UNDERSTANDING ATTACHMENT TO UTILITARIAN LANDSCAPES AND WIND ENERGY SUPPORT IN THE CHIGNECTO AREA

by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

While increasing production from renewable sources is of critical importance to address climate change and other global issues, it requires the construction of new infrastructure, which is often highly visible and located near communities. Unlike fossil fuel generation, which usually occurs in remote locations, the success of renewable energy production depends on support from communities for infrastructure in their landscape. Landscapes evolve to meet the changing needs of societies, and renewable energy production will change landscapes around the world in coming decades, with support for these changes from surrounding communities dependent on many factors.

The purpose of this study is to explore factors influencing support for wind energy from communities around an existing wind farm, in an area that has experienced other changes to local infrastructure. The study examines how residents perceive change to past utilitarian landscape features and how this influences support for future change in the context of wind energy. The study also explores other factors influencing support, specifically the distribution of energy and benefits from wind development. This research is guided by the framework of climax thinking, which is used to understand how people respond to change in their landscape and proposes that people are more likely to oppose change if they believe their surroundings to be static and fail to imagine past landscapes, future landscapes, or landscapes that occur elsewhere as a result of their energy use.

Research was conducted in the Chignecto area of Atlantic Canada, a region with a long history of interaction between humans and the environment and significant change to built landscapes over recent decades. The area is losing or has lost four landscape features: dykes from the 1600s are being moved or restored to salt marsh due to rising sea levels, foundries built in the 1800s no longer exist, most of the giant hay barns from the 1800s have collapsed or been removed, and radio towers dating from the Second World War were recently dismantled. Additionally, a wind farm was constructed near the Town of Amherst in 2012. A mail-out survey was designed and distributed to randomly selected homes in the region, achieving a response rate of 40%. All surveys contained question sets asking about exposure to wind turbines; support for wind energy development; place attachment to the Chignecto area; beliefs concerning distribution of energy and benefits from wind farms; and demographics. Half the surveys also contained an experimental section asking residents how they feel about past landscape change in the Chignecto area.

Results found that residents demonstrate attachment to past utilitarian landscapes, and analysis revealed this attachment to be independent of both place attachment and time in the region, but higher among males and conservatives. Attachment to past landscapes also increases wind support among people who currently see turbines from their home, but is not a significant predictor of support for people who can’t, suggesting wind turbines can become a part of people’s ‘climax landscape’. Many commonly used predictors of wind support, such as place attachment or community ownership, lack significance in this study, particularly at the local scale. New predictors, including support for additional renewable energy generation for export beyond local needs and agreement that wind turbines provide a reminder of energy use and generation, instead emerge at the local scale. This thesis explores how residents think about change to utilitarian features and wind energy generation in their surrounding landscape, suggesting new opportunities for understanding support for renewable energy development.

LIST OF ABBREVIATIONS USED

APUL – Attachment to Past Utilitarian Landscapes

BC – British Columbia

CNR/CN Rail – Canadian National Railway

COMFIT – Community Feed-In Tariff Program

EGSPA – Environmental Goals and Sustainable Prosperity Act

EU – European Union

FSA – Forward Sortation Areas

GCADB – Georeferenced Civic Address Data Base

GED – General Educational Development

GeoNB – Geographic New Brunswick

GIS – Geographic Information System

GRP – Gross Regional Product

MW – Megawatt

MWh – Megawatt Hours

NB – New Brunswick

NDP – New Democratic Party

NIMBY – Not In My BackYard

NOOMBY – Not Out Of My Back Yard

NS – Nova Scotia

OLS – Ordinary Least Squares

PCA – Principal Component Analysis

RCI – Radio-Canada International

UK – United Kingdom

US – United States

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CHAPTER 1 INTRODUCTION

1.1 Statement of the Problem

The importance of replacing some fossil fuel energy generation with renewable sources has become increasingly apparent in recent decades as global energy demand has grown and concern about climate change has become widespread (Enerdata, 2017; Selman, 2010). Approximately 70% of global electricity generation currently comes from fossil fuel sources, with associated greenhouse gas emissions, air pollution causing harm to human health and the environment, depletion of non-renewable resources, and energy security concerns (Kaldellis, Kapsali, Kaldelli, & Katsanou, 2013; Longo, Markandya, & Petrucci, 2008). It is evident that a decrease in fossil fuel use is necessary to slow further climate change and this reduction will require decreasing our energy demand, increasing the energy efficiency of technologies, and replacing much fossil fuel electricity generation with renewable sources (Selman, 2010).

Increased generation of energy from renewable resources requires the construction of new and often highly visible infrastructure including wind farms, hydroelectric dams, solar panels and associated electricity network extensions such as high voltage power lines (Batel, Devine-Wright & Tangeland, 2013). In addition to the high visibility of infrastructure, renewable energy is often generated on a smaller scale than fossil fuel generation, necessitating a greater number of project proposals and siting decisions (Wustenhagen, Wolsink, & Burer, 2007). Unlike fossil fuels such as coal or oil which can be extracted in remote locations and transported long distances, renewable energy is place-dependent and must be located where optimal production will occur, such as constructing wind turbines in coastal areas with high winds (Wustenhagen et al., 2007). In many cases this also corresponds with areas of human habitation, as in the case of coastal areas that often have a greater number of human settlements. These characteristics of renewable energy result in new, highly visible infrastructure being constructed near communities.

In addition to the importance of renewable energy to address issues at the global scale, it can also have multiple benefits at the regional and local scales, including providing profits and employment to surrounding communities, reducing air pollution if it offsets a nearby fossil fuel plant, and giving communities greater energy security (Kaldellis et al., 213; Musall & Koik, 2011). However, as with all forms of electricity generation, renewable energy also has environmental impacts and the costs are most often experienced at the local level (Warren, Lumsden, O'Dowd, & Birdie, 2005). The high visibility of such infrastructure in the landscape can be disruptive to local people's sense of place, turning natural landscapes into 'landscapes of power' and sometimes leading to opposition to developments (Devine-Wright, 2009; Pasqualetti, Gipe, & Righter, 2002, p. 3). To increase the production of energy from renewable sources without causing harm to local people by imposing developments that disrupt communities, it is important to understand factors influencing support for renewable energy developments from the residents living around them.

To explore local people's support for renewable energy infrastructure in their surrounding landscape and factors influencing this support, I begin by focusing on how communities perceive change in utilitarian landscape features. Utilitarian is defined by the Oxford English dictionary as "useful or practical rather than attractive" ("Utilitarian", 2009, p. 1022), and we use the term 'utilitarian landscape feature' to refer to infrastructure that humans construct in a landscape to respond to a societal need. I then explore how perceptions of change, along with other factors concerning the costs and benefits of renewable energy, influence support for renewable energy at different scales.

1.2 Conceptual Framework: Climax Thinking

Much of the research concerning perceptions of landscape change and support for renewable energy development in this thesis is guided by the conceptual framework of climax thinking. Climax thinking is a new theory proposed by Sherren (in press) to explore how people understand and respond to change in their landscape. Developed from the concept of climax communities in ecology in which succession progresses following a disturbance until a stable and dominant plant community is reached, climax thinking proposes that people often view their surrounding landscape as at a stable endpoint reached after years of human progress (Sherren, in press). Climax thinkers may have difficulty imagining past landscapes, future landscapes or landscapes that they influence elsewhere, leading them to oppose change to their surroundings (Sherren, in press). The theory of climax thinking offers an alternate but related explanation for opposition to renewable energy infrastructure to that of place attachment, which proposes that individuals develop an emotional bond with the places they live and new infrastructure can disrupt this attachment (Devine-Wright, 2009).

The temporal dimension of climax thinking is used in Chapter 2 to explore knowledge of and attachment to past utilitarian landscape features. Individuals may not have been present to observe previous landscape features or may not notice gradual change over time, therefore believing their surroundings have been static (Sherren, in press). They may thus resist the removal of landscape features even if these features are no longer serving their purpose (Sherren, in press). If people do not recognise that landscapes are continually evolving over time to adapt to societies' changing needs and do not recognise the inherent costs of energy generation, whether these impacts occur within their view or not, they will be less willing to support renewable energy infrastructure in their landscape. However, much as the theory of climax communities in ecology has largely been replaced by new theories describing ecosystems as fluid and continually evolving, the inability of communities to adapt to change in their landscape has often been proven false (Sherren, in press). In their study of rural landscapes in England, Park and Selman (2011) state that people consistently value rural landscapes, despite the fact that these areas are continually evolving. Similarly, Keilty, Beckley and Sherren (2016) demonstrated how local people's expectations of their surrounding landscape changed within a single generation in the context of dam construction and removal.

