest for the project development and local acceptance of wind power subjects. Each of the six participants presented his/her ideas, after which they were arranged into some general themes and subcategories. The project group then identified four main themes and a number of subtopics that might be of importance. The following table introduces the four main themes from the workshop session and their subtopics. All four themes and their subtopics were used as a framework for the literature review.

Social acceptance	Stakeholders and siting strategies	Decision making, institutions and governance	Risk communication
• Public perceptions • Community effects & economic development • Social and mass media • Social trust • Risk communication strategies	• Power structure of the system & local institutions • Effective siting recommendations • Siting and stigma • Risk perception (longitudinal and monitoring) • Cultural theories of risk • Social amplification of risk	• Decision theory • Frameworks for project development practices • Institutions, regulation and its limits - role of authorities • Costs, subsidies, compensation, equity • Ecological risks & monitoring; Ecological benefits • Global risk governance	• Persuasion vs. enlightenment • 1-way , 2-way dialogue, multi-flows • Conflicting information and perspectives (includes controversies) • Strategies for information display • Focus groups and their limits • Defining risks and uncertainties

Due to the project limitations and the scope of WP3, not all topics could be described and discussed in this document. Although it is apparent that there are many themes and topics which can be related to local acceptance of wind power, this document examines only two topics that seemed to have an important role for local acceptance of wind power. The first theme is the public perception of the risk associated with wind power, and the second theme is NIMBY (Not-In-My-Backyard) concept.

After the literature review session and the identification of main themes and subtopics, a deeper study of relevant literature was conducted. The literature study was based on academic papers addressing the topic of “local acceptance of wind power” and found from various sources. The review mainly focuses on highly quoted journal papers (according to Google), that are within the scope of the Wind2050 project. However, the credibility of sources can in some situations be discussed: while some sources favour certain theories or argue for their cause, it is also possible to find literature that argues exactly the opposite. This work did not investigate which theories or hypotheses are right or wrong, but deals with their relevance in relation to previously defined topics (public perception and NIMBY).

Developer practices

The section on developer practices was written mainly out of the knowledge gained from working with a few wind farm developers over many years. It started out as a step-by-step description of the main phases that pretty much all wind farm projects go through but it was clear that points of contact with the public and planning authorities needed to be highlighted in order to identify areas for focussing on. Furthermore, it was necessary to expand these points of contact so as to introduce some of the methods that developers use to engage the public.

The challenge with this is that there are as many different approaches as there are development firms and it would not serve any purpose to describe them all (even if this were possible). It was,

therefore, chosen to try to describe a lowest-common denominator approach to find some kind of a basis from which to start the further work.

As a means of both a) raising awareness of the project, and b) getting a feel of the topics considered to be acute, a seminar was attended on local acceptance organised by the Wind Turbine Owners' Association (Danmarks Vindmølleforening). Furthermore, the work package leader, Niels-Erik Clausen, presented the project and WP3. From this meeting, the following points were noted:

- The developer community has many variations in size and approach
- Interaction with the public and the opposition met by developers is a very emotive topic
- There is a question as to whether the four instruments of the VE-loven are being used as intended and there is a pressure for them to be reformed.
- In the present situation, it is a challenge to see the general public as a resource that can be used positively in a wind energy project.

DTU Wind Energy is a department of the Technical University of Denmark with a unique integration of research, education, innovation and public/private sector consulting in the field of wind energy. Our activities develop new opportunities and technology for the global and Danish exploitation of wind energy. Research focuses on key technical-scientific fields, which are central for the development, innovation and use of wind energy and provides the basis for advanced education at the education.

We have more than 240 staff members of which approximately 60 are PhD students. Research is conducted within nine research programmes organized into three main topics: Wind energy systems, Wind turbine technology and Basics for wind energy.

Technical University of Denmark
Department of Wind Energy
Frederiksborgvej 399
Building 118
4000 Roskilde
Denmark
Phone 46 77 50 85

info@vindenergi.dtu.dk
www.vindenergi.dtu.dk