Participatory Mapping and Community-Informed Spatial Planning of Renewable Energy Projects

by

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ABSTRACT

PARTICIPATORY MAPPING AND COMMUNITY-INFORMED SPATIAL PLANNING OF RENEWABLE ENERGY PROJECTS

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Displacing fossil fuels with renewable energy (RE) resources is essential to mitigate climate change. The implementation of RE systems brings stark and potentially divisive changes, especially for communities located near such development. One approach for managing these changes is through proactive and inclusive spatial planning techniques that are implemented early in the planning stages of RE projects. This research uses map-elicited interviewing (MEI), a form of participatory mapping, through which to identify and analyze community sentiment to RE projects, and to illustrate how those sentiments are reflected spatially, in terms of what regions and kinds of landscapes community members might find acceptable or not for new RE development. The research aims to better understand the relationship between sentiment and landscape values. A case study was undertaken for onshore wind energy in the Annapolis Valley region of Nova Scotia, Canada. This scenic and economically diverse region presents unique opportunities to study the extent to which landscape values underpin community sentiment toward wind energy.
DEDICATION

For my best girl, Ann,

who may not have been here for the journey,

but whose presence will never fade.
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First and foremost, I would like to extend my deepest gratitude to Dr. Kirby Calvert for his help in developing this research and for guiding me through this journey of graduate education. The journey itself would not have been as successful or enjoyable as it was without his insight, patience, and good-natured attitude; I am forever grateful for having him as my advisor and mentor. A special thank you to Dr. Jennifer Silver, my committee member, for her attention to detail and extensive knowledge of methodology, which helped greatly in shaping my final work. A sincere thank you to Dr. Karen Landman for her important and practical planning perspective in her role as my Examiner. Thank you to Dr. Wanhong Yang for his early role in assessing and shaping the context of my research, and for providing myself and my cohort with a great start to our graduate studies in one of our first courses. Thank you to all faculty, staff, and students (both graduate and undergraduate) in the Department of Geography, Environment and Geomatics who have made my Master’s experience one of both profound learning and good fun.

Thank you to my participants for sharing their experiences and opinions so candidly, and for being interested in speaking with me in the first place; the Annapolis Valley region of Nova Scotia will always feel like a home away from home because of their welcoming nature. Last but not least, thank you to my parents, grandparents, love of my life, and friends who kept me motivated and helped me cross the defense finish line this year.

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List of Symbols, Abbreviations or Nomenclature

- RE – renewable energy
- MEI – map-elicited interview(s)
- GIS – Geographic Information System(s)
- MCE – multi-criteria evaluation, MCDA – multi-criteria decision analysis (interchangeable)
- VESPA – Visual, Environmental, Socioeconomic, Procedural Aspects (organizational framework for coding interview responses)
- PPGIS – Public Participatory Geographic Information Systems; also referred to as participatory GIS or participatory mapping
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1 Chapter 1: Introduction

1.1 Research Context

The most recent report on climate change from the Intergovernmental Panel on Climate Change (IPCC) states with a high degree of certainty that an energy transition away from fossil fuels and toward widespread renewable energy (RE) systems is essential to mitigate climate change (IPCC, 2018). The mix of renewables in the global energy system is projected to be 25% by 2030 and 70% by 2050. However, even under these scenarios, the average global temperature is still projected to increase more than 1.5°C (IPCC, 2018). As a result, negative environmental, social and economic impacts will be catalyzed and/or intensified. Projections like these are important and offer the broadest motivation for this thesis: an energy transition toward renewables must be implemented efficiently and fairly if we are to mitigate the most devastating effects of climate change before it is too late.

However, global trends and local RE plans can be at odds with each other – a phenomenon sometimes referred to as a ‘green-on-green’ problem. Although RE technologies contribute to climate change mitigation, they can also introduce local environmental impacts, such as the alteration of landscape aesthetics and significant changes to or losses of natural ecosystems. In addition, their implementation may cause lasting socioeconomic changes to an area, such as a shift in resource base and therefore regional employment, or effects on a tourist industry that is based on a ‘natural’ landscape. These trade-offs are sometimes accepted. More often, however, RE development faces opposition from people within local communities for a variety of reasons, even if the same people or community are supportive of RE generally (Bell et
The dichotomy between general acceptance and local-level concern is referred to as the ‘social gap’ in RE development (Bell et al., 2013). Resolving this problem is important to the development of inclusive and sustainable RE policies.

One solution is through careful and inclusive spatial planning: i.e., guiding RE development toward ‘low impact’ areas (Ruggiero, Onkila, & Kuittinen, 2014; Wüstenhagen, Wolsink, & Bürer, 2007). Spatial planning is defined by Albrechts (2006) as “a transformative and integrative, (preferably) public sector-led sociospatial process through which a vision, coherent actions, and means for implementation are produced that shape and frame what a place is and what it might become” (pp. 1152). The significance of an explicit ‘spatial’ aspect of planning for RE development is threefold. First, because RE systems drive profound impact on the landscapes and land-use systems in which they are developed. Second, to ensure environmental and other landscape-specific impacts are considered in the RE development process. Indeed, there has been a tendency for proponents and developers of RE to focus on commercial or economic interests and on ‘global climate change’ while ignoring local-level impacts and other landscape-specific factors (ECTP-CEU & TCPA, 2016). Third, because energy planning has typically been aspatial in nature, emphasizing targets (e.g., 20% RE by 2020) without connecting those targets to what a particular landscape is able to actually provide without compromising existing land-based economies and ecosystem services. Once based primarily on technical criteria and guided by ‘expert’ analysis (Voivontas et al., 1998; Calvert & Mabee 2015), spatial planning procedures increasingly incorporate community-level consultations through which the underlying factors in public responses to RE are better
understood in combination with technical criteria that must be satisfied in order to facilitate RE development (Ruggiero et al., 2014; Wüstenhagen et al., 2007). The methodology and the results described in this thesis are meant to contribute an approach to, and understanding of, the RE spatial planning process.

1.2 Research Aim and Objectives

The purpose of this thesis is to advance understanding of the factors that shape public sentiment toward RE development, and to develop practical methods and insights for incorporating community voices into spatial planning processes. More specifically, the aim is to address the following question: how do landscape values influence local sentiment toward RE development, and how can these values be incorporated into spatial planning processes? The aim and research question have been addressed through a methodology centered on participatory mapping and map-elicited interviews (MEI). The research objectives are as follows:

1) Identify individuals who represent key stakeholder groups in the study region to participate in the participatory mapping and spatial planning process.

2) Create maps with each individual participant that distinguishes ‘acceptable’, ‘conditional’, and ‘unacceptable’ locations for RE development, and compile these maps into a map layer that can be used to indicate more and less opposed locations for RE development across a region.

3) Identify dominant themes, and any patterns within and/or between aggregated stakeholder groups within those themes, relating to sentiment toward RE development with emphasis on landscape values.
The purpose of including a mapping exercise in the study of sentiment toward RE is twofold. First, interview participants are able to communicate sentiment in the context of real potential local impacts and in this way differs from conventional polling techniques. Second, participants get a sense of tangible and practical contributions to the research process while the information gathered from this exercise can be easily translated into practical map outputs that may be of interest to regional or municipal planners. This mapping exercise may also be considered an exercise in Public Participatory GIS (PPGIS), also referred to as ‘participatory mapping’.

The purpose of identifying dominant landscape value themes through interview data is also twofold. First, these landscape values provide context for the information gathered through the mapping activity and, if used in a real-world context, would allow decision-makers to adapt their RE planning more specifically and effectively to the sentiments expressed by the community. Second, aggregating stakeholder groups and testing for any similarities or differences allows users of this process to understand sentiments in new ways and plan accordingly. For example, if stakeholder groups are aggregated based on ‘productive’ (i.e., seeing the landscape as a resource for human use for profit, energy, etc.) versus ‘consumptive’ (i.e., seeing the landscape as a resource indicative of nature that should be consumed in a temporary and non-invasive way, such as hiking briefly through a forest) groups, researchers could use results to determine if these seemingly opposite points of view hold true when participants are confronted with the challenge of siting RE development, which has characteristics of both environmentally-friendly values and economic interest.

Figure 1 below depicts the objectives and their outputs in relation to the MEI process.
The objectives of this thesis and the methods used to satisfy them may be taken up in the spatial planning of any RE technology in any place. However, the results will always be strongly influenced by the unique physical and social landscapes of a place. Due to the importance of context and location, it was necessary to choose a specific place and technology for this research. For the purpose of this thesis, a case study was conducted in the Annapolis Valley region of Nova Scotia, Canada.

A case study is a methodology defined by Baxter (2016) as “the study of a single instance or a small number of instances of a phenomenon in order to explore in-depth nuances of the
phemonon and the contextual influences on and explanations of that phenomenon” (pp. 131). Additionally, case studies allow for researchers to show why a theoretical concept or explanation may not be inherent in the context of a case (Baxter, 2016). The entirety of this thesis is not a case study in itself because the main contributions and focus of the work are about the concepts of participatory mapping and its use for community inclusion in RE spatial planning, how the MEI method can be used to understand sentiments toward RE development in-place, and how these sentiments are rooted in people’s landscape values. However, it is necessary to include a case study component in this work due to the highly spatial nature of the study and because one’s sentiment on RE development based on landscape values must have spatial parameters in order to be realistic. Therefore, the case study in this instance allows us to explore the nuances in sentiment toward RE development specifically in the Annapolis Valley region, using the methodology of MEIs, which can be replicated in any location and for any RE technology.

1.2.1 Case Study: Onshore Wind Turbines in the Annapolis Valley Region of Nova Scotia

The case study for this research is onshore wind turbines in the Annapolis Valley region of Nova Scotia, Canada (see Figure 2). I selected this region based on two primary criteria. First, the region boasts a diverse landscape in which multiple economic, social, and environmental activities take place. The region is mostly rural in character with some small towns dotted along the highway and along the shore of the Bay of Fundy; there are no towns with a population higher than 7,000 residents (Valley Tourism, 2014). Hence, there are many areas that feature little to no human development at all. The Annapolis Valley features extensive farmland, particularly used for soft fruits and wineries, many areas for outdoor recreation, such as Blomidon Provincial Park, the Grand Pré UNESCO World Heritage Site, many small fishing
communities along the Bay of Fundy, the larger town of Wolfville which hosts Acadia University, large forestry operations on the South Mountain, and many small and medium-sized towns along the 101 highway, which runs through the heart of the Valley (Valley Tourism, 2014). Second, the landscapes of the Annapolis Valley do not currently host any wind turbines but have technical potential to host them, as illustrated by various bids for commercial-scale farms in the County (Municipality of Annapolis County, 2012). It is pertinent to conduct this sort of research before such bids are realized in order to be able to inform spatial planning practices. The strong connections to land from a residential and tourist perspective, and from both a recreational and utilitarian perspective, all contribute to the underlying reasoning as to why this area is an informative case study for onshore wind turbine development: there is definite potential for such technology, but would drastic changes in the Annapolis Valley’s landscape due to the addition of onshore wind turbines help, hinder, or make no difference to residents?
1.2.2 A Note on Indigenous Perspectives in the Annapolis Valley Region

There are seven (7) official First Nation Reserves within the study area which are inhabited by three different Indigenous communities: Bear River First Nation, Annapolis Valley First Nation, and Glooscap First Nation (Government of Canada, 2014; see Figure 3). All Nations are Mi’kmaq. Land claims in Nova Scotia are disputed: in the eyes of the Mi’kmaq, all land and waters that constitute ‘Nova Scotia’ were never ceded by First Nation peoples through
treaty or voluntary cession (Office of Aboriginal Affairs, 2018a). This is confirmed through ‘Peace and Friendship Treaties’ signed prior to 1779 in Atlantic Canada and Quebec, but are interpreted by the Canadian government as meaning that the included Indigenous communities have treaty rights to ‘hunt, fish and gather towards earning a moderate livelihood’ (INAC, 2015). As a way to work toward agreement between Mi’kmaq Nations and the Provincial and Federal government, negotiations have begun under a so-called ‘Made-in-Nova-Scotia Process’ (Office of Aboriginal Affairs, 2018b). This process is a forum for all parties to resolve issues related to treaty rights under the Peace and Friendship Treaties, Aboriginal rights and titles, and Mi’kmaq governance (Office of Aboriginal Affairs, 2018b). To date, preliminary discussions have been held and a basic Framework Agreement, outlining the negotiation process, was signed on February 23, 2007 (Office of Aboriginal Affairs, 2018b). The Framework Agreement addresses issues that are pertinent to RE, including land and water, natural resources both renewable and non-renewable, and environmental assessment and protection. At its current stage, the parties are examining the issues outlined in the framework and are working on a ‘Memorandum of Understanding’ to articulate agreements that have been made (Office of Aboriginal Affairs, 2018b).