In addition to the temporal dimension in Chapter 2, the spatial dimension is used in Chapter 3 to explore support for renewable energy at different scales. Individuals may fail to consider landscapes or impacts that occur elsewhere as a result of their energy decisions and use. Traditional fossil fuel energy is typically produced far from where it is consumed, leading to a lack of awareness about the costs of electricity use and a lack of support for renewable energy infrastructure at the local scale (Adams & Bell, 2014; Sherren, in press). Local production and use of renewable energy has been proposed as a strategy to reduce the 'out of sight, out of mind' mentality inherent in fossil fuel generation and motivate more sustainable choices. Studies have suggested that people may place a higher value on energy generated by nearby infrastructure, therefore reducing their consumption (Adams & Bell, 2014). Both the temporal and spatial dimensions of climax thinking are used throughout this thesis to understand support for current and future landscape change in the context of renewable energy infrastructure.

1.3 Context: The Chignecto Area

The Chignecto area is situated on the border of New Brunswick (NB) and Nova Scotia (NS) in Atlantic Canada (Figure 1). The area has a population of approximately 20,000 and includes the towns of Sackville, NB and Amherst, NS (Statistics Canada, 2017). The region has undergone numerous changes to the built landscape over recent decades, with the loss or modification of four historic utilitarian landscape features as well as the addition of a wind farm. Dykes constructed by the Acadians in the late 1600s to drain the saltmarsh and create agricultural land have existed in the region for centuries but are now being moved, breached or modified to accommodate rising sea levels caused by climate change (McClearn, 2018; Mount Allison University Archives, 2004). Foundries with tall smokestacks were established in the area in the mid-1800s for metal processing and existed until some buildings were demolished in the 1980s, while others were destroyed by a large fire in 2012; none of the tall smokestack remain today ("Historic Sackville", 2012; Mount Allison University Archives, 2004). Large hay barns were constructed throughout the 19th and 20th centuries and used to store hay for horses, with over 400 barns existing on the marsh at one time (Mount Allison University Archives, 2004). However, following the increased use of automobiles, the hay economy declined, and the barns were slowly destroyed by fires, storms and vandalism, with fewer than 13 remaining (Mount Allison University Archives, 2004; "Tantramar Marsh", 2016). Radio towers with a distinctive web of wires and flashing lights were constructed during the Second World War to broadcast radio to Canadian troops overseas, continuing to transmit Canadian radio following the war until internet largely replaced shortwave radio and the towers were dismantled in 2014 (Foster, 2014; Morris, 2012). Despite being a rural area, the regional landscape has experienced significant change.

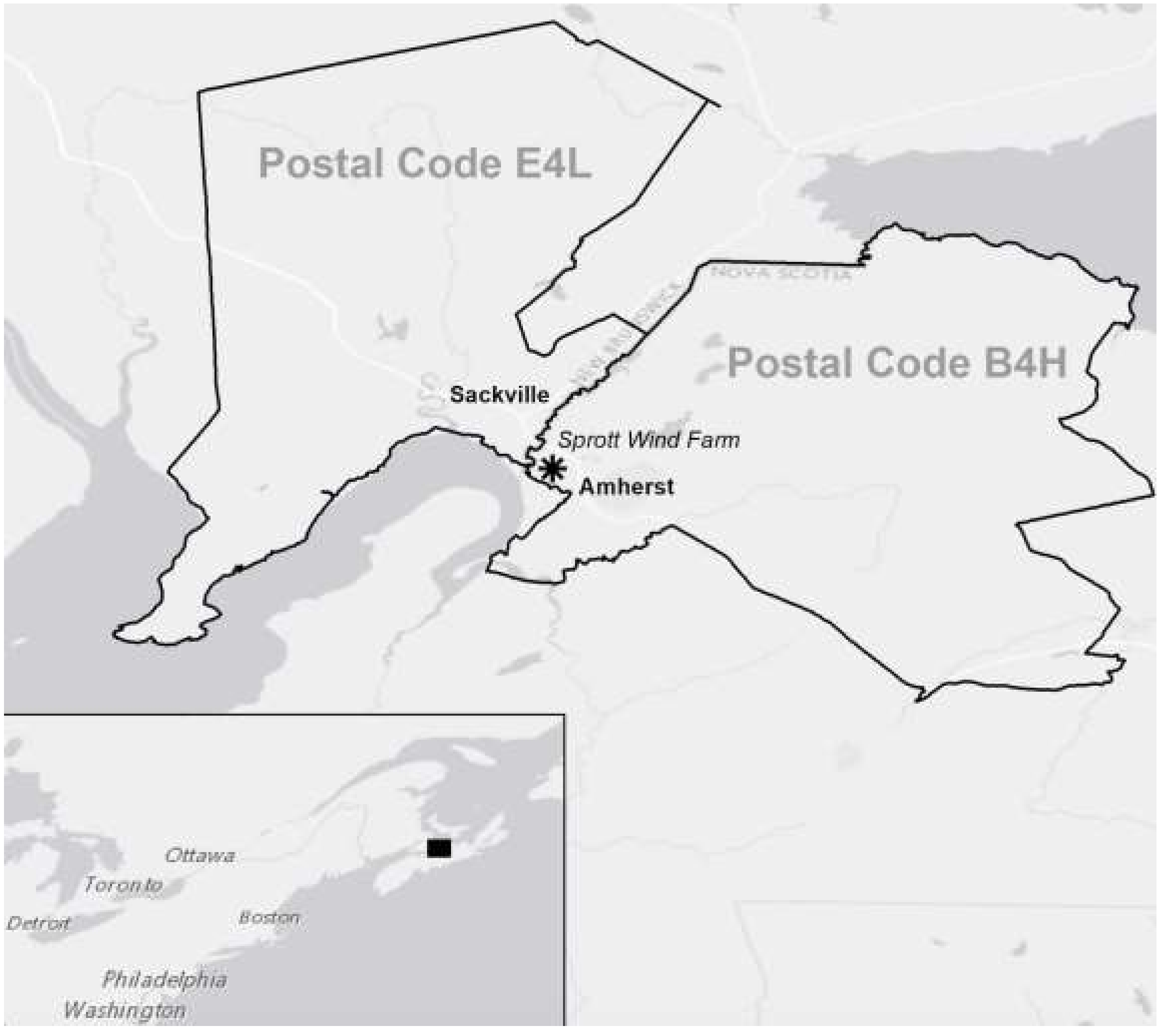

Figure 1. Map of study region in the Chignecto area, defined by postal code FSA of E4L on the NB side and B4H on the NS side, including the Sprott Wind Farm in relation to Northeastern US cities.

In addition to the loss of the four utilitarian landscape features discussed above, the region also underwent change to the built landscape through the construction of a wind farm. Fifteen turbines were approved and constructed near Amherst in 2012. ("Maritime Wind", 2012). Around the same time, another wind farm proposed near Sackville was rejected by that town (John Higham, personal communication, June 27, 2018). The wind farm is located approximately three kilometres west of the Amherst town centre and approximately ten kilometres southeast from the Sackville town centre, with the turbines visible from most of Amherst and parts of Sackville due to the flat topography of the marsh. The wind farm is privately owned and operated with energy sold to NS Power to help the province meet their target of 40% renewable energy by

2020 ("Maritime Wind", 2012; NS Power, n.d.). Renewable energy targets were set by the province in 2007 to address greenhouse gas emission and energy security concerns, as at the time 88% of the province's electricity came from fossil fuels, with 75% from imported coal (Adams, Wheeler, & Woolston, 2011). An additional three turbines have been constructed since 2012, with all 18 turbines existing prior to the start of the study period (Cole, 2019).