With this context in mind, any spatial planning process for RE development should be considered provisional or incomplete until Indigenous land claims are resolved. The process developed in this thesis is one possible pathway to incorporate Indigenous worldviews into the spatial planning process and through which Indigenous communities might make decisions about RE development on their sovereign lands. However, due to time and scoping constraints for this study, it was not possible to include this consultation. The particular legal and ethical position of
Indigenous peoples deserves careful and thoughtful consideration in planning and management, which I was unable to provide at this time and in the context of this study; it is my sincere hope that future iterations of MEI can include such considerations. Refer to the map in Figure 3 below to show the locations of First Nation communities in the Annapolis Valley.

Figure 3 A map of First Nation Reserves in the Annapolis Valley Region.

1.3 Thesis Structure

The research is reported in two substantive chapters which cover research objectives 2 and 3 respectively. Chapter 2 describes the participatory mapping technique that is used in order
to develop a process through which to incorporate community voices into the spatial planning process for RE development. The technique involves user-generated maps that indicate areas in the study region considered to be ‘acceptable’, ‘unacceptable’, or ‘conditional’ by a research participant. These individual maps are aggregated and compiled for the purpose of generating a final map of ‘social acceptability’ for wind turbine development. Following analysis of these maps, the chapter makes recommendations for how this process can be used by municipal planners and RE industry representatives as they work toward inclusive RE spatial planning processes. Chapter 3 describes the MEI process and the analytical framework with which public sentiment toward wind energy in the region is analyzed. Here, the work builds on the mapping process by analyzing local perspectives on potential wind energy development in-place, thereby adding important social context to the maps developed in Chapter 2. Chapter 4 concludes the thesis and summarizes the practical and theoretical contributions of the work. Approval to conduct all research was granted by the Research Ethics Board of the University of Guelph in August of 2017, prior to any interviews taking place.
Chapter 2: A Method for Inclusive Spatial Planning for Renewable Energy Through Participatory Mapping

2.1 Introduction

The implementation of RE projects is considered to be the most direct and effective way to mitigate human-induced climate change (IPCC, 2014). Through policies that have increased the development of RE resources while simultaneously reducing fossil fuel usage, the global capacity of RE electricity generation has doubled since 2008 to just under 2.2 million megawatts (MW) (IRENA, 2018). Canada has seen its share rise by 20% to 99,000 MW including large hydro (IRENA, 2018)

As market and policy changes facilitate more RE development, local landscapes and land-use systems are changing. Agricultural land will be utilized for solar farms. Regions that attract tourists for their scenic vistas are now hosting wind turbines. New biomass-to-energy production facilities are appearing in small towns. Some of these changes are supported by local communities, while others are opposed and divisive (Bell et al., 2013; Cleland et al., 2016). Factors that influence sentiment toward RE development relate to social and cultural sensibilities toward, and perceptions of, environmental impacts, aesthetic value, potential impacts on economic livelihood, or other factors based on location and context (Cleland et al., 2016). These values will differ between individuals; for example, one person may be concerned with the impact of a wind turbine on bird migratory patterns, while another person is not concerned with birds but is worried about the health of the local economy (Solecka, 2018; Zube, 1987). One key distinction that has been noted is between individuals who tend to see landscapes as productive
(e.g., farmers) and those who see landscapes as something to be consumed (e.g., cottagers or recreationalists) (Solecka, 2018; Zube, 1987). There is some debate as to how much influence these different landscape values hold in terms of shaping preferences related to the spatial planning of RE development. Some studies have found more correlation than others (Brown & Raymond, 2007; Wolsink, 2018). What has been well established in literature, however, is that opposition to new RE projects is strongest when community members are not incorporated into the planning process (Lienhoop, 2018; Petrova, 2016; Walker & Baxter, 2017; Wolsink, 2007). This opposition can delay and, in some cases, deny projects entirely. In turn, this slows the pace at which the transition toward renewable, low-carbon energy systems can occur and constrains climate change mitigation at a broad scale. Research suggests that collaborative and inclusive planning processes may be more likely to lead to RE placement and development that is supported by the community (Petrova, 2016; Walker & Baxter, 2017; Wolsink, 2007).

This study is motivated in part by the need to increase the capacity of local governments and local planners to develop and implement collaborative and inclusive RE spatial planning processes through new tools and techniques. At the same time, there is clear need to develop these tools and techniques in ways that facilitate dialogue across communities and stakeholder groups (Chilvers & Longhurst, 2016; Jami & Walsh, 2017; Rand & Hoen, 2017). This chapter contributes to these efforts by illustrating the design and execution of a MEI methodology as a means of gathering and spatially representing public sentiment toward wind energy development. The goal of this exercise is to engage stakeholders in an interactive way that creates a GIS output that is easily integrated into existing RE spatial planning processes.
The chapter consists of three main parts. First, it situates MEI within the context of RE potential and planning. Second, it describes the methodology developed and employed through this research. Finally, it presents the results of the mapping process, first for the entire sample of participants, and then based on a segmentation of the sample across groups that arguably hold productive versus consumptive views toward their local landscape. Note that this methodology is designed to be used for any RE technology in any location, but the case study chosen for this research is onshore wind in the Annapolis Valley region of Nova Scotia.

2.2 Literature Review: The use of GIS to Support Renewable Energy Spatial Planning

RE spatial planning processes are often rooted in a multi-criteria analysis. GIS-based multi-criteria evaluation (MCE), also known as GIS-based multi-criteria decision analysis (GIS-MCDA), is defined as “a process that transforms and combines geographical data (map criteria) and value judgments (decision-makers’ preferences and uncertainties) to obtain appropriate and useful information for decision-making” (Boroshaki & Malczewski, 2010, p. 302). Typically, GIS-based MCE begin with a goal or set of goals that the user would like to achieve, along with evaluation criteria or attributes which form the basis of decision, for example, optimizing for profit or balancing profit maximization with minimizing local environmental impacts. GIS-based MCE are particularly useful for problems and decisions that have multiple objectives with spatial implications (Malczewski, 2006).
2.2.1 GIS-Based MCE as it Relates to Renewable Energy Spatial Planning

A plethora of factors influence the spatial planning of RE projects and should be considered in broader spatial planning efforts. The way in which these factors are accounted for and organized within past and current literature varies, but there is a general trend toward distinguishing economically feasible energy resources/potential from a theoretical base that is bound by various factors and constraints.

2.2.1.1 Mapping Theoretical Potential

Theoretical potential represents the maximum amount of energy that may be extracted in an area at any given location or time, and before any other factors are considered (Voivontas et al., 1998). Measurements for this potential may be taken in situ or estimated using modeling techniques. Any area in the world could have some level of theoretical energy potential, so it is important to first assess the maximum amount of energy present in order to determine the suitability of a location for a RE project.

Examples of theoretical potential factors for onshore wind turbines include: wind speed, power density, altitude, or slope (Angelis-Dimakis et al., 2011; Lopez, Roberts, Heimiller, Blair, & Pollo, 2012; Voivontas et al., 1998). These factors differ by technology, but their commonality is that all theoretical potential factors define the most amount of energy that could possibly be harnessed. These stocks and flows of energy alone are not enough to make any RE project possible for implementation because, in reality, there are many other social and technical factors influencing access to these resources.
2.2.1.2 Mapping Technical and Economic Potential

Technical potential is the amount of energy that can be extracted over a set period of time by the energy device based on the most current technology (Voivontas et al., 2012). Technical potential also considers the accessibility of the site in terms of the physical components of the RE device and the physical characteristics of the proposed location, such as its slope or soil composition (Voivontas et al., 2012). This defines the production ceiling of a site or area, but it can grow as more efficient technologies move from the laboratory to a commercial setting.

Economic potential considers economic feasibility factors, such as the cost of infrastructure related to the project or the ongoing cost of energy production (Voivontas et al., 1998). This is tied to technical potential because the price of implementing renewable technologies is ultimately evaluated by prospective developers in local and regional economic contexts, who would look at factors such as the price of energy and key inputs such as labor and materials. With subsidies, tax incentives, or the internalization of externalities from conventional energy generation, such as a carbon tax, government support can shift a given site from sub-economical to economical, which expands the geographic area that is attractive to prospective developers. It is also important to note that many RE technologies are becoming competitive across a wider range of geographic contexts without direct subsidy or market manipulation.

2.2.1.3 Mapping Legally-Accessible Potential

Legally-accessible potential is the amount of energy that is present for use after considering political and regulatory exclusionary factors, which can be classified as ‘hard’ or ‘soft’. ‘Hard’ factors are those that directly prohibit energy production activities of any kind at a
given site (Calvert & Mabee, 2015); examples of this include not being able to locate a project within a certain proximity to a town or protected environmental area. ‘Soft’ factors are those that influence the likelihood of RE development at a given site or region, and only become constraints if a certain set of conditions are met (Calvert & Mabee, 2015). One example of this is when a particular siting decision triggers a requirement for an environmental impact assessment that may lead to either a rejection of the project or a change to its location or design. The softest factors are declared policies and stated intentions from public agencies that may lead to the denial of a project over the course of the project’s review. Public institutions, including municipal governments and government agencies, will develop strategic guidelines for decision-making related to RE development (e.g., a land-use plan). These guidelines may not have legislative authority to directly prohibit a given development but may indicate social license to develop RE in a given area and should therefore be taken into consideration when mapping legally-accessible energy resources.

Many of the legal constraints on RE development, especially wind, are designed to limit biophysical impacts, and in particular mortalities to birds and bats (Marques et al., 2014). Although many regulations for environmental protection do not mention onshore wind energy specifically, these policies may still affect the development of this resource. For example, Environment Canada has acts such as the Species at Risk Act (2002) or the Habitat Conservation Program Strategy (2011) that protect species and habitats from development by calling for in-depth environmental assessment prior to development.
2.2.2 Incorporating Social Values into GIS-Based MCE for Renewable Energy Spatial Planning

When social values are not adequately addressed, they may play out as public opposition, which not only brings negativity to the space of RE development but may also slow or halt the progression of a project (Cleland et al., 2016b; Haggett, 2011). The following section outlines how these social dimensions might be considered as part of a GIS-based spatial planning approach and how the effective use of these techniques as a means of public engagement in the spatial planning process may facilitate power-sharing between governments, industries, and communities.

There are several methodologies through which data on social values may be gathered and incorporated into a GIS-based MCE framework for RE spatial planning (see Figure 4 for a summary). One primary methodology is through expert-driven modelling techniques, meaning that desktop researchers and GIS analysts gather map layers that can be fed into the framework to produce results. For example, someone looking to conduct spatial planning for a wind turbine project might make assumptions about aspects that are important to community members, such as aesthetic views, habitat degradation, or farmland preservation. Then, they may model these assumptions as new map layers that are incorporated into the broader framework, such as creating a viewshed layer so that any turbines are not visible along a skyline, or identifying sensitive habitats or primary farmland and excluding them from possible development areas, even if there is no formal regulation supporting that decision. It can be positive for these models to be used if there is truth to support it, but there is no real participation from the public in any step; instead, sentiment toward land-use issues and trade-offs are assumed by the modeler.
A second methodology involves the use of secondary data, in which public sentiment toward land-use issues and trade-offs are gleaned from content found on social media sites such as Facebook, Twitter, or Instagram (Karami et al., 2017; Sherren et al., 2017). For example, one could use Instagram posts to identify places of significant cultural or aesthetic value to locals and tourists based on the number of times it is ‘hashtagged’ or its location is pinned; the Instagram platform in particular may be useful for the preliminary assessment of social and landscape values because it combines the user’s own comments and the comments of others along with photos (Karami et al., 2017; Sherren et al., 2017). In this way, landscapes of ‘higher value’ and higher interest can be identified (Karami et al., 2017; Sherren et al., 2017). Although this is still considered an expert-driven framework because the mining and analysis of sentiment is done solely by researchers, it is more collaborative because the data being collected comes directly from a non-expert source. However, this methodology lacks direct contact with participants. For direct contact, this thesis leverages participatory mapping techniques combined with interviewing, or ‘map-elicited interviews’ (MEI).
Participatory mapping can be loosely defined as a method that focuses on providing those with limited access to GIS knowledge and decision-making power access to geographic information technologies so that their spatial knowledge may be included in decision-making processes (Mukherjee, 2015). Providing the public with a tangible way to influence spatial planning decisions is a key component to the attractiveness of this technique, particularly in the world of natural resource management and conservation (Mukherjee, 2015). Supporters of this method within spatial planning suggest that participatory mapping has the potential to foster diversity and inclusion within the planning process and reduce land-use conflicts, which can build public acceptance toward the project itself (Brown & Raymond, 2014; Mukherjee, 2015; Boucquey et al., 2016; Strickland-Munro et al., 2016). Others caution that participatory mapping may lose its focus and become exclusionary if technological and social barriers to different classes are not properly addressed (Byrne & Pickard, 2016). For example, it is important that if a
computer is being used for the mapping component of an activity, but a potential participant is not computer literate, an alternative is made available so that they may still participate. This could be as simple as providing a paper map to fill in or providing a skilled mapping technician to assist in the process. The general consensus for natural resource spatial planning is that participatory mapping techniques have great potential for inclusive data collection and should be further explored in the spatial planning context, while the methodology is refined (Brown & Raymond, 2014; Mukherjee, 2015; Boucquey et al., 2016; Strickland-Munro et al., 2016).

Participatory mapping is one method through which people with little knowledge of GIS can be included in decision-making processes concerning RE development. This idea complements a key feature of contemporary environmental governance: the decentralization of power in making environmental management and protection decisions (Lemos & Agrawal, 2006). Since it is difficult for nation-states to manage the dynamic environmental needs of an entire country, giving more power to lower levels of government and alternative actors has the advantage of adding more place-specific knowledge and bringing the decision-making process closer to those who will be directly affected by governance actions (Lemos & Agrawal, 2006). The ongoing industrialization of land supports the notion that flexible and inclusive environmental governance arrangements are necessary for the development of RE resources (Wright, 2015). Eliciting and meaningfully engaging with community responses before a RE project is completed within RE planning processes is one option. This arrangement is often broadly referred to as public participation.

Approaches to integrating the public into RE planning processes is always evolving and can be adapted to many sectors. Public participation can be used as a way to obtain community
responses to a RE project prior to development. Recent research has confirmed the importance of public participation in the spatial planning process of RE development because information gathered aids in the understanding of community responses by creating a platform for people to voice their opinions and offering an opportunity for early engagement (Cleland et al., 2016; Haggett, 2011). This research also highlights the idea that such engagement should be real and meaningful, going much further than traditional town-hall meetings or surveys (Cleland et al., 2016; Haggett, 2011). Lienoop (2018) goes further, suggesting that public participation should be written into planning legislation to ensure procedural justice in the planning process.

There are already many examples of participatory mapping being used in RE spatial planning. Mekonnen and Gorsevski (2015) conducted a hypothetical case study for offshore wind farm suitability in Lake Erie, Ohio, that used web-based PPGIS and allowed users to select and rank relevant criteria for the purpose of creating maps as spatial output to visualize optimal site locations for the project. Although the study was not conducted with real stakeholders, the prototype showed flexibility and depth in its analysis. A recent study conducted in the Kimberley coastal region of northwest Australia used an online PPGIS interface that allowed users to move icons related to either place values or management preferences and locate them on the map to show their preferences (Strickland-Munro et al., 2016). Examples of place values from the application are ‘fishing (recreational)’, ‘economic (non-tourism)’, and ‘scenic/aesthetic’, while examples of management preferences were ‘restrict/limit access’, ‘commercial fishing/aquaculture’, and ‘no oil/gas development’ (Strickland-Munro et al., 2016). Researchers engaged 372 respondents and used their findings to create many maps representing the most important place value and management preferences; this information is valuable for local
decision-makers and land-use planners (Strickland-Munro et al., 2016). In conjunction with this study, the same authors took the results of the PPGIS application and analyzed how stakeholders could be identified and if those identifications had relation to the preferences that they chose in the mapping exercise (Brown, Strickland-Munro, Kobryn & Moore, 2016). The study found that there was correlation between the identity of a stakeholder group and what they preferred (for example, that an NGO would be more focused on conservation efforts, while fisherman favoured fishery-related conservation), but the authors are cautious to extrapolate their findings; they suggest that there are knowledge gaps in the area of being able to determine stakeholder preferences based on identity and being able to weight these preferences accordingly in order to avoid bias (Brown et al., 2016).

Although it is a fairly new and emerging area of research, the use of MEI could be an effective way to engage communities in the spatial planning process of RE projects. Building on the concept that public participation is an important power-sharing tool of environmental governance, the following section will outline the methodology for the participatory mapping technique of MEI used for this study.

2.3 Methods: Using Participatory Mapping to Inform Renewable Energy Spatial Planning

2.3.1 Map-Elicited Interviews as Participatory Mapping

MEI are a form of primary data collection that combine the technique of in-depth interviewing with focusing the conversation on the spatial aspects of a problem. Each MEI had
three core components: first, stakeholder groups are identified and solicited by the researcher; second, participants are asked to self-identify or self-associate with a particular stakeholder group; and third, the MEI is conducted, which consists of a mapping exercise and interview held simultaneously.

2.3.1.1 Stakeholder Group Identification and Interview Solicitation

Stakeholders are defined as groups with a collective interest and shared preferences for a given issue (Colvin, Witt, & Lacey, 2016); in this case, the issue of onshore wind turbine development in the Annapolis Valley region. Different stakeholders will have varying opinions on which sites are deemed acceptable and which are not for new RE development (Colvin et al., 2016; Devine-Wright, 2009; Manzo & Perkins, 2006). As such, it is important to carefully consider the process through which participants are selected for analysis that include environmental resource management and participatory methods. Stakeholder identification is a difficult process, as it is easy for a researcher to think subjectively when choosing participants (e.g., subconscious preferential treatment toward a particular group; predetermining ‘stakeholder’ status) (Prell, Hubacek, & Reed, 2007). There may also be issues if groups that are historically marginalized are excluded or if the participatory process is too focused on highly specific groups for in-depth evaluation instead of reaching broadly for participants (Prell et al., 2007). Colvin et al. (2016) note that at times, the same groups are consistently solicited for community engagement activities, leading to a case of ‘the usual suspects’ being the only voices that are heard while others are silent. If silence from a particular group on an issue is due to lack of rigor in seeking out participation instead of that group choosing not to participate, then this bias is concerning and should be remedied in the study design (Colvin et al., 2016). Therefore,
although it is very important to include many stakeholders in participatory methods of planning, the process for choosing stakeholders should be thoroughly considered beforehand.

This study applies a form of stakeholder mapping in order to determine who to contact for participation (Colvin et al., 2016; Walker et al., 2008). Stakeholders in participatory methods of engagement are usually chosen based on one or more of these three main principles: power to influence the project, interest in the project, and attitude toward the project (Murray-Webster & Simon, 2006). Since stakeholders within the same groups are generally thought to have similar interests or preferences, and due to the fact that onshore wind turbines are a matter of land use and cause changes to the local landscape, I chose stakeholder groups with the two themes of land use and landscape changes in mind.

One way to organize stakeholder groups is to consider different stakeholders’ relationships to the land, which is heavily dependent on what people do with/in a particular landscape (Colvin et al., 2016). For example, a farmer whose livelihood depends very heavily on the quality and availability of land may have a different viewpoint than someone who is an avid trail runner and uses the land as a recreational area. Within the vein of land use and landscape changes, I created stakeholder groups (illustrated in Figure 5) based on ways in which people may experience landscape, specifically through their occupational and leisure activities, so that the analysis could draw on the input and sentiment of individuals with a wide range of such activities. In this way, stakeholder mapping helps to ensure a diversity of viewpoints to gain an *illustrative* sample of the greater community (Hennick, Hutter & Bailey, 2015), which is especially important in cases where time and resource limits prevent a statistically representative
sample. In addition, consistent with Colvin et al. (2016), this approach helps to ensure
forethought that allows the sample to go beyond ‘the usual suspects’.

With these ideas in mind, Figure 5 shows the stakeholder map that was used to guide the
sampling process. Note that these groups are general and therefore could be applied to similar
studies, but the specific organizations and people contacted within each stakeholder group would
vary from place to place. I recruited specific participants for this study using purposive and
snowball sampling methods, as described below.

![Figure 4 A visual showing the stakeholders involved in the study.](Image)
Purposive sampling was used in order to ensure representation across the pre-determined stakeholder groups. Purposive sampling involves the selection of initial research participants based on a set of criteria developed by the researcher, and helps to ensure that the sample is stratified across the groups that must be represented in order for the research to be undertaken (Oliver, 2006). This is a non-probability type of sampling, which reduces self-selection bias. This is important because traditionally with controversial topics like RE spatial planning, those who volunteer themselves to engage first have stronger opinions one way or another. Snowball sampling, a technique by which one participant offers other potential contacts in their network, was employed to expand the sample size and ensure that the sample is well-stratified and therefore closer to representative (Oliver, 2006).