1.4 Site Rationale

While other forms of renewable energy such as solar and hydro similarly have both costs and benefits, this study is focused on wind energy. Wind energy has been recognised as one of the least environmentally harmful sources of electricity (Slattery, Lantz, & Johnston, 2011). It requires a smaller land footprint than solar power and, unlike hydropower, does not damage ecosystems through flooding of land, with relatively few lasting impacts following the removal of turbines (Firestone & Kirk, 2019; Le Du-Blayo, 2011). Electricity generation from wind energy has increased over recent years and is projected to continue to rise, with wind accounting for 6% of Canada's energy production in 2017, up from just 1% in 2007 (Rand & Hoen, 2017; Richards, Noble, & Belcher, 2012). In NS, wind similarly generated just 1% of the province's energy in 2007, but now accounts for an average of 18% as of April 2019 (NS Power, 2019). Wind energy has been identified as a sector with further potential development, as NS is a coastal province with significant wind resources (Adams et al., 2011). However, despite the potential for wind to offset fossil fuel generation in NS and beyond, turbines can be met with mixed reactions from surrounding residents. Although some individuals have concerns about the potential health impacts of living near turbines, these health implications have been explored extensively in a recent nation-wide study by Health Canada. The study found the health impacts experienced by some individuals around wind farms to largely be the result of expectations of harm to health and resulting stress: the Nocebo Effect (Michaud et al., 2013). My thesis is focused on other factors influencing support for wind energy, namely landscape impacts and the distribution of energy and benefits, rather than potential human health impacts.

The Chignecto area was selected for this study due to the natural experiment occurring in the area with the loss of past utilitarian landscape features and the construction of the wind farm, allowing for the exploration of how local people form attachment to utilitarian features and conceptualise change in their landscape. The radio towers are of particular interest as they share many structural characteristics with wind turbines as tall towers, and were widely recognised across the marsh and beloved by many (Morris, 2012). Additionally, the construction of the wind farm near Amherst and the rejection of another development near Sackville allows for the exploration of how attitudes differ between the two towns, as well as how attitudes in Sackville may have changed in the seven years since the Amherst development was completed. Furthermore, the towns have different histories and demographics, with the existence of Mount Allison University in Sackville contributing to the population of Sackville having a younger age, higher university education, and higher income than Amherst (Statistics Canada, 2017).

1.5 PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

The purpose of this study is to understand: climax thinking in the context of attachment to past utilitarian landscape features; how knowledge of and attachment to past features influence support for wind energy development; and other factors influencing support for wind energy development. As it is expected that renewable energy infrastructure, with associated landscape impacts, will continue to be developed over coming decades to address the sustainability challenges inherent in fossil fuel generation, it is valuable to understand factors influencing support from the communities around developments. Currently, a lack of research exists concerning communities' responses to the loss of historic, utilitarian landscapes, as well as how this relates to acceptance of current and future utilitarian landscape features. Additionally, it has not been clear whether climax thinking is independent from place attachment. Concerning wind energy, Rand and Hoen (2017) note that North American literature is lacking in detailed exploration of the attitudes of people living closest to developments, as well as needing more research focused on existing wind farms rather than proposed or hypothetical developments. Furthermore, Aitken (2010) notes that studies often cite high support for wind energy at the national scale but lack detail of how this support is measured, and suggests that support for development at the national scale be studied more frequently. To address these gaps, we explore attachment to past landscapes and support for wind energy at the national, regional and local scales from residents living around the Amherst wind farm, focusing on the distribution of energy and benefits from wind energy to respond to the following research questions:

1. How do people think about past landscape change and how is this related to other dimensions such as place attachment?

2. What drives support for wind energy development at the national, regional and local (within view of respondents' homes) scales?

1.6 Methodological Overview

To respond to these research questions, we designed and distributed a mail-out survey to residents in the Chignecto area, around the vicinity of the Amherst wind farm. All surveys contained question sets asking about exposure to wind turbines; support for current and future wind energy development at the general/ national, regional and local/ home scales; place attachment to the Chignecto region; beliefs concerning the distribution of energy and benefits from wind farms; and demographics. Half the surveys also contained an experimental section asking about past landscape change in the Chignecto area, with pictures and brief descriptions of the four past landscape features described earlier accompanied by questions asking if they had noticed it, if they believed it fit well in the landscape and if they were sad at its loss. This experimental section was used to examine attachment to past landscape change in the region as well as to test whether being reminded of past change increased support for current and future change in the context of wind energy, which is why it was only included in 50% of the surveys. This experimental section was asked after the question set about support for wind energy at the national scale but before the question sets about support at the regional and local scales, as it was testing whether being reminded that the landscape is continually evolving increases support for wind farm development causing local landscape change, rather than wind energy development in general.

We conducted a multiple reminder mail-out study to balance both research objectives and time and budget constraints. While interviews or focus groups can collect more in-depth, qualitative perspectives from a smaller number of participants, we wanted to reach a large number and spectrum of people in the area to explore local perceptions using quantitative analysis. As studies have noted declining response rates from mail-out surveys over recent years (Stedman, Connelly, Heberlain, Decker, & Allred, 2019), we explored various options to maximise response rate. One option was drop-off/pick-up survey distribution (Jackson-Smith at al., 2016), but this would have been expensive with a research assistant or very time-consuming for one person given the rural area, and was not guaranteed to yield a higher response rate. An online survey advertised through Facebook and posters around the town was also considered, but the Cambridge Analytica scandal that occurred shortly before our survey period raised concerns about online data collection (Cadwalladr & Graham-Harrison, 2018). Conducting research using a survey company was also considered, but this would have been very expensive and would not have allowed us control over our data collection. Therefore, the multiple reminder mail-out approach following Dillman (1978) was identified as the best method to balance response rate with other considerations.

1.7 Limitations

As with all research methods, there are limitations inherent in mail-out survey research. Unless a survey achieves a 100% response rate, there is self-selection bias in who chooses to answer the survey. The demographics of our survey population can be compared to the demographics of region using census data only for variables included in the census. Furthermore, by conducting a survey through the mail rather than in person, we were unable to control the order in which people completed the survey or how they interpreted the questions. The order the survey was completed in mattered, particularly for the experimental surveys, and questions on the survey were numbered but we do not know whether participants followed this intended order or not. Additionally, while we carefully considered each question and tested them prior to distributing the survey, people may have been unclear about some questions or may have interpreted them differently from how we intended.

The results of this study are specific to the Chignecto area and cannot be generalised to wind farms in other regions. Support for wind energy as well as perceptions of other landscape features vary depending on factors specific to an individual location including the surrounding landscape, politics at various scales, relationships within the community, history of the development and many other factors. For example, as noted by Walker, Stephenson and Baxter (2018), wind energy in Ontario is significantly more controversial and politicised than in NS, with local support for wind energy from nearby residents only 27% in Ontario compared to 79% in NS. Therefore, results of this study should only be used to understand support for wind energy development from a sample of people in the Chignecto region and care should be taken with generalising to other populations.

1.8 THESIS OUTLINE

This thesis is presented as two separate papers focused on different but related topics. The first, Chapter 2, is focused on local people's perceptions of change to surrounding utilitarian landscape features. It explores how residents think about past landscape change in the Chignecto region and the factors influencing attachment to past utilitarian landscape features. It also discusses preliminary results for wind energy support at three scales to examine the impact of the experimental treatment on support for wind turbines. Chapter 3 explores other factors influencing support for wind energy at the three scales from people in the Chignecto region, with a focus on regression analysis and how beliefs about the distribution of energy and benefits impact support. The experimental treatment and attachment to past landscapes scale were dropped from the analysis in Chapter 3 due to a low sample size and inconclusive results, explained in Chapter 2. Finally, Chapter 4 summarises the key findings of this study, why we believe these findings are significant and suggests opportunities for further research.

CHAPTER 2 ATTACHMENT TO PAST UTILITARIAN LANDSCAPE FEATURES AND ITS IMPLICATIONS FOR WIND ENERGY DEVELOPMENT

2.1 INTRODUCTION

Built landscapes change over time to meet the continually evolving needs and objectives of societies. Landscapes can be defined as areas resulting from the natural and cultural interactions between the environment and humans (Council of Europe, 2000; Park & Selman, 2011). Antrop (2005) explains that cultural landscapes result from consecutive societies reorganising the land to adapt it to their changing needs. Therefore, landscapes are always evolving due to the dynamic interactions of nature and culture (Antrop, 2005). These changes are influenced by a variety of factors and differ depending on the location. In many areas around the world, economies shifted from traditional agriculture to larger scale production during the industrial revolution, resulting in unprecedented changes to landscapes (Nadai & van der Horst, 2010). As technologies have continued to develop, along with increased globalisation and urbanisation following the Second World War, landscapes have further evolved (Antrop, 2005). In more recent years, climate change and environmental concerns have led to the increasing prevalence of renewable energy infrastructure, presenting new challenges and opportunities for landscapes (Nadai & van der Horst, 2010).