A range of techniques can be used to contact potential research participants, and it is important that they satisfy the two caveats of having scope in the range of groups and depth in the number of people within groups. Initial participants within each groups were contacted through cold-calling when no formal or informal connections to a stakeholder or group exist. This method aims to improve the scope of the study. Initial contact was made through email or phone number identified on a government website, local newspaper articles, or even organizations’ websites or Facebook groups to see who shows interest in a given subject. A complementary method to cold-calling is using a gatekeeper to facilitate access to a larger group of people who may be good candidates as participants for the study; this method promotes depth in the number of participants gathered from each group. A gatekeeper is a person who is considered a leader of a group, whether it is an organization or a cultural or social group; generally, this person is looking out for the wellbeing of other members, and the purpose in
speaking with them first is to ensure them that the research being conducted will not be of harm and create potential benefits for all parties involved (Saunders, 2006). Once a gatekeeper’s trust is gained, they can provide access to a wider group of people who can participate in the study (Saunders, 2006). Using a gatekeeper can be very effective in gathering participants, but they both have the issue of bias because, oftentimes, people in similar social networks may have similar views on given topics (Oliver, 2006). In addition to cold-calling and emailing, I solicited participants by attending events such as farmers’ markets and energy-related conferences. This attendance resulted in finding participants directly or making connections to new people or organizations in order to find more participants. Posters were hung in these specific venues as well in order to attract attention from interested parties.

Overall, purposive cold-calling was the primary method of participant elicitation and using gatekeepers and snowballing was used with a critical eye. I made significant effort to attract participants that ranged from clearly supportive of RE development in their region to ones that were not, so as to hear from a varied sample group. For example, when soliciting participants at a farmers’ market, some people had to be thoroughly convinced to participate and assured that the study wanted to hear about all views on wind turbine development and not just the positive ones; in some cases, this took over 10 minutes of in-person conversation plus multiple emails thereafter to achieve.

2.3.1.2 Map-Elicited Interviewing

The map elicited interview (MEI) process included two main components. First, the participants are asked to fill in a short form with information about themselves, including their
location of residence (they are free to be as specific or vague in this answer as they are comfortable with) and, most importantly, which stakeholder group(s) on the list they identify with (see Appendix for list of questions). For example, a person may be a resident of the region but also work for the municipal government and be involved in the planning of RE resources in that capacity, which would put them in both the ‘Resident’ and ‘Government’ stakeholder groups. These varying roles in life may influence a participant’s decision-making due to the added nuance to their perspective, especially if they belong to many different stakeholder groups and can speak to a variety of personal knowledge and experience. It is useful for this information to be collected by the researcher so that it is possible for analysis within and between stakeholder groups, assuming a meaningful sample size. It is also important for participants to self-identify in this process for two reasons: first, if their roles are assumed by the researcher, mistakes could be made in those assumptions, which would result in inaccurate data collection. Second, it is helpful to have participants start the MEI process by thinking of themselves as a stakeholder with valid, nuanced information to contribute and putting them in this self-reflective mindset before diving further into conversations about RE spatial planning may aid in teasing out more thoughtful answers.

Second, the participant conducts the mapping exercise. The researcher uses some form of mapping platform (in this case, ArcGIS Online with a private account provided by the University of Guelph) and chooses a basemap that may be created or loaded through the program. ArcGIS Online has a variety of basemaps available for use; I chose ‘aerial imagery with labels’ for this study. The researcher should have a pre-made shapefile layer loaded into the program with a given set of options for drawing. In this case, I used a shapefile with three possible options of
‘acceptable’, ‘unacceptable’, and ‘conditional’ with unique colours for each category. Once participants answer the preliminary information questions, they move on to the mapping exercise and semi-structured interview. Although there were a set of specific questions created prior to the interviews (see Appendix), the MEI portion of the interview did not follow a particular order in asking participants to fill in their perceived ‘acceptable’, ‘unacceptable’, and ‘conditional’ sections on the map and why. Rather, I provided an overview of the activity and participants were able to start a fluid conversation by filling in the map and discussing their reasoning in order of what came to their minds. This way, participants were not guided in any particular direction and their responses were generated organically. Interview times ranged from a short 20 minutes up to a period of two hours.

2.3.2 Post-Interview Data Processing: Mapping Social Acceptance

A total of 41 map layers representing each participant were created with shapefiles representing areas that were considered acceptable, unacceptable, or conditional to each participant. These layers were combined to create one ‘heat map’ layer that identifies areas of higher or lower acceptability based on all of the maps. Below is an example of a raw map that was created by a participant; the blue areas are acceptable, red is unacceptable, and grey is conditional.
These individual map layers were compiled as follows. First, the layers were exported from the ArcGIS Online platform and opened with the full Desktop version 10.2 of ArcMap. Although the colour of the polygons denotes their value to the participant, there needs to be a numeric equivalent in order to combine layers and create the heat map. A new field was added in the attribute table called ‘Rating’ and subsequently filled in giving a value of 2 for ‘acceptable’, 1 for ‘conditional, and 0 for ‘unacceptable’. Once this was completed for all layers, the Union tool combined all of the layers into one. Each of the smaller polygons within this layer retained the values that were drawn onto it by participants. In order to calculate a final score for each area on the map, it is required to add up these ratings. To combine the ratings, I created another field entitled ‘Total’ in this layer and used the Field Calculator to add up the total score for each polygon. Note that the lowest possible score would have been 0 (if every participant deemed a spot ‘unacceptable’) and the highest possible score would have been 82 (if every participant
Figure 9, below, shows a screenshot from the attribute table of the final union polygon before it was converted. The two most important columns in the table are the ‘Categor_37’ column, which shows the rating of each piece of this polygon as being ‘acceptable’, ‘unacceptable’, or ‘conditional’ and the ‘Total’ column, which shows the final score on the acceptability scale for each participant.

Figure 6 A screenshot of the attribute table for the polygon that includes all participant layers brought together via the Union tool.

Next, the vector polygon was converted into a raster format in order to visualize the final heat map layer in a fluid way instead of broken up into hundreds of tiny, intersecting shapes. I
used the Polygon to Raster tool, with the conversion based on the Total field created in the previous step. This resulted in one layer in which each raster cell is given a value from 0 – 82 based on the scores calculated previously, which are illustrated with a stretched colour scheme wherein the highest values are coloured shades of blue, toward a yellowish colour in the middle, and toward shades of red for areas with lower scores. As a final step to make this layer as visually appealing and understandable to the viewer as possible, the Focal Statistics tool was used to smooth the layer. The Focal Statistics tool calculates a statistic of the values around each input cell location based on how many the user suggests. In this case, the neighbourhood was relatively small (only 3 cells around each input cell) so as to decrease alteration in the values and achieve a smoothing effect on the final product.

I repeated this process three times in total to create three final ‘heat map’ layers that could be analyzed; once for the entire participant population and one each when the population was segregated in half. The results and analysis of these maps are discussed in the following sections.

2.4 Results and Discussion

Figure 8 below shows the final heat map layer for all participants in the study. It is clear from the patterns displayed in the map that there is a high level of consistency across all participants with regard to their chosen areas of acceptability for onshore wind turbine development in the region. This is evident in the relative lack of mid-line responses (visualized in yellow in the map) and clear patterns in what is considered more or less acceptable.
Figure 7 The final heat map layer with all participants’ layers included.

The areas of lower acceptability are the Valley floor, the Blomidon and Cape Split areas, and the Grand Pre and eastern side of West Hants area. The sole highway of the region, Highway 101 or the aptly named ‘Harvest Highway’, runs directly through the Valley floor and is the main artery for traffic used by anyone travelling in the area. Apart from the highway, the Valley floor is where most of the development in the region is found and it is where the best soil for farming is available. In total, there are around 840 farms located throughout the region and this accounts for approximately 26% of all cropland in the province (Annapolis Valley Farmland Trust, n.d.).
This region is a significant part of locals’ economy and livelihoods. There are a variety of agricultural land-uses, particularly for soft fruit and vineyards. There is also a growing tourist industry based on wine and farm tours.

The Blomidon and Cape Split area, which is the hook-shaped piece of land in the northeast of Kings County, is an area of high outdoor tourism and natural beauty. Blomidon Provincial Park is on the east side of the hook and Cape Split Provincial Park covers most of the end of the hook; both of these areas feature public hiking trails, ocean vistas of the Bay of Fundy, beaches, and points of higher elevation to view the rest of the Valley and Grand Pre areas. These parks are well-used by locals and tourists alike, and feature prominently in tourism advertisements throughout the region and province.

The areas of highest acceptability are the North and South mountain regions, as shown in blue on the map. The North Mountain area is characterized by many coniferous and deciduous trees, a very small amount of farmland in some areas along the base of the mountain, some houses dotted throughout the mountainside and forested areas, and small and winding roads that allow access to either side of the mountain. The Valley lies to the south, and on the north side are some (approximately less than 15) small coastal fishing villages that are sometimes connected by more than one road, but usually only have one road in and out. To the south of the Valley floor is the South mountain region, which is also sparsely populated and has only a few key regional roads (namely, highways 8, 10, and 12, although they are only one lane each way and are not considered true highways) connecting the Valley to the other counties on the southern, Atlantic-coast half of the province. The South mountain region is also known for extensive forestry
activity, which can be seen from of the main roads when driving through but is more obvious in the large trucks carrying logs to and from their destinations in certain seasons.

The mapped results for this chapter are consistent with findings from Wüstenhagen et al. (2007), Devine-Wright (2009), Bell et al. (2013), and Fast (2015), among others, who insist that NIMBY is not a sufficient explanation for opposition to RE development, particularly onshore wind energy. In this case, all participants live and/or work in the Annapolis Valley and would see wind turbines on a frequent basis if they were placed anywhere in the areas of high acceptability on the heatmap. If NIMBY truly were an issue, then every participant would have coloured the map red for unacceptable. This finding is expanded upon and supported with interview data in Chapter 3.

2.4.1 Comparison of Maps between Participants Who View Landscape as ‘Productive’ versus ‘Consumptive’

The sample was segmented into two groups. First, a group who, in theory, perceives landscape as serving a productive function. This group includes participants who self-identified as Farmers, Government, Small Businesses, Tourist Industry, and Energy Services (n=21). Second, a group who perceives landscape as serving a consumptive function. This group includes participants who self-identified as Residents, Recreationalists, Non-Governmental Organizations, and Researchers or Academics (n=21). This segmentation groups individuals into a larger grouping that indicates some commonality in how they most often use or consume the land (Solecka, 2018; Zube, 1987). For example, someone like a farmer would primarily ‘use’ the land in order to grow food for themselves or to sell for profit. Someone who works for a wind
turbine construction and maintenance company (energy services) ‘uses’ the land as a way to create energy for profit. On the other hand, someone who self-identifies as a recreationalist would likely ‘consume’ the landscape for their own aesthetic pleasure, or perhaps as exercise running trails or hiking; there is no monetary, tangible profit that they are making from the land. Based on these differences in how land is either used or consumed, and the fact that onshore wind turbines visibly change the landscape that they inhabit, it could be hypothesized that these two groups may have different views on where onshore wind turbines are more or less acceptable. Segmenting the sample in this way will allow for the research to engage with the debate about the role of landscape values in driving sentiment toward wind turbines (Brown & Raymond, 2007; Solecka, 2018; Zube, 1987).

I utilized the same steps in ArcMap to produce one heatmap for each segregated stakeholder group. Previous studies have noted that opposition tends to be stronger among the ‘consumptive’ group, because they value the aesthetic scenery of rural areas which wind turbines are considered to spoil (Batel & Devine-Wright, 2014). As is evident in Figures 9 and 10, however, the maps do not differ greatly.
Figure 8 A map showing the final heat map layer for Consumptive stakeholders.
Figure 9 A map showing the final heat layer for the Productive aggregated stakeholder group.

These maps have some similarities and some differences, both of which are indicative of the levels of acceptance held by the stakeholders in each group. There are clear similarities in the lack of acceptance for onshore wind turbines in the Blomidon, Cape Split, and Grand Pre areas, indicating that most participants recognize these as areas that should not be changed by such a radical addition. There is also similarity in the high degree of acceptance for onshore wind turbine development on the North mountain and for most of the South mountain, particularly as one moves away from the Valley floor. Finally, the majority of the Valley floor shows similar
levels of low acceptance, particularly through the centre of the Valley, where the highway and most communities are located.

There are differences in the responses regarding the peripheral areas of the Valley floor. The productive group seems to have less consistency in acceptance, whereas the consumptive group draws a clearer line between the Valley floor as being less acceptable and the South mountain being more acceptable. In addition, there is a higher degree of acceptance in the West Hants area from the productive group than the consumptive. There are a number of factors that may describe the differences between productive and consumptive groups in relation to landscape values. Recall that landscape values are defined as social and individual preferences for the form and function of a given area of land and that research has shown people’s landscape values to differ based on their relationship with their surroundings. Based on this definition and knowledge of the Annapolis Valley region, one explanation for the consumptive folks being more hesitant to accept onshore wind turbine development in the West Hants region could be due to the fact that there are already about 10 turbines in that area, and an addition to that number may be less aesthetically pleasing from their viewpoint. Another observation is that levels of acceptability on the Valley floor were less universal with the productive group; perhaps this is due to the presence of farmers in this group who would presumably wish to preserve viable farmland and may be more hesitant to give that land up on the Valley floor.

Although differences may be telling, the clear similarities between responses in both productive and consumptive groups is significant. The similarities in responses between the two groups show inconsistency with the ideas of Zube (1987) and Brown and Raymond (2007) which suggests that productive and consumptive landscape values heavily influence land use choices.
In this case, it seems that aggregated productive and consumptive groups alone are not enough to predict responses to RE development in the Annapolis Valley region.

Similar to the mapping activity presented in Chapter 2, even if no conclusive results can come from this MEI exercise due to the small number of participants relative to the population of the region, the process itself is still highly replicable and would yield useful results in other scenarios.

### 2.4.2 Replicating the Map-Elicited Interview Process

The results discussed above regarding this study of the Annapolis Valley region have some significance in-place, but due to the low number of participants relative to the total population of the region, the most practical and useful part of this study is the MEI process itself. The MEI process is one that can be replicated in any location and in relation to the deployment of any RE technology (for example, utility-scale solar panels or biomass facilities). Of course, it is not recommended that this process is the only method used in the spatial planning of RE projects, as the stakeholders contacted are not all experts in RE planning and can only offer important information from their own perspectives as people living and/or working in close proximity to proposed projects. As previously outlined, there are a host of theoretical, technical, economic, and political factors that must also be taken into account when siting a RE project. Rather, the purpose of adding the MEI exercise to this process is to add an activity-based form of stakeholder engagement that is useful for planners because results can be easily integrated into commonly used planning practices and is beneficial for everyone involved because it fosters positive relationships between those planning the projects and those who are affected by these projects.
2.5 Study Limitations

The two main limitations in this study are related to GIS processes and programming that could be set up differently and that there were no Indigenous participants. The following outlines these limitations and offers suggestions for modification in any future studies that wish to replicate similar methods.

For the mapping activity, participants were encouraged to draw their own polygons (or very specifically guide the researcher in making the map) to show their chosen areas of acceptable, unacceptable and conditional locations wind turbine development in their region. They were shown aerial imagery as their background with the study area boundaries shown – and nothing else. The purpose of setting up the mapping activity in this way was so that participants would not be influenced one way or another by showing too many specific features (ie., location of prime farmland, location of residential or commercial buildings, etc.) which may change their initial decisions. I wanted their answers to come from an organic, uninfluenced place that was informed by their own experiences and thoughts as opposed to ideas that were put in front of them by the researchers. However, in many cases, participants expressed wishes to know certain pieces of information, such as where the highest wind speeds are or where endangered species are located. Therefore, it may be useful in future iterations of MEI projects to have this information in the form of many layers on hand so that it may aid in the participants’ completion of the mapping activity.
Along the same vein as influence, it should be acknowledged that in some situations, one-on-one engagement for MEI may not be the ideal form of engagement for real-world situations. For example, some planners may actually want participants to be influenced by factors other than their own thoughts as a way of expanding participants’ knowledge base and opinions. Map-elicited focus groups could be a more effective way of garnering similar information, except from a larger pool of people at once. Planners could host events wherein people from the same stakeholder groups or people from different stakeholder groups all come together at once and are asked to complete a mapping activity similar to the one described in this chapter individually, and then again they can be asked to work together to reach consensus on a map for the group. This way, participants would still be able to contribute their own personal thoughts but would also be influenced by others in the community who will surely have different areas of expertise and life experiences informing their choices. However, such activities would require meticulous planning and forethought so as not to devolve into arguments between participants.

As previously addressed and not without serious thought, the choice was made to exclude the participation of Indigenous community members in this study due to epistemological differences between their worldviews and the methodology used for this study, which is rooted in ‘Western’ practices. This is a limitation in the sense that an entire sub-group of the population and their important viewpoints are being excluded, but also offers opportunity for future adaptations of the MEI process. For example, a study could be done wherein the design is presented to an Indigenous community’s leaders or anyone willing to participate, and then remodelled with their own preferences with the goal of including Traditional Ecological Knowledge (TEK) into the process. This may end up modifying the process entirely or only
slightly, but the point would be that the community would have more control in its design and implementation, and therefore better serve the needs of the community.

Figure 11 below shows the locations of current First Nation Reserves in the Annapolis Valley region, overlaid on the social acceptance layer that was created using the MEI process.

![Map of First Nation Reserves in the Annapolis Valley](image)

Figure 10 A map showing the locations of First Nations Reserves in the Annapolis Valley region, along with the social acceptance layer created by the MEI process used for this study.

Note that two out of the three reserves are in areas that were rated moderately acceptable by participants, while one is in a decidedly less acceptable area. If this were to be used by
planners, it would be useful in showing that, in addition to concerns held by other stakeholders in the area, there may be concern (or support and partnership – one should not assume) from Indigenous communities as well. It is also worth noting that no participant mentioned Indigenous communities throughout the course of their interviews. Although this is not indicative of how all people in the region think about RE spatial planning, it shows the clear need for the inclusion of Indigenous voices in this process and supports the idea of completing it specifically within an Indigenous community.

2.6 Conclusion

The motivation for this study is partially rooted in the need to increase the capacity of local governments and planners to develop and implement collaborative, inclusive planning processes. There is a clear need for tools and techniques that can incorporate RE development into local and regional spatial planning processes, particularly in ways that allow for widespread dialogue across stakeholder groups (Chilvers & Longhurst, 2016; Jami & Walsh, 2017; Rand & Hoen, 2017). The methodology of MEI was used in this chapter as a way of gathering and spatially representing public sentiment toward wind energy development, thus accomplishing the goal of engaging stakeholders in an interactive way and creating a GIS output that can be easily integrated into existing RE spatial planning processes. Although the chosen study area was the Annapolis Valley region of Nova Scotia and the technology of discussion was onshore wind turbines, one of the most valuable pieces of the MEI methodology is in its replicability.

Chapter 2 described the MEI methodology and analyzed the results from the mapping exercise itself. However, this is not the full story; if a planner were to use these maps, it would
tell them about the levels of social acceptance but with no context to help them understand the rationale or the reasons underpinning these spatial patterns of acceptability. The next chapter follows through on this, unpacking the interview data.
Chapter 3: The Role of Landscape Values in Shaping Sentiment Toward Renewable Energy In-Place

3.1 Introduction

As market and policy changes catalyze more RE development, local landscapes and land-use systems are changing. Agricultural land is being used for solar farms. Regions that attract tourists for their scenic vistas sometimes feature wind turbines. New biomass-to-energy production facilities are located in small towns. In many cases, the given community might be generally supportive of RE development, but opposed to actual projects in-place. This phenomenon is often referred to as the ‘social gap’ (Bell et al., 2013). Scholars have theorized about the factors that contribute to the social gap, with emphasis on NIMBYism (Devine-Wright, 2009), a sense of procedural injustice and distributional injustice (Walker & Baxter, 2017), and a lack of cost-sharing opportunities. Often, this research is oriented towards understanding factors that might lead to community or public acceptance (Wüstenhagen, Wolsink, & Bürer, 2007, p. 2685). In this chapter, I seek to categorize and understand community sentiment to RE development and planning. Specifically, the goal is to identify factors that influence support and/or opposition (i.e., sentiment) of RE projects, with emphasis on the role of landscape values.

For the context of this study, landscape values are defined as social and individual preferences for the form and function of a given area of land. A landscape value may be aesthetic, such as being fond of a particular view, like a cliff overlooking the ocean. It could be environmental or related to nature in the sense that a certain species needs it to survive, such as a marshland area. It could be based on the feel of a landscape based on its current and past
uses, such as an area of particular historical significance, like a fortress with a re-created or well-preserved town inside. It could be based on current and future uses, such as areas of high agricultural value or regions whose economy is based on the tourist industry.

This chapter will first provide a literature review on social responses to RE development generally, then proceed to describe the MEI methodology used for this study, and finally describe and analyze the results produced from the primary data collection conducted.

3.2 Literature Review: Beyond NIMBY

3.2.1 The Gap Between Social Acceptance and NIMBYism

A range of studies have focused on public responses to wind energy developments. Early research drew heavily on theories related to NIMBYism – i.e., ‘not in my back yard’. Devine-Wright (2009) traces a clear path from the concepts of place attachment and place identity, both of which deal with the relationship between a person’s local environment and how it affects their self-conceptualizations and attachments, through to place disruption, which poses a threat to their place attachments and identities. In relation to NIMBY, this disruption of place values was/is thought to contribute heavily to a protective attitude toward that place when changes are suggested (Devine-Wright, 2009). In other words, the idea behind NIMBY is that locals’ close attachment and identification with a place will usually cause them to be wary, protective, and likely opposed when significant changes, such as new RE developments, are proposed (Devine-Wright, 2009).
Although widely used at one time and particularly in the media as an explanation for why many people opposed early RE developments, the explanation of NIMBYist attitudes is not so straightforward. More recent research has shown that community members who may be lumped into the category of having ‘NIMBY’ attitudes range from people who may support RE projects as long as they are ‘not in their backyard’ to people who have more specific concerns, such as consumers who are troubled by changes in the price of energy or technology hosts who directly own and operate competing energy technologies (Wüstenhagen et al., 2007; Fast, 2013; Larson & Krannich, 2016). There has been useful research in recent years that aims to more carefully categorize and define the qualifying factors which lead to a member of the public supporting or opposing a project in order to avoid over-simplifying public opinions. Fast (2015) used the empirical technique of Q-method, which employs statistical approaches to delineate like-minded groups of individuals on a particular topic, and arrived at four archetypes:

- impatient supporters, who are staunchly in favour of a RE project;
- idealistic supporters, who fundamentally favour RE, but still have some reservations about certain aspects of the projects;
- qualified opposition, who would like to support RE projects but have such strong reservations for some perceived negative factors associated with the project that they become opposed;
- absolute opposition, who staunchly oppose RE projects.