The European Landscape Council recognises landscape as one of the most important environmental components for quality of life (Council of Europe, 2000) and significant further changes are predicted to rural landscapes around the world in coming decades to accommodate new demands for food security, transport, energy, housing and tourism (Park & Selman, 2011). Therefore, it is important to understand how communities adapt to changes in their landscape as global challenges put new pressures on local environments. Much of the current research concerning communities' responses to built landscape change has been conducted in Europe (Antrop, 2005; le Du-Blayo, 2011; Park & Selman, 2011). Built landscapes in Canada have been influenced by various forces over time, as discussed by Niewojt (2007), who examined landscape change in the context of agriculture in Norfolk County, Ontario and described a continuum of change in the centuries following European arrival in the area. However, relatively little research has been done in the Canadian context concerning utilitarian landscape features, including how residents respond to the removal of past landscape features as well as the addition of new ones. Utilitarian landscape features are defined for this study as infrastructure constructed by humans in a landscape to meet a societal need, following the Oxford English dictionary definition of utilitarian as meaning “useful or practical rather than attractive” (“Utilitarian”, 2009, p. 1022).

Renewable energy development requires the construction of new, often highly visible utilitarian landscape features such as wind turbines or solar panels (Wustenhagen, Wolsink, & Burer, 2007). Understanding community perceptions of past utilitarian landscape features may help in predicting support for future utilitarian features in the context of renewable energy. Multiple studies have focused on communities’ responses to the addition of renewable energy infrastructure to their landscape (Devine-Wright, 2011; Jacquet & Stedman, 2014; Krauss, 2010), including some in Canada, such as a study in Ontario examining residents’ landscape preferences regarding wind farms (Hempel, 2017). However, few studies have been conducted that also examine responses to the loss of utilitarian features from landscapes. Concern may arise over threats to heritage or protected landmarks, such as Nova Scotia’s Fortress of Louisbourg currently being flooded by rising sea levels (Dunham, 2017), but less attention is paid when everyday features are lost from the landscape, despite the significance these may have to the communities around them. Lighthouses are one example of a utilitarian landscape feature often valued by surrounding residents beyond their need, with a recent report from Canada’s auditor general suggesting more should be done by the federal government to preserve Canada’s heritage lighthouses (Gunn, 2018). Exploring communities’ attachment to both past and current utilitarian features in their surrounding landscape may provide additional insight into support for renewable energy development.

Opposition to landscape change by surrounding communities may arise if community members believe the changes will be a negative disruption. Park and Selman (2011) explored attitudes towards rural landscape change in England. They argue that landscape change can have both positive and negative aspects, with positive changes being those that are consistent with people’s visions for an area’s enhancement (Park & Selman, 2011). Le Du-Blayo (2011) discussed landscape change in Europe in the context of resilience, differentiating between changes that are easy to reverse, such as dismantling wind turbines, and those that have a more lasting impact on the landscape, such as large scale agro-fuel development that replaces meadows or fodder crops and accelerates levelling of embankments.

In addition to understanding the resilience of the landscape, it is useful to explore the resilience of people in surrounding communities. Resilience thinking proposes that social-ecological systems are continually changing, and Rawluk and Curtis (2016) explain that individuals perceive and adapt to these changes in different ways. Jacquet and Stedman (2014) explored the social-psychological disruption to communities caused by landscape change in the context of renewable energy development. They argue that the landscape impacts of energy developments can disrupt place-based identity in surrounding communities, which can result in opposition to further land use changes (Jacquet & Stedman, 2014).

The Not In My Back Yard (NIMBY) concept was introduced in the 1980s and frequently used to explain the opposition of communities to nearby developments (Jacquet & Stedman, 2014), or Not Out Of My Back Yard (NOOMBY) in the case of objection to removal of landscape features (Fox, Magilligan, & Sneddon, 2016). However, researchers have since begun exploring more nuanced understandings of the impacts of landscape change on communities and the reasons why opposition may arise (Cass & Walker, 2009; Graham & Rudolph, 2014). Alternative explanations to NIMBYism that aim to understand support for landscape change include climax thinking (Sherren, in press) and place attachment (Devine-Wright, 2009). Climax thinking proposes that individuals may resist change to their landscape because they have a difficulty imagining past or future landscapes and believe their surroundings are in an optimal state that would be damaged by further change (Sherren, in press). Place attachment, a related concept, states that people have an emotional bond with the place they live and may oppose change to the landscape if it disrupts this bond, a part of their identity (Devine-Wright, 2009). These two concepts are explained further in the background section.

We build on this small amount of previous work examining the dynamic nature of landscapes and the ways people perceive and adapt to changes in the landscape using knowledge of and attachment to past landscapes. A lack of research currently exists in the Canadian context concerning communities' responses to the loss of historic utilitarian features from their landscape, as well as how this relates to support for new utilitarian features, specifically renewable energy infrastructure. Furthermore, little research has been conducted to clarify whether Attachment to Past Utilitarian Landscape features (APUL) is independent from place attachment, as residents' attachment to specific features may differ from their general attachment to the place they live. While place attachment has been used to help understand support for or opposition to landscape change caused by renewable energy development (Devine-Wright, 2009), APUL may offer a new, related but different explanation if it is distinct from the concept of place attachment. To address these gaps, we examine perceptions of landscape change and APUL in Canada using an experimental mail-out survey distributed to residents in a rural, dyked, historically agricultural region that has undergone numerous changes over recent decades. Through this study, we aim to answer the following research questions:

1. How do people think about past landscape change?

2. How is (1) related to familiar dimensions such as place attachment, time in place and politics?

3. How do (1) and (2) above influence support for wind energy development?

2.2 BACKGROUND

NIMBYism is now largely discredited as an explanation of public resistance to landscape change (Devine-Wright, 2005; Wolsink, 2006). Devine-Wright (2005) and Wolsink (2006) explain that NIMBYism has often been used to portray objectors as selfish or ignorant individuals with greater concern for their own interests than for society or the environment, arguing that this term is often unhelpful and does not accurately represent the varied and complex reasons individuals and communities may have for objecting to change. Graham and Rudolph (2014) agree that research should explore alternative explanations to NIMBYism when examining community opposition to new developments in the landscape. Going beyond merely avoiding community opposition to projects, Batel, Devine-Wright and Tangeland (2013) differentiate between acceptance and support in their exploration of community support for renewable energy. Acceptance implies non-agency and can involve people living with something they may not support, but do not actively oppose, while support involves a more active and positive view of a project (Batel et al., 2013). Alternative explanations have emerged to understand the multiple factors influencing community support for built landscape change. These alternative explanations include the concepts of place attachment and climax thinking and are explained in more detail in the following section, as they are used throughout this study to examine the attachment of community members to utilitarian landscape features.

The theory of place attachment suggests that people or communities with stronger attachment to the places they live will be more likely to resist changes to their surrounding landscapes (Devine-Wright, 2009). Devine-Wright and Howes (2010) explain place attachment as the emotional bond that individuals or groups have with the locations they live or visit frequently. Place attachment is usually, although not always, a positive bond developed through cognitive, affective and behavioural ties with the physical and social aspects of a place (Devine-Wright, 2011). Place attachment can be influenced by factors such as the length of time lived in a location or perceptions of neighbourhood cohesion (Devine-Wright, 2011). Raymond, Brown and Weber (2010) identified five dimensions of place attachment: place identity, place dependence, nature bonding, family bonding and friend bonding. Place identity refers to the ways in which symbolic connections to a place and feelings about the physical setting contribute to an individual's sense of self (Brown, Raymond, & Corcoran, 2015). Rural environments in particular can inspire strong identity associations for residents and various studies have examined place attachment as it relates to acceptance of landscape change. Park and Selman (2011) found that strong place attachment in rural areas, measured as high levels of affirmative attitudes to rural landscapes, was the strongest barrier to accepting change in these locations. They also found older people to be more resistant to change (Park & Selman, 2011). A study by Brown, Perkins and Brown (2004) found place attachment to be positively influenced by years lived in the region. Devine-Wright and Howes (2010) applied the concept of place attachment to study support for an off-shore wind development in Wales. They compared two towns located an equal distance from the wind development and found support for the wind farm to be negatively correlated with place attachment (Devine-Wright & Howes, 2010).