The significance of this research is in adding nuance to the understanding of those who ‘oppose’ or ‘support’, and recognizing that opposition and support often comes with qualifiers and is
rarely absolute. Distinguishing participants by stakeholder groups, and toying with the aggregation of such groups, allows for the nuance in sentiment to be analyzed more thoughtfully than simply classifying all participants under one umbrella.

Building on the idea that community responses to RE development are nuanced, some studies have identified the specific underlying factors influencing where a community member may land on the spectrum of opposition to acceptance. A study conducted for onshore wind turbines in Ontario indicated that, contrary to popular belief, key predictors of public acceptance or opposition hinged on the issues of health risk perception, community benefits, general community improvement, and a preference for energy generated by turbines as opposed to fossil fuels (Baxter, Morzaria, & Hirsch, 2013). Some specific health concerns included the ‘flicker effect’, noise annoyance, and low-frequency vibrations (Baxter, Morzaria, & Hirsch, 2013). Although these concerns are certainly legitimate and supported by rigorous scientific study, there is also a great deal of misinformation available across the Internet which could be the culprit in bringing these concerns to light in the first place.

A range of studies have assessed RE development processes for procedural justice issues (Adams, Wheeler, & Woolston, 2011; Giordono et al., 2018; Rand & Hoen, 2017; Simcock, 2016; Walker & Baxter, 2017). Overall, these studies show that local citizens tend to be insistent on some form of public participation in the planning process for RE development and that a lack of public participation can be seen by locals as being procedurally unjust, resulting in higher levels of opposition (Adams, Wheeler, & Woolston, 2011; Giordono et al., 2018; Rand & Hoen, 2017; Simcock, 2016; Walker & Baxter, 2017). Participation can range from simply informing residents of changes and allowing for discourse between government, industry, and locals about
the proposed changes, or it can be as involved as subsidizing community-owned and operated RE facilities. This idea of power-sharing tends to also involve discussions about costs and who will be in charge of providing capital and receiving economic benefits from such projects. Different approaches would be more or less suitable for different locations, depending on a plethora of socioeconomic factors. Although this call has been issued, there are fewer studies offering specific methodologies for ways in which such levels of participation may be achieved.

A recent review paper on public concerns regarding RE development concluded that the knowledge about causes of public opposition is strong, but scholarship is lacking in solutions or strategies to combat these concerns (Cohen, Reichl, & Schmidthaler, 2013). This finding supports the idea that a more nuanced approach to categorizing and placing members of the public somewhere on the spectrum between support and opposition to RE projects is necessary due to the complexities behind their opinions, and that better strategies for mitigating these concerns are essential to successful and fair RE implementation. The inclusion of more meaningful public participation in the spatial planning process of RE projects is one way in which public concerns can be gathered, summarized, and potentially mitigated throughout the exercise (see also Brown & Raymond, 2007; Chilvers & Longhurst, 2016; Jami & Walsh, 2017; Resch et al., 2014; Walker & Baxter, 2017).

One way by which public concerns can be organized once they are identified is the VESPA framework (Petrova, 2016). VESPA stands for: visual/landscape, environmental, socioeconomic, and procedural aspects (Petrova, 2016). It was created to move analyses away from the NIMBY school of thought and to provide a framework to identify and organize nuances in public sentiment toward wind turbine projects specifically (Petrova, 2016). It has been used in
this study as a way of organizing and gauging public sentiment toward onshore wind turbine development in the Annapolis Valley region, regardless of whether that sentiment is positive, negative, or mixed/conditional. The VESPA framework provides a solid foundation on which to organize responses in a way that lends itself well to replicability and ease in coding, and it is informed by many previous studies that have identified the most important concerns that communities have regarding wind turbine development (Petrova, 2016).

This study combines participatory GIS methods with semi-structured interviews into a process referred to as map-elicited interviews or MEI. This methodology is built on similar work that has sought to improve community participation in RE spatial planning by actively engaging community members in real-world planning efforts through participatory mapping (Brown & Raymond, 2007; Chilvers & Longhurst, 2016; Jami & Walsh, 2017; Resch et al., 2014; Walker & Baxter, 2017). Through the MEI process, spatial and thematically specific information to the area being studied is elicited. Although the process draws out NIMBY-related concerns, insights from Fast (2015) and Petrova (2016) are used to build the analytical framework through which to tease out nuance in responses, with particular emphasis on landscape values.

3.3 Methods

3.3.1 Map-Elicited Interviews: A Place-Based Conversation

As mentioned in the previous chapter, a stakeholder mapping exercise was completed in order to identify possible research participants. As well, a purposive sampling technique involving cold-calling, snowball sampling, and attending targeted community events to solicit participation was employed (see Figure 9 for stakeholder map).
MEI was the chosen methodology for this study due to its spatial nature and the way in which the conversation is held regarding a specific, place-based issue. The themes of spatiality and specificity are important because it allows for respondents to think about wind turbine development in a more realistic way and one that relates strongly with their everyday lives (i.e., asking someone what they think about wind turbines generally may elicit a more general response, whereas asking them what they think about a wind turbine beside the freeway that they drive every day may elicit a more specific and useful one). The previous chapter situated MEI in the space of other methods for determining community sentiment toward a place, such as using secondary sources like social media or modeling based on collected or projected data. For the purposes of this study, a semi-structured interview, in which the structure used the themes of ‘acceptable’, ‘unacceptable’, and ‘conditional’ sentiment toward RE development, was conducted alongside the mapping activity. Essentially, participants were asked to explain these sentiments and their mapping choices in an unstructured conversation in order to answer the ‘why’ question: Why is one place acceptable in their minds for onshore wind turbine development and another is not?

This type of question can be difficult to answer alone, but when it is asked with a map of a well-known area about a specific issue, the answers can become narratives that dig deep into the reasoning behind participants’ spatial choices (Brown & Raymond, 2007). This study uses MEI as opposed to specific surveys or polling questionnaires with little context as a way for participants to reach these deeper, nuanced answers. The chosen methodology allows for the participant to expand on their thoughts and answer freely, whereas highly structured surveys or questionnaires may run the risk of streamlining participants’ answers into a pre-determined set of
responses, which could cause them to leave out their original thoughts in favour of what is presented. In other words, the use of MEI allows us to elicit participants’ sentiment toward onshore wind turbine development based on their landscape values at a local scale, whereas a survey may only scratch the surface of their opinions on this topic. In total, 41 interviews were conducted (refer back to Figure 7). Members of the fishing industry did not respond to repeated solicitation but should be pursued in replication or similar studies in future.

3.3.2 Post-Interview Data Processing: Organizing Responses in the VESPA Framework

Interviews were transcribed from their recorded form into Word documents and loaded into an analysis software called NVIVO version 12. Data were coded according to the VESPA framework. Interview data are coded in an iterative process with the goal of identifying dominant themes emerging from the interviews (Charmaz, 1996). Although there is no predetermined hypothesis being tested, the VESPA framework was used for organisational purposes, to categorize data in the first round of coding.

A second round of coding was conducted to distinguish the sentiment of responses as ‘positive’, ‘negative’, or ‘conditional’. Finally, a third round of coding was used to identify specific sub-themes within each of the VESPA categories, and in terms of the sentiment. See Appendix for a full listing of all categories. The following will describe results in two ways: first, through an overall summary based on the VESPA framework itself, and second, by segmenting the population, as in Chapter 2, in terms of their productive or consumptive views toward landscapes.
3.4 Results and Discussion

3.4.1 Summary of Responses Using VESPA

Figure 12 below provides an overview of the results from all stakeholder groups; this stacked bar graph shows a breakdown of the number of times statements were made throughout the 41 interviews relating to each category in the VESPA framework, and also how many mentions had positive, negative, or conditional sentiment attached to them. For a breakdown of more specific results, there are two tree diagrams showing the most prominently mentioned themes for each letter of VESPA in the Appendix.

Figure 11 A breakdown of responses at their most aggregated level.
Contrary to NIMBY theories, which suggest that locals oppose onshore wind turbines primarily due to their aesthetics, 50% of participants characterized wind turbines in a positive light on the ‘visual’ theme (per Figure 12), using adjectives such as ‘progressive’, ‘interesting’, or even ‘beautiful’ to describe them, while very few considered them to be unsightly or downright ugly. However, the largest portion of comments related to the visual aspect of wind turbines had the conditional sentiment that they are good-looking and that people are not overly bothered by them, but that there are still some situations in which they would be considered undesirable due to ruining views. Areas of particular interest were, unsurprisingly, the Blomidon, Cape Split, and Grand Pre UNESCO World Heritage Site areas. One resident said, “Blomidon is so important. People would never want it obscured” but also said that they do not have a problem with them aesthetically in general or in other areas of the Annapolis Valley region.

Additionally, many of the comments related to conditional sentiment for wind turbine aesthetics were specifically linked to the tourist industry and the perceived loss of revenue that would occur if such fantastic, iconic views were altered with turbines. Therefore, it was not necessarily the look of the turbine and how it changed the landscape for them personally causing the problem, it was the thought that others may not want to look at the turbines if located in specifically beautiful views of natural landscapes. This sentiment was also rooted in the idea that the viewscapes that make the Annapolis Valley region so special are ‘natural’ and that wind turbines are too stark of a contrast with their glaringly human-made imprint on the landscape. This sentiment was described very well by one participant when they said,
Well, the fact that I'm seeing renewable energy being generated, I mean it's... I kind of enjoy seeing them. They add a little bit to the horizon. I mean, I wouldn't want to see them absolutely, everywhere. I mean, I think we should protect some more pristine landscapes to recreate in. I mean, if you look at what I like to do, I mean, I camp at night, and I fish and I paddle, and that kind of thing. And if, you know, I couldn't get away to somewhere where I didn't see a lot of signs of civilization, I might go insane (NGO 1).

Finally, it seems that, in the case of onshore wind turbines, size and density matter. Many respondents expressed the sentiment that they would not have a problem seeing about 20 to 30 turbines dotting the landscape, but that “…where you are looking for miles and miles and miles and miles and seeing [only turbines] … I think if I saw that, then my reaction would be, ‘Oh my God. Wow, that’s a lot of landscape that they ruined,’”. This indicates that for some participants, a limit on turbine density exists. For the size of turbines, some respondents expressed the idea that in some locations, such as the Valley floor, it would be better to have small-scale turbines (under 1 megawatt each) and that they should be developed more on an individual, ad-hoc basis (i.e., some farmers or wineries throughout the Valley use one or two on their own property to power their own operations) and that any large-scale developments should be either on the mountains or out of sight completely if possible.

In terms of environmental qualities associated with wind turbine development, a strong majority of respondents believe that moving away from the use of fossil fuels is the right choice on a moral and environmental level for the human race as a whole. In some cases, people even put the importance of mitigating climate change through the use of RE technologies as more important than making money for themselves; indeed, one respondent who had signed a lease agreement with a company looking to put wind turbines on their land stated,
And that's why we agreed to that, because people are like, ‘Oh, don't sign, don't sign.’ Because they're going to take advantage of you, and down the road, there are better deals to be made. At least, that's what the talk was when we signed these contracts. I said, ‘You know what? This is an opportunity. I'm going to do it because money aside, it's the right thing to do.’ Instead of burning coal or whatever dirty other source they have (Farmer 1).