The concept of place attachment as it relates to new landscape developments is further supported by the U-shaped curve of support for wind energy infrastructure proposed by Wolsink (2007) (Figure 2). General public support for wind energy is high prior to a specific project proposal, but support within a community often declines following the proposal announcement due to concern about landscape impacts (Wolsink, 2007). Support remains low throughout the planning and construction phases, but usually increases a few years after completion (Wolsink, 2007). This suggests that new developments with significant landscape impacts can be disruptive and upsetting to community members, but that people can often adjust to these new landscape features over time and come to accept or even appreciate the new development (Wolsink, 2007). The U-shaped curve of support is also supported by the concept of shifting baselines, discussed below in the context of hydroelectric development (Keilty, Beckley, & Sherren, 2016).

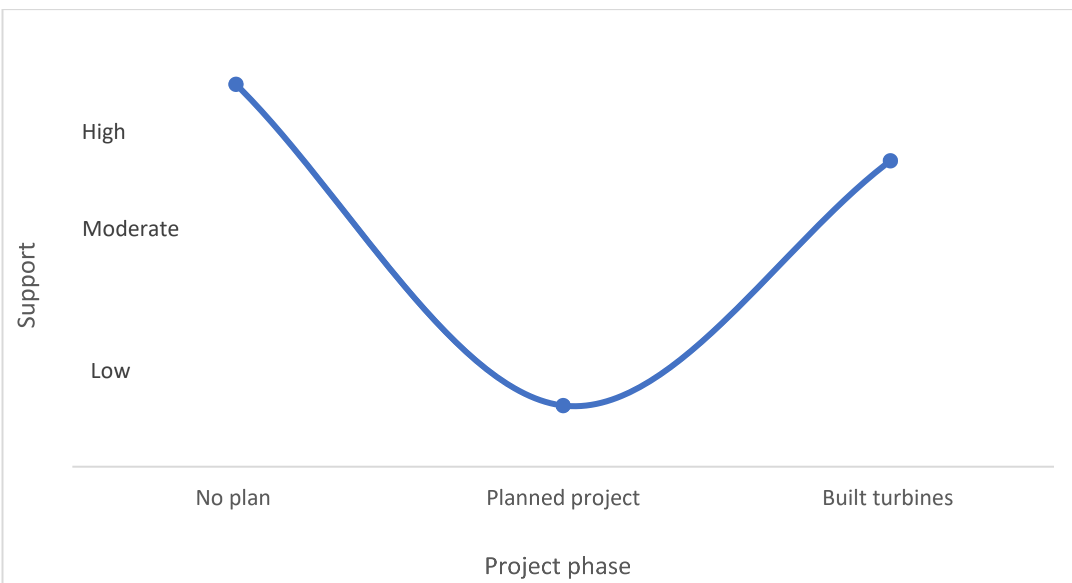

Figure 2. The U-shaped curve of support, showing public attitudes towards wind power at different phases of a near-by project with multiple turbines. Adapted from Wolsink (2007).

An alternative theory, climax thinking, proposes that individuals who view their surroundings as at the optimal endpoint reached after years of human progress are more likely to oppose further changes to the landscape. Proposed by Sherren (in press), it echoes the idea of climax communities in ecology, in which ecological succession progresses following a disturbance in an area until the ecosystem reaches a stable and dominant plant community, the so-called equilibrium. Sherren (in press) argues that as the ideas of succession and climax communities in ecology have largely been replaced by non-equilibrium concepts that describe ecosystems as fluid with multiple potential states, so we should do the same with lived landscapes. Climax thinking was hypothesised to have temporal and spatial dimensions including a lack of awareness of previous landscapes and landscape change in the area, whether people were not present to observe it or simply did not notice gradual change over time, and therefore hold that their surroundings are static (Sherren, in press). Similarly, Pasqualetti (2011) discusses the concept of immutability in exploring opposition to wind energy, explaining that opposition may arise from an expectation that the landscape should exist permanently in its current state. Additionally, Fresque-Baxter and Armitage (2012) state that continuity in landscapes can be a critical aspect of place identity for surrounding residents. Building on these ideas, climax thinking can include an inability to imagine past landscapes, future landscapes, or impacts of local stasis on landscapes that exist elsewhere (Sherren, in press). Climax thinkers may be more likely to resist future changes, such as renewable energy developments, as they believe the community will be unable to adapt to this landscape change (Sherren, in press).

Fears of inability to adapt have frequently been proven false, however, as communities are often highly adaptable and capable of adjusting to new surroundings (Sherren, in press). Norms can change over generations, or even within generations as people modify their preferences and expectations of the landscape (Sherren, in press). Supporting this idea, Park and Selman (2011) found that individuals have consistently highly valued the rural landscape of England, which can sometimes result in opposition to new developments in rural areas. However, they argue that landscapes have never been static and that people consistently value rural settings despite the continuously changing nature of these landscapes, suggesting that people adapt their preferences for landscapes and these partialities can be learned through the process of socialisation (Park & Selman, 2011).

Examining the response of communities to past changes in their landscape may be helpful in understanding support for future modifications, such as renewable energy infrastructure and other landscape change decisions. Antrop (2005) discusses past landscape change in Europe, explaining that not only are landscapes continually evolving but our values also change over time, influencing what landscape features are appreciated and protected. Understanding the processes that have influenced past change and the ways people have managed and adapted to alterations in valued landscapes can be useful in planning for future changes (Antrop, 2005). Using past change to understand future change, Krauss (2010) explored wind power in the dykelands of North Germany. Krauss (2010) explained that the coastal landscape in the region has resulted from centuries of interactions between humans and the environment, with historical construction and maintenance of dykes used to drain the salt marshes and create agricultural land. The dykes, built by residents of surrounding communities, interacted with the wind and tides to create a dynamic constructed landscape (Krauss, 2010). Krauss (2010) argues that the rise of wind energy in the landscape similarly resulted from the interactions between people and nature in the area rather than from a top-down imposition of wind farms on the communities. The success of wind energy in the region thus can be viewed as a continuation of the centuries of dynamic constructed landscapes (Krauss, 2010). Similarly, Hanley et al. (2009) examined the impact of awareness of past landscape change on perceptions of current and future changes. Hanley et al. (2009) surveyed local residents and visitors in two national parks in the United Kingdom (UK) using in-person questionnaires. The study used a split-sample design, with each version of the survey containing different information, including maps and text portraying alternative perspectives on past landscapes in the parks, followed by questions on their preferences for either no change or different types of future change in the landscape (Hanley et al., 2009). The study found that the landscape history information had a significant impact on respondents' preferences for future land use (Hanley et al., 2009). Overall, results of the study suggested that learning the landscape had been different in the past or learning that perceptions of the landscape had shifted over time increased support for future change in the region (Hanley et al., 2009).

Selman (2010) discusses the idea of ‘acquired aesthetics’ versus ‘hard-wired’ landscape preferences, proposing that there is a balance between biological baselines, which are unchanging, and cultural baselines, which evolve as societal values change. Keilty et al. (2016) demonstrated the significance of shifting cultural baselines and the ways in which residents’ views and expectations of their surrounding landscape change both within and between generations in the context of a hydro-electric development. The Mactaquac hydroelectric dam was built in New Brunswick (NB) in the 1960s and is now reaching the end of its lifespan, earlier than expected due to premature aging (Sherren, Beckley, Greenland-Smith, & Comeau, 2017). Despite the initial disruption, in the decades following construction local people grew to value the headpond for its aesthetic and recreational value and, following public consultation, a decision was made to maintain the dam and headpond (Sherren et al., 2017). Using a Baselines of Acceptability framework to explore how landscape preferences change both within and between generations and at both the individual and societal level, Keilty et al. (2016) found that local residents demonstrated the ability to adapt to landscape change caused by the hydroelectric development. Their study included both people who had lived in the area prior to construction of the dam as well as people who had not, and all participants supported maintaining the dam and headpond, even those who spoke of trauma caused by its construction (Keilty et al., 2016). This suggests that, although people may fear change in their landscape, preferences can shift and people can adapt and even come to like the change they had initially feared (Keilty et al., 2016). Understanding how people see past change in landscapes can be useful for understanding climax thinking and acceptance of future change.

2.3 Methods

2.3.1 Study Area

The Chignecto area, also called the Tantramar Marsh or the Chignecto Isthmus, is located on the border between the provinces of NB and Nova Scotia (NS) in Atlantic Canada. The area is situated on the edge of the Bay of Fundy, an inlet of the Atlantic Ocean and the Gulf of Maine, and includes the towns of Sackville, NB (population 5,331), Amherst, NS (population 9,413), as well as surrounding homes and farms. The

Chignecto area is known for its large erstwhile salt marsh with a unique ecosystem and extremely high tidal range (Mount Allison University Archives, 2004). The area has a rich and long history of interaction between humans and the environment, providing an example of a region that has undergone alterations to the built landscape over past decades as the economy and needs of the area have changed. Five significant changes are described that are explored in the research.

One of the earliest examples of built landscape in the region is the network of dykes constructed by French settlers (Acadians) beginning in the late 1600s (Figure 3a). Prior to the arrival of Europeans, Indigenous people in the region had been harvesting plants and animals from the marsh for over 5000 years, as well as building temporary encampments on the edge of the marsh as they travelled through the region seasonally (Mount Allison University Archives, 2004). However, there was little significant landscape alteration in the area prior to the settling of Acadians in 1672 (Mount Allison University Archives, 2004). The Acadians constructed dykes to drain the salt marshes and convert the marshland to agricultural land, similar to techniques used in their native western France (Mount Allison University Archives, 2004). Although the Acadians were deported from the region by the English in 1755 (some resettled back later) and little other remnants of their original settlements remain, the dykes have been maintained and expanded for centuries, allowing the marshland to be farmed and inhabited by the New England Planters and later European settlers in the area following the Acadians (Mount Allison University Archives, 2004).

Despite the centuries-long existence of dykes in the region, rising sea levels and strong storm surges caused by climate change have resulted in recent changes to the dyke network (Lieske & Bornemann, 2011). Some dykes have already been breached by rising sea levels, causing flooding in the region, while others are being repaired, upgraded or realigned to prevent further flooding and reduce maintenance burden (Lieske & Bornemann, 2011; Sherren, Bowron, Graham, Rahman, & van Proosdij, 2018). Climate change models predict that sea levels will rise enough to breach dykes and flood the marsh within the next 15 to 20 years, resulting in the loss of farm land, parts of Amherst and Sackville, and the Trans-Canada highway and CN Rail line (Corfu, 2017). Flooding could also result in NS, now an isthmus, becoming an island (Corfu, 2017). It is highly likely that the existing dykes won't be able to withstand rising sea levels in the coming century, so alternative engineering strategies to protect against flooding are currently being discussed, and further changes to the historic dyke lands are expected in coming years (Corfu, 2017). Dykes will need to be at least 1.5 metres higher than their current height but adding additional height to existing dykes would weaken them, so a new dyke network will likely be required, and some areas previously protected by dykes may be abandoned (McClearn, 2018). As well, some dykes are intentionally being moved or breached to return the land to a salt marsh, which can help absorb flood water and storm surges that come with increased storm action predicted for the area under climate change (Lieske & Bornemann, 2011). As the dykes represent a centuries-long interaction between humans and nature, and changes to them may alter the region's geography, the recent challenges are of significance to many.

a) b) c) d)

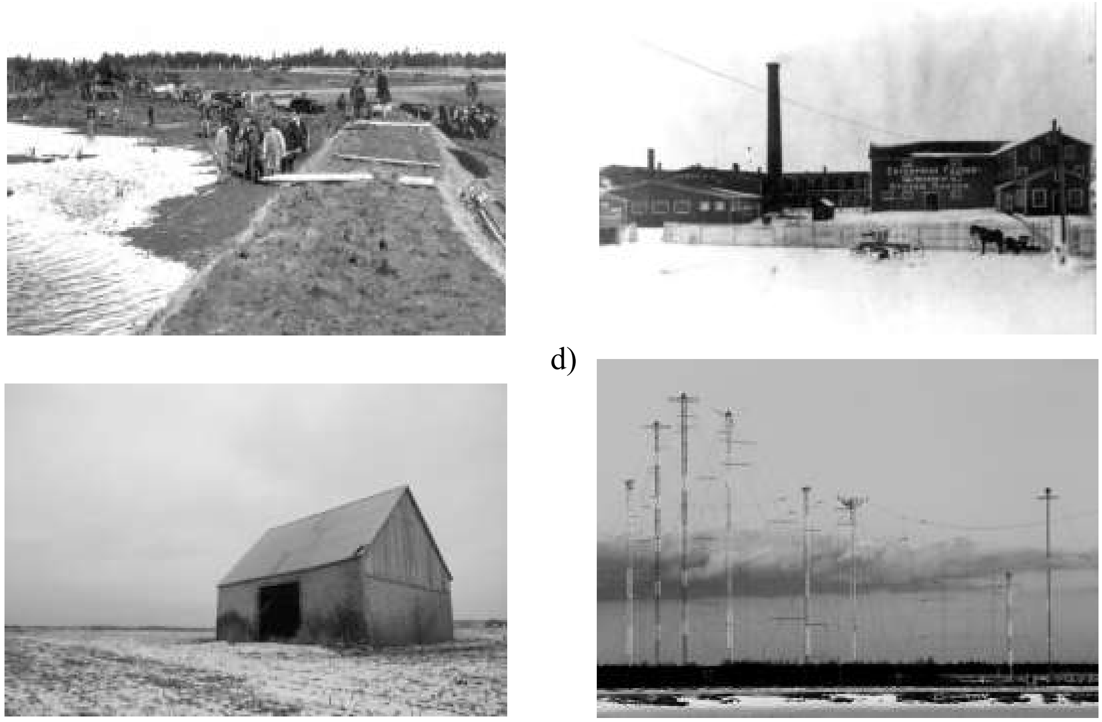

Figure 3. Images of the four past utilitarian landscape features used on the experimental page of the survey.

(a) Photograph of a dyke being constructed. From *Construction d'une levée et d'un aboiteau*, by Musée virtuel du Canada, 1900, http://www.museevirtuel.ca/sgc-cms/histoires_de_chez_nous-community_stories/pm_v2.php?id=record_detail&fl=0&lg=Francais&ex=00000630&rd=148367 Copyright 2019 by Musée virtuel du Canada.
(b) Photograph of one of the foundries prior to the fire. From *Prior to fire in 1908*, by P. Stopps, n.d., https://www.historicplaces.ca/en/rep-reg/image-image.aspx?id=7181#i3 Copyright Canada's Historic Places.
(c) Photograph of a haybarn. From *Tantramar haybarns slowly disappearing from landscape,* by P. Rockwell, 2016, https://www.cbc.ca/news/canada/new-brunswick/tantramar-marsh-hay-barns-disappearing-1.3468265. Copyright 2019 CBC.
(d) Photograph of Radio-Canada International towers. Retrieved from https://www.telegraphjournal.com/greater-saint-john/story/36148900/radio-canada-international-shortwave-tow?source=story-related

Following the deportation of the Acadians in 1755, the area was primarily inhabited by English settlers (Mount Allison University Archives, 2004). By the 1840s, the rapidly-growing towns of Amherst and Sackville were established as centres in the area (Mount Allison University Archives, 2004). Although agriculture was the dominant activity in the region, other industries such as quarrying, shipbuilding and milling developed in the 1800s (Mount Allison University Archives, 2004). Foundries were established in the Chignecto area for metal processing in the mid-1800s thanks to local coal and ore deposits (Mount Allison University Archives, 2004) (Figure 3b). The foundries included several large buildings as well as tall smoke stacks. Two foundries near Sackville were active up until the 1980s, at which point some buildings were demolished while others were retained but later destroyed by a large fire that occurred in 2012 ("Historic Sackville", 2012; Mount Allison University Archives, 2004). Summerby-Murray (2002) explores industrial heritage in Sackville, explaining that industry was seen as a beacon of economic progress in the late 19th and early 20th centuries, but the region has since undergone a process of de-industrialisation. In 1912, the foundry industry employed over a quarter of the town's population, but the Sackville economy today instead focuses on retail, education, eco-tourism and information exchange (Summerby-Murray, 2002). Although some buildings still exist today, none of the tall smoke stacks remain. The stacks were emblematic of the region's history of coal and iron production and their loss is perceived by some as a loss of industrial heritage.