The most prominent concerns related to the environment were that deforestation should not happen for the sake of a wind turbine project alone and that prime agricultural land should definitely not be used for large-scale wind farms. Participants were more conditional in their sentiment toward deforestation, with many saying that it would be acceptable to clear-cut trees to make room for wind turbines if the trees being cut were to be used for logging operations anyway or that the same number of trees would be replanted elsewhere in the province. Interestingly, environmental concerns about deforestation expressed by participants, paired with their overall support for RE based on its benefits in mitigating climate change, provide a direct example of Bell et al.’s (2013) ‘social gap’ theory; however, the high amount of conditional sentiments concerning deforestation and ideas around integrating wind turbines as a multi-functional land use in areas that already have heavy forestry activities shows nuance in this social gap and a willingness to compromise for a net environmental benefit, ideally.

Socioeconomic factors such as job creation and impacts on tourism were the most mentioned topic overall across the interviews and were the areas of most concern for participants. The reason for this appeared to be due to the fact that the tourist industry in the region is a large employer and contributor to the overall economic wellbeing of the area and that this industry is predicated on the beautiful ‘natural’ landscape and views available to tourists. As one participant aptly stated,
There’s definitely, I think, viewscapes we should preserve especially for tourism. On Blomidon or Cape Split. Yep. Or any of the really scenic spots, I think it’s a good idea to protect those values. People go there because of the way they look, so I think that should definitely be a consideration when planning for those things [wind turbine development] (Researcher 2).

Most participants valued the revenue already being created by the tourist industry and although some acknowledged the potential economic growth that may occur due to wind turbine development, none expressed a willingness to risk the money that could be lost on tourism for the money that could be gained from a working wind farm. On the conditional side, most respondents were concerned with whether the turbines would be efficient enough and strongly expressed that they should only be erected in areas of maximum efficiency in terms of wind regime and return on investment (i.e., if money is going to be put into these projects at the risk of changing the landscape in ways that cannot be remediated, then it is only worth it if enough energy and money are being created by the project).

The intricacies of the procedural aspects of wind turbine development are perhaps the most difficult to understand on some level for those who are not usually involved in the planning process of such development; however, opposition to development is often rooted in perceived or real injustices to locals related to the procedural aspects to how a project is planned, executed, and maintained (Walker & Baxter, 2017). Respondents were resoundingly of the opinion that very careful and deliberate planning should go into the spatial planning process of wind turbine development and that locals should be given the opportunity to participate in at least some aspects of this process. One respondent said,
If it's planned well and engagement [are important]. And I think this [mapping activity] is great because the community should have a voice in saying where they think they would feel comfortable putting these items, so I think that's really important (Tourism 1).

In addition to engagement, people were calling for increased transparency and information for locals as part of the planning process. This sentiment was creatively expressed as a metaphor by one respondent when they said,

… sometimes, I feel that alternate sources are being sold to people the way that bread is sold to people in supermarkets. You don’t tell them what’s in there. You just tell them it’s good for you. And what is the environmental footprint [of the turbine] ...it’s not just the concrete that stands on it but the technology, the method that’s going into that...and that same thing, how much electricity can it produce to cover that initial cost… (Resident 6).

This statement illustrates that some community members in particular have a desire to learn more about the technology and financial aspects of projects, and believe that this information should be made available to the public. The most negative aspect of the planning process that respondents spoke about came from real-life experience and was fairly predictable in its dichotomy: participants felt that interference from the government and other community members in the implementation of wind turbine projects was negative, but only when it went against their own beliefs (i.e., one respondent was upset that the setback distance for the county as decided by the municipality and key community members would not allow for any turbine development on their land, whereas another felt that the municipality and other key community members were trying to push wind turbine development through the county too quickly).

In addition to the themes that fell under the VESPA umbrella, one other trend emerged from the interviews which is worth noting. In many cases throughout the interviews, respondents
felt the need to veer away from talking about their own personal opinions and instead assume the opinions of the general population without solid proof that their assumptions were correct. For example, it was very common for statements similar to “I expect you will have a lot of opposition from local folks here,” or “… it's fine where it is, but I think you'd get a lot of kickback in Annapolis, because Annapolis is a very tight-knit, little historic community. And, they would not want that around,” or “They don't want to ruin their beautiful views.” In some cases, respondents were simply assuming what others would want based on their own beliefs and transferring those thoughts onto others, but in some cases, people made assumptions about others’ sentiment toward turbines which were opposite to their own. Either way, making such assumptions can be dangerous for spatial planning exercises such as this one because if their assumptions are wrong, then the final results are affected; therefore, this is reinforcement that a wide variety of people from across the study area should be interviewed in order to create an accurate picture of the entire community’s sentiment.

Overall, the variety of responses gained from the interview portion of the MEI strongly confirm Fast’s (2015) theory that community sentiment toward RE development is rarely absolute and instead, has many qualifiers and factors involved. The responses were also essential in giving context to the map results gleaned in Chapter 2. While having the maps is useful for adding to a GIS-based MCE specifically for siting purposes, the reasoning behind the choices allows for researchers and decision-makers to specifically address community tensions in the spatial planning processes in new ways that cannot be determined from maps alone. For example, the idea that Blomidon and Cape Split are areas that should not be developed for wind turbines because of aesthetic views, recreation, and potential for negative effects to tourism
would not be possible to assume from maps alone. Therefore, if the MEI process is to be used effectively for the spatial planning of RE technologies, it is essential to have both maps and added context behind them. It must be noted that these results are specific to this particular case study and would not be applicable to another location, despite how similar it may be to the Annapolis Valley region. However, once again, the interview design and analysis itself is a process which may be replicated in any location and in relation to any RE technology.

3.4.2 Comparison of Interview Responses between Participants Who View Landscape as ‘Productive’ versus ‘Consumptive’

As was completed in Chapter 2 in mapping comparisons between groups, so are sentiment comparisons between ‘productive’ and ‘consumptive’ stakeholder necessary here. Figures 13 and 14 below show the number of responses per letter in the VESPA acronym, with specificity around positive, conditional, or negative sentiment:
Figure 12 A summary of participant responses from those classified in the 'productive' group, organized within the VESPA framework.
Recall that participants were divided between productive and consumptive groups (see Chapter 2 for details) and that this division conveniently sectioned the population approximately in half. The pattern of many conditional statements with less positive and negative ones which was observed across all participants also holds true within both of these groups. The number of positive responses is also fairly similar in both cases. This consistency throughout a majority of sentiments may indicate that, although the themes discussed in the interviews are about landscape values and these landscape values affect participants’ preferences regarding the spatial planning of onshore wind turbines, overall the chosen levels of aggregation as ‘productive’ or ‘consumptive’ did not play a role in responses in this case. This is not to say that the idea of productive versus consumptive stakeholder views should be abandoned, but rather that they did
not place a strong role in this case study. Perhaps when it comes to the development of RE technologies (as opposed to other developments), particular human-made addition to the landscape is one that a wide variety of stakeholders can accept in the name of a clean energy transition.

The clearest differences between the two groups can be seen in the higher number of conditional statements by the utilitarian group related to the conditional procedural aspects of wind turbine development in the region and the higher negative sentiment from consumptive participants on both the visual and socioeconomic side. Although any claims made about what could cause these differences would be speculative and could be highly case-specific, it can be useful to conjecture, as such ideas could be useful for future iterations of this study. About 75% of the conditional comments made by productive participants related to the procedural aspects of the spatial planning process were about the ideas that the process should be carefully and deliberately planned with consultation and engagement activities for the community baked into the process. This desire to participate and have the process thoroughly planned perhaps points to their level of awareness for land use practices and the importance of different perspectives when making planning decisions; simply put, perhaps people whose livelihoods or everyday lives focus more on how to efficiently and effectively use space for human purposes may be more likely to care about whether they are consulted in a matter of wind turbine development or not.

When consumptive participants spoke negatively about the visual impacts of wind turbine development in their region, they mentioned that views would be ruined; when talking about socioeconomic impacts of wind turbine development, they focused specifically on tourism. It is true that the tourist industry is a large economic driver in the Annapolis Valley region, and
the type of tourism specifically is related to the natural beauty and rural aesthetic of the region as viewed by tourists when they hike, paddle, cycle, visit wineries, paint, shop etc. Perhaps the hesitation from consumptive participants for wind turbine development due to a fear of ruining the economic value of the region through tourism stems from their higher sentiment of wind turbines being eyesores on the landscape no matter where they are placed (whereas most productive participants were more conditional about their dislike for the look of turbines), and they are assuming that other tourists to the area will feel the same.

3.5 Study Limitations

The main limitations with this part of the study are related to the number of participants interviewed and the way in which data was collected. The final n value of 41 participants is not high in relation to the population of the entire Annapolis Valley, but the fact that almost all stakeholder groups were accounted for shows that there was still breadth in participation. Therefore, one could not say that this is a representative sample by any means, but the results in terms of the spatial planning process itself and how results can be gleaned from this process are still valuable.

The second limitation was by design in some aspects, because it was a clear choice made at the beginning of the study to interview people on a one-on-one basis. This choice was made partially for ease in scheduling for myself, as this case study takes place hundreds of kilometers from my home base, but also because this would ensure that there was no influence from others on the results of each participant. In some cases, as outlined in Chapter 2, a focus-group style meeting could be more effective because perhaps people who have little or no information could
learn from others about this topic and formulate their opinion. In real-world situations, this sharing of knowledge is likely ideal in comparison to how this study was conducted. However, for the purposes of a thesis study, conducting interviews one-on-one with the intent of showing the usefulness of a spatial planning technique is sufficient.

3.6 Conclusion

Local landscapes and land-use systems are changing as market and policy changes facilitate more RE development. Some of these changes are supported by local communities, while others are opposed and divisive (Cleland et al., 2016). In many cases, the given community might be generally supportive of RE development, but opposed to actual projects in-place: a phenomenon often referred to as the ‘social gap’ (Bell et al., 2013). For the purpose of this chapter, I framed this scholarship in a broader context of trying to understand community responses, so as to negate the idea that overall community acceptance is always the end-goal for social science research and spatial planning practices. Rather, the goal is to understand the nuances of the factors that lead to support or opposition of RE projects.

This chapter provided a short review on literature related to the NIMBY phenomenon, current research which contests older NIMBY theories, then described the methodology and results gathered from this study that provided support for the idea that there is much more nuance to NIMBY which should be taken into account when planning for RE development. A majority of responses were conditional in nature, reinforcing Fast’s (2015) idea that a majority of people are along the midline of the spectrum of acceptance to opposition and although there was certainly evidence of Bell’s (2013) social gap theory, the conditional nature of responses showed
flexibility and an awareness for making compromises when it comes to wind turbine
development in the region. Participants also expressed a clear desire to be given the opportunity
to participate in the spatial planning process of RE development and that the presence of such an
opportunity would contribute to easing their concerns around new developments. The following
chapter will summarize the supporting theories which informed this study and the results of the
study as both theoretical and practical contributions of this research.
Chapter 4: Conclusions and Contributions of the Research

4.1 Summary

The effects of climate change will intensify over the decades ahead. A swift energy transition away from fossil fuels and toward RE resources is critical to mitigating the worst effects (IPCC, 2018). However, RE can also cause lasting local environmental, social, and economic effects that may be opposed by communities, even if those communities are supportive of RE generally (Bell et al., 2013; Cleland, Bird, Fast, Sajid, & Simard, 2016b; Fast, 2013; Fast, 2015). The separation between general acceptance and local-level concern has been referred to as the ‘social gap’ in RE development (Bell et al., 2013). One solution to this issue is through careful spatial planning: i.e., guiding RE development toward ‘low impact’ areas (Ruggiero, Onkila, & Kuittinen, 2014; Wüstenhagen et al., 2007). Once based primarily on technical criteria and guided by ‘expert’ analysis (Voivontas et al., 1998; Calvert & Mabee 2015), spatial planning procedures increasingly incorporate community-level consultations through which the underlying factors in public responses to RE are better understood in combination with technical criteria that must be satisfied in order to facilitate RE development (Ruggiero et al., 2014; Wüstenhagen et al., 2007).