Hay cultivation was a significant industry in the region throughout the 19th and 20th centuries as the dyked marsh provided an ideal environment in which to grow hay (Mount Allison University Archives, 2004). Hay was stored in large barns, approximately nine metres wide by 12 metres long (Figure 3c), and used to feed horses in the area as well as being exported, as there was a significant market for horse feed prior to the invention of automobiles (Mount Allison University Archives, 2004; Tantramar Marsh", 2016). At one time there were over 400 hay barns on the marsh ("Tantramar Marsh", 2016). However, following the spread of automobile use, the hay economy began to decline in the 1930s (Mount Allison University Archives, 2004). Agriculture on the marsh shifted from growing hay to raising cattle on pasture (Mount Allison University Archives, 2004). By the 1960s, few hay barns were still in use and many began to be dismantled or were slowly destroyed by fire, lightning strikes, vandalism and storms (Mount Allison University Archives, 2004; "Tantramar Marsh", 2016). As of 2016, only 13 hay barns remained. Older people in the area may remember the barns for their intended use in agriculture, while younger people may have attended weddings or parties held in the barns after they were no longer used for storing hay (Tower, 2009). Hay barns have become iconic, featured in many photographs and paintings of the region, such as in the work by photographer Thaddeus Holownia, as well as in a recent calendar designed to commemorate this landscape feature (Tower, 2009).

A more recent landscape change in the area was the dismantling of the Radio-Canada International (RCI) towers (Figure 3d). These towers were built during the Second World War to broadcast radio to Canadian Forces overseas (Foster, 2014). The Chignecto area was selected for construction because the flat topography, proximity to the East Coast and conductive soils made it ideal for transmitting radio waves (Foster, 2014). Following the Second World War, the towers continued to transmit Canadian radio around the world, including broadcasting "Canadian values of freedom and equality", as described by former prime minister William Lyon Mackenzie in the inaugural broadcast (Foster, 2014). By 2013, however, the radio towers were no longer being used by RCI since internet had largely replaced radio (Morris, 2012). RCI made significant efforts to sell the towers but, with a very small market for shortwave radio, they were unsuccessful and instead dismantled them to sell the land (Foster, 2013). The towers were dismantled in 2014 (Foster, 2014). Throughout the decades in which the towers stood, they were widely recognised across the marsh for their distinctive wires and bright flashing lights at night, a landmark to many (Morris, 2012).

While the four previously discussed landscape changes involved the partial or complete loss of landscape features, wind farms have been a recent addition to the Chignecto Area. This study area was chosen due to the natural experiment resulting from the removal of the RCI towers in tandem with wind farm development in the region. The largest wind farm was approved for construction near Amherst and built in 2012, while another wind development proposed near Sackville was rejected by locals around the same time (Mayor John Higham, personal communication, June 27, 2018; "Maritime Wind", 2012). The Amherst farm is composed of 15 turbines, each 90 metres tall with a generating capacity of 2.1 Megawatts (MW) each, or 31.5 MW for the farm, enough power to supply approximately 10,000 homes ("Maritime wind", 2012). The wind farm is located approximately three kilometres west of the Amherst town centre, near the coast of the Cumberland Basin, and approximately ten kilometres southeast from the Sackville town centre. Due to the flat topography of the marsh, the turbines are visible across much of the area, including from the majority of homes in Amherst as well as parts of Sackville, particularly at night due to the lights on top.

2.3.2 Survey Design and Implementation

A mail-out survey was designed and distributed to randomly selected homes in the Chignecto region (Appendix B and C). The survey was created to measure public support for wind energy and factors influencing this support. All surveys contained questions asking about exposure to wind turbines, place attachment, support for wind energy at the national, regional and local level, and demographics. Half the surveys also contained images and brief descriptions of the four landscape features described above that have been partially or completely lost over recent decades – the dykes, the foundries, the hay barns and the radio towers. Each landscape feature was accompanied by questions asking if respondents had seen the feature, if they believed it fit well in the landscape, and if they were sad at its loss or decline. The purpose of this experimental section was to understand factors influencing perceptions of past landscape changes and how these perceptions relate to support for future change in the context of wind energy. Additionally, the experimental design aimed to test whether being reminded of past landscape changes through the photos and descriptions influenced acceptance of wind infrastructure. This article focuses on the factors influencing perceptions of past landscape change in the region, based on the questions only included in 50% of the surveys, and then discusses some preliminary applications of these results to support for wind energy. The survey also included optional written response questions, allowing respondents the opportunity to elaborate on topics mentioned elsewhere in the survey if they chose to. Out of the 335 survey respondents, 153 people included a written response. Although these written responses were not systematically coded, they were used to better understand respondents' perspectives and some examples are provided in the discussion to elaborate on themes explored in the analysis.

The surveys were distributed to 1000 randomly selected homes in the region using the multiple reminder mail-out method (Dillman, 1978). The study area was defined using postal code Forward Sortation Areas (FSAs) of E4L on the NB side and B4H on the NS side. These two FSAs encompass Sackville and Amherst as well as houses and farms in the surrounding area. As the study area crosses two provinces, address lists were obtained from two different sources. In NB, a Georeferenced Civic Address Data Base (GCADB) containing point data with complete civic address attributes is provided by the provincial government through Service NB and governed by the GeoNB Open Data License. The version I used was last updated on April 4, 2018. In NS, an Assessed Value and Taxable Assessed Value History dataset is provided by the Property Valuation Services corporation through the Data Zone website, a Nova Scotian open government data website. This dataset provides civic addresses and map coordinates, as well as limited information about each dwelling, and was created on October 6, 2016 with the version I used last updated on January 14, 2018. Since the NS dataset contains property assessment information, I was able to eliminate residences in NS that I believed were unlikely to have current residents by excluding those that had zero bathrooms as well as those that were under construction. I was unable to do this for the NB addresses as that dataset does not include this information. Since neither the NB nor NS dataset contain postal codes, these were obtained from the Dalhousie University GIS Centre, using version 2017.3 from DMTI Spatial. In GIS, address data was clipped to the FSA in each province and address lists were exported to Excel, with 3214 addresses in E4L and 4030 in B4H, for a total of 7244 addresses. The random number function in Excel was used to select 1000 addresses, with 440 from E4L and 560 from B4H to proportionally represent each of the two regions. The randomly selected addresses were numbered from 1 to 1000, with odd numbers receiving the control survey and even numbers receiving the experimental survey.

The surveys were designed as three double-sided pages that folded open to make one wide sheet, with the cover page being a letter explaining the purpose of the study and how the information collected would be used. Return envelopes with postage paid were included with the surveys. Inspired by the Dillman (1978) method, the survey period began on May 28th, 2018, with an initial postcard mailed to the 1000 selected residents informing them they would be receiving a survey, followed by a first copy of the survey mailed on May 31st, a second postcard on June 15th, a second identical copy of the survey on June 29th in case they'd lost the first copy, and a final reminder postcard on July 10th. Completed surveys were accepted until August 1st, 2018, with a total of 335 surveys returned during this survey period. Undeliverable postcards and surveys were returned for 157 addresses, with 67 out of 560 undeliverable in NS and 90 out of 440 undeliverable in NB. The proportion of undeliverable surveys was likely higher in NB than in NS due to the different sources used to acquire address data in each province. The NS dataset included property information, allowing for the exclusion of addresses that were likely to be unoccupied, while the NB dataset did not include this information. Undeliverable surveys were subtracted from the initial 1000 to have 335 completed surveys out of 843 deliverable for a response rate of 40%.

2.3.3 Data and Analyses

2.3.3.1 How Do People Think About Past Landscape Change?

Responses from the completed surveys were input to the statistical software STATA for analysis. To explore how people think about past landscape change and how this is related to other concepts such as place attachment or time in place, the key variables of interest are those asked about the four landscape changes (Table 1). These dependent variables include the three questions asked for each of the four landscape features (dykes, foundries, hay barns and radio towers): have you noticed the feature in the Chignecto landscape, do you believe the feature fits well in the Chignecto landscape, and are you sad at the loss of the feature. Questions asking about fit and sadness were asked on a three-point scale: disagree, neutral and agree.