The purpose of this thesis is to advance understanding of the factors that shape public reactions to RE development, and to develop practical methods and insights for incorporating community voices into spatial planning processes. More specifically, this work aims to address the question: how do landscape values influence local sentiment toward RE development, and
how can these values be incorporated into spatial planning processes? The thesis drives toward these questions through a methodology that centers on participatory mapping and map-elicited interviews (MEI). The three objectives for this thesis are strongly rooted in the process of MEI being used to achieve them, meaning that success in completing the MEI process is essentially equal to fulfilling the objectives of: identifying stakeholders, creating individual and composite maps for onshore wind turbine acceptability, and identifying dominant themes and sentiment related to landscape values from interview responses.

The results for Objective 2, as outlined in Chapter 2, showed consistency in where all participants considered to be more and less acceptable for onshore wind turbine development in the Annapolis Valley region. This consistency can be seen on the composite map and in the maps comparing ‘productive’ and ‘consumptive’ participant viewpoints. Such consistency prevailed in the results for Objective 3, as outlined in Chapter 3, when interview responses were coded under the VESPA framework and dominant themes and sentiments related to landscape values around onshore wind turbine development were identified. The results suggest that landscape values play a significant role in determining sentiment toward RE projects in this case, but that a participant’s relationship with the land, when characterized as ‘productive’ or ‘consumptive’, did not heavily influence their responses. Overall, the most important result from this thesis is the testing of the replicable MEI process and its usefulness in creating tangible, usable information that could inform future spatial planning practices for RE development.
4.2 Contributions

The contributions of this research may be divided into three categories that map onto the design of this study and the results which have been discussed and analyzed in previous chapters: the methodological, conceptual, and practical contributions. Each are discussed in turn.

4.2.1 Methodological Contributions

The overall MEI process, particularly the combination of participatory mapping with semi-structured interviews, contributes to the growing body of knowledge around participatory GIS and its uses for environmental management and landscape research. Past studies have used participatory mapping and interviewing separately, in paper-map form, as a modeling activity, or in online-only formats (Brown & Raymond, 2014; Hempel, 2017; Mekonnen & Gorsevski, 2015; Strickland-Munro, Kobryn, Brown, & Moore, 2016). This study draws upon those previous works to create a process which is interactive for the participant, while creating a layer which can be used in the broader spatial planning process when making siting decisions around RE development.

Additionally, the process allows for engagement in a place-based conversation that can provide a sense of procedural justice for participants by allowing them to participate in a tangible way in which their contributions (i.e., the map layers and interview data) have a clear path for use by decision-makers. In turn, it allows for researchers (or anyone using this methodology) to improve their understanding of public sentiment toward RE. Conducting the mapping activity alongside the semi-structured interview helps participants to think about where they live spatially...
while also picturing these places in their mind’s eye as the conversation focuses on particular changes in particular landscapes rather than on abstract or decontextualized changes. Conducting the analysis at a regional scale is consistent with spatial planning processes. The fact that this process is easily replicable also contributes to the strength in methodology and provides a clear way for other researchers to adapt the methods to other locations.

4.2.2 Conceptual Contributions

Recent studies have clearly shown that using the theory of NIMBY as an explanation for opposition to RE projects it not sufficient (Cleland et al., 2016; Devine-Wright, 2009; Fast, 2015). The variety of results generated by this study uphold the theory that there is much more nuance to social responses to RE projects. For example, NIMBY theory would suggest that residents of an area would never want to see wind turbines in their community, but 88% of participants are residents of the Annapolis Valley region and half of them not only accepted seeing wind turbines near them, but actively wanted to see turbines developed in the future for visual, socioeconomic, and environmental reasons. The nuanced reasoning participants provided as to why they support or oppose (or conditionally support or oppose) wind turbine development in the Annapolis Valley supports Fast’s (2015) theory that most people land on the spectrum between opposition and support, with qualifiers that may cause their sentiments to lean one way or the other.

Furthermore, their responses allow the researcher to identify their landscape values as organized in VESPA and assess what is most important to them and why; this type of information is much more difficult (or rather, impossible) to gather from opinion polling or short
surveys because working through these concepts may not come naturally for many people, so it is important to provide them time to think and assess their answers through targeted conversation. In this case, Petrova’s (2016) VESPA framework worked as an excellent organizational tool for interview responses, as all of the themes and factors discussed neatly fit into each of the categories provided.

This study examined the influence of landscape values on social responses to RE projects. All responses dealt with landscape values in some way, whether participants talked about why they would not want to look at a wind turbine in a particular spot due to its significance to them or why they felt the addition of wind turbines to the landscape would add an air of progressiveness to the region. These responses indicate a strong connection between varying landscape values and where people consider more or less ‘acceptable’ for RE development in their locality. An examination of results when participants were aggregated as ‘productive’ and ‘consumptive’ groups showed that there was little difference in response as a whole, indicating that although landscape values are important drivers in shaping sentiment toward RE development, these values may not be as strongly linked to whether a person views the land as an entity to be ‘used’ or ‘consumed in this case. Further study is recommended to add to this ongoing debate.

Alongside landscape values, the idea of participation and procedural justice are attributed to positive sentiments related to RE development (Adams, Wheeler, & Woolston, 2011; Giordono et al., 2018; Rand & Hoen, 2017; Simcock, 2016; Walker & Baxter, 2017). Some researchers have gone so far as to say that participation as a form of procedural justice should be written directly into legislation related to RE development in order to ensure its delivery.
(Lienhoop, 2018). The results of this study further support this idea because half of participants specifically stated that engagement in the RE planning process is a key factor in what they would consider an ‘acceptable’ project. Furthermore, the MEI process used for this study takes participation and procedural justice as a concept and puts it into practice in a replicable and adaptable format.

4.2.3 Practical Contributions

On a practical level, the replicability of this study is useful for municipalities, planners, and RE industry representatives who are looking to develop new projects. Any of these actors could use this process to get a better sense of locals’ sentiment toward RE development and understand why they feel this way, which contributes to a fairer and more just spatial planning process. As documented through other research, a lack of participation provided to locals in advance of a RE project often fosters opposition due to feelings of injustice in the process (Cleland et al., 2016b; Devine-Wright, 2011; Haggett, 2011). The ‘decide-announce-defend’ model of spatial planning for RE technologies has proven to be a point of tension between planners and local communities, and research on this topic calls for improved methods of early engagement (Devine-Wright, 2011). The use of a participatory mapping process such as this could be used to ease tensions in order to move development forward or cause for proposed development to change (i.e., a municipality looking into solar panels instead of wind turbines) or move the entire operation somewhere else based on local feedback. Either way, it is not about pushing projects forward with no regard for public input, but serving the region as a whole. Additionally, a recent review paper by Rand and Hoen (2017), which summarizes 30 years of
research in North American wind energy acceptance, says that the implementation of research findings into practice is sorely missing. Perhaps this is due to a disconnect between researchers investigating factors contributing to public sentiment toward wind energy and people ‘on the ground’ who are planning and executing wind energy projects. Lack of political will and incentives to carry on ‘business as usual’ may also offer explanations. Researchers and practitioners should work together on this sort of knowledge translation. Although the methodology of MEI is not perfect, I believe that it can provide some practical guidance (with theoretical roots) for decision-makers as they grapple with RE development in their regions.

Brown and Raymond (2007) articulate the practical contributions of this process perfectly when they say, “The mapping of landscape values and special places can provide an operational bridge between place attachment and applied land use planning that seeks to minimize potential land use conflict” (pp. 108). The methods used for this research aim to contribute to this ideal. Finally, the participatory mapping and MEI process is a tangible form of participation for people that not only helps them feel like they are contributing, it truly translates their thoughts into a form that can be used by planners in a streamlined way; if done effectively, this method could be a win for all parties involved. It is my sincere hope that this process is examined critically, replicated, and adapted for use in order to support future RE development.
References


5 Appendices

APPENDIX A

Community-Informed Spatial Planning for Sustainable Renewable Energy Resources:

Interview Questions

Information

1) Can you identify your place of residence? You can be as precise as you wish (region, city, town, exact address, or prefer not to answer).
   a) For how long have you lived there?

2) Circle all of the groups with which you identify. Please choose one with which you identify the most in the context of renewable energy development (which hat are you wearing in this situation?).
   a) Resident of the Annapolis Valley region
   b) Indigenous person/First Nation group
      i) Which First Nation group are you a member of?
         ______________________________________________
   c) Recreationalist
      i) What recreational activities do you participate in?
         ______________________________________________
   d) Fish harvester
   e) Farmer
      i) What is your primary crop and/or livestock?
         ______________________________________________
   f) Government official or civil servant
      i) What department do you work in?
         ______________________________________________
   g) Small business owner
i) What is the name of your business?

______________________________________________

h) Non-Governmental Organization representative
   i) What is the name of your organization?
      __________________________________________

i) Academic or non-academic researcher
   i) Under what discipline do you mainly conduct research?
      __________________________________________

j) Tourist industry representative
   i) What is the name of the tour company?
      __________________________________________

k) Energy services/developer or related company representative
   i) What is the name of your company?
      __________________________________________

l) Other (please specify)
   ____________________________________________
   ____________________________________________
   ____________________________________________

General Questions

3) What is your experience with and opinion of wind turbine development?

Unacceptable

4) When looking at this map of the region, can you identify areas that you would consider unacceptable for wind farm development? This could be a specific place or a more general land use type, land cover type, or landscape.
   a) When you were filling out the map, which factors did you consider when drawing the ‘unacceptable’ locations?
b) Can you elaborate on why these factors matter to you?
c) Are there any conditions that would cause you to change this to an acceptable location?

**Acceptable**

5) Please fill out areas on the map which you would consider to be completely unacceptable for wind farm development.
   a) When you were filling out the map, which factors did you consider when drawing the ‘acceptable’ locations?
   b) Can you elaborate on why these factors matter to you?
   c) Are there any conditions that would cause you to change this to an unacceptable location?

**Conditional/Unclassified**

6) Let’s look at the areas on the map which are not filled in. Can you elaborate on why these areas were not filled in?
   a) Are there any conditions that would cause you to classify these locations as either ‘acceptable’ or ‘unacceptable’?

**Wrap-Up**

7) Thinking back to your responses, what is your overall perception of wind turbine development? Has your opinion of it changed from the start of this conversation?
APPENDIX B

Figure 14 A more detailed breakdown of the V and E letters of VESPA, depicting the most prominent themes recorded for each type of sentiment.

Figure 15 A more detailed breakdown of the S and PA letters of VESPA, depicting the most prominent themes recorded for each type of sentiment. The (26) indicates that the two themes of ‘community owned’ and ‘distributed energy system’ tied with 13 mentions each.