Table 1. Questions, response options and descriptive statistics for the key dependent variables of interest from survey of Chignecto area, used to construct the Attachment to Past Utilitarian Landscapes (APUL) scales. n=167

Dependent Variable Question[#]:	Descriptive Statistics % Yes or Agree	Mean (S.D.)
Have you noticed the dykes in the Chignecto area (Figure 1a)?	84%*	
If, yes (*n*=141):		
The dykes fit well in the Chignecto landscape. (dykefit)	91%**	2.91 (0.29)
I am sad at the loss of the dykelands. (saddykes)	64%**	2.57 (0.61)
Did you live in the Chignecto area prior to the loss of the foundries? (Figure 1b)	54%*	
If, yes (*n*=91):		
The foundries fit well in the Chignecto landscape. (foundryfit)	41%**	2.26 (0.71)
I am sad to see the loss of the foundry stacks. (sadfoundry)	31%**	2.02 (0.78)
Have you noticed hay barns in the Chignecto area? (Figure 1c)	95%*	
If, yes (*n*=159):		
The hay barns fit well in the Chignecto landscape. (barnsfit)	90%**	2.89 (0.33)
I am sad to see the loss of the hay barns. (sadbarns)	81%**	2.79 (0.45)
Did you live in the Chignecto area prior to the removal of the RCI towers? (Figure 1d)	95%*	
If, yes (*n*=159):		
The RCI towers fit well in the Chignecto landscape. (towersfit)	52%**	2.36 (0.73)
I am sad to see the loss of the RCI towers. (sadtowers)	53%**	2.37 (0.75)

* scale is Boolean Yes/No = 1/0
** scale is Disagree = 1, Neutral = 2, Agree = 3
[#] These questions were asked with reference to the photos provided in Figure 2.

Principal Component Analysis (PCA) with varimax rotation was conducted for the questions about fit and sadness for the four landscape features to determine clusters within these eight questions (Table 2). Five scales were created based on this factor analysis, which revealed four factors, one for each of the four landscape feature pairs. One scale for each landscape feature was created by taking a mean for each pair of fit and sadness questions. These four landscape feature scales are referred to as the DYKE, FOUNDRY, HAYBARN and RADIOTOWER scales. One scale was also created for all eight questions combined by taking the mean response for all eight questions (fit and sadness for each of the four features). This fifth scale was created to examine overall attachment to past landscape features in the region and is referred to as the Attachment to Past Utilitarian Landscape (APUL) scale. APUL represents a preliminary attempt to measure the past dimension of climax thinking. Mean was used instead of simply adding responses so that the values would not be affected by landscape features not seen.

Table 2. Principal component analysis with varimax rotation for questions about fit in the landscape and sadness at loss for four landscape features. n=167

Variable	Factor 1	Factor 2	Factor 3	Factor 4
Towersfit	**0.882**	0.168	0.225	0.012
Sadtowers	**0.909**	0.183	0.154	-0.051
Barnsfit	0.135	**0.950**	0.094	0.038
Sadbarns	0.142	**0.933**	0.114	0.041
Foundryfit	0.150	0.177	**0.884**	0.062
Sadfoundry	0.225	0.062	**0.893**	-0.011
Dykefit	-0.085	0.099	-0.004	**0.910**
Saddykes	0.491	-0.114	0.189	**0.549**
Proportion	0.246	0.237	0.214	0.143

Cronbach's alpha, a measure of internal consistency, was used to measure scale reliability for each of the five scales. The APUL scale has a Cronbach's alpha of 0.76, demonstrating moderately high internal reliability, and the four landscape feature scales have alpha values above 0.75, except for the DYKE scale, which has an alpha of 0.29 (Table 3). Relationships between these five scales were then examined using a bivariate correlation matrix with Spearman correlations, a correlation coefficient based on the ranked values of each variable (Table 3). From this correlation matrix, the FOUNDRY (rho=0.81) and the RADIOTOWER (rho=0.80) are the most highly correlated with the APUL scale, indicating these two landscape features have the greatest impact on the APUL scale. Responses to these two features, the foundry and the radio towers, are also more varied than responses to the questions about the hay barns and dykes, which the majority of respondents view positively in the landscape (Table 1).

Table 3. Bivariate correlation matrix for scales for each landscape feature and all four features together created by combining fit in landscape and sadness at loss (Spearman rho values)

Variable	Dykes	Foundry	Barns	Towers
Dykes (*n*=140, α=0.29, $\bar{x}$=2.74, s=0.37)	-			
Foundry (*n*=89, α=0.82, $\bar{x}$=2.14, s=0.70)	0.285**	-		
Barns (*n*=158, α=0.77, $\bar{x}$=2.84, s=0.36)	0.303**	0.284**	-	
Towers (*n*=158, α=0.87, $\bar{x}$=2.37, s=0.70)	0.368**	0.393**	0.272**	-
Combined (*n*=167, α=0.76, $\bar{x}$=2.56, s=0.37)	0.607**	0.812**	0.495**	0.795**

*significant at 0.05
**significant at 0.01

2.3.3.2 How Is APUL Related to Familiar Dimensions Such as Place Attachment, Time in Place and Politics?

Multivariate linear regression was used to create a model for the dependent variables, each of the five scales, using predictor and control variables. Ordinary Least Squares (OLS) regression was used for all models because the dependent variables are all scales and therefore continuous variables. Multivariate models include all three predictor variables and the four control variables. Significance is reported at the 0.05 level and the 0.01 level. A preliminary analysis of variable relationships was conducted through bivariate correlations between each of the five scales with the control and predictor variables (Supplemental Table 1). Bivariate correlations were also conducted for all predictor and control variables in a correlation matrix to check for collinearity (Supplemental Table 2). None are high enough to question independence and risk multicollinearity. The highest correlation between independent variables is between years lived in the region and age, with a rho value of 0.53, which is acceptable collinearity for both variables to remain in the analysis.

Predictor variables include place attachment, time lived in the region and politics. Place attachment was selected as a predictor variable as previous studies have found it to be a significant factor influencing opposition to landscape change (Devine-Wright & Howes, 2010). A secondary goal was to examine whether the concept of climax thinking is independent from that of place attachment. Place attachment to the Chignecto was measured using five questions adapted from Raymond et al. (2010) and asked on a five-point Likert scale in both the positive and negative direction (Table 4). These were recoded to all be phrased positively and averaged to create a scale from one (low place attachment) to five (high place attachment). Cronbach's alpha was again used to confirm the internal reliability of this scale, with an alpha value of 0.88 (Table 4).

Table 4. Questions, response options, and descriptive statistics for the key predictor independent variables of interest from survey of Chignecto area. n=335

Independent Variables	Distribution (%)					Mean (S.D.)
Years in region: How long have you lived in the Chignecto area?						40.7 (21.9)
Place attachment: Likert scale response options from 1 (strongly disagree) to 5 (strongly agree)	1	2	3	4	5	
The Chignecto area means a lot to me.	0	1	13	38	48	4.32 (0.75)
I live in the Chignecto area but do not feel attached to it.*	35	39	14	10	2	2.05 (1.04)
I feel the Chignecto area is a part of me.	1	8	24	39	28	3.84 (0.96)
I identify strongly with the Chignecto area.	1	9	24	38	28	3.82 (0.98)
I would prefer not to live in the Chignecto area.*	45	39	11	4	1	1.76 (0.85)
Place attachment scale Cronbach's alpha	0.88					3.99 (0.84)
Political views: What party best represents your political views, whether or not you vote?	1	2	3	4		
Response options: Green (1), NDP (2), Liberal (3), Conservative (4).**	11	16	40	37		

*negatively phrased, reversed for scale
**percentages add up to greater than 100 as some respondents selected multiple responses (eg. Liberal and Conservative)

Time lived in the region was used as another predictor as previous studies have found place attachment to be influenced by years in a region, with people who have lived in an area for longer having greater attachment to their surroundings (Brown et al., 2004). Time in the region was measured through a written response question asking respondents the number of years and months they have lived in the Chignecto area and then converted to a decimal years (Table 4).

Finally, politics was used as a predictor variable as previous studies have found that people with conservative politics demonstrate a greater preference for the past, while non-conservatives show stronger support for future opportunities (Baldwin & Lammers, 2016). Options for the politics question on the survey were provided as the four main parties present in the region; Conservative, Liberal, New Democratic Party (NDP) and Green; as well as an option for other. Many respondents declined to select a response, with only 198 responses, 107 people choosing not to answer and 30 people selecting 'other' (Table 4). This variable was recoded to be a dichotomous variable with 'Conservative' as one category and Liberal, NDP and Green as the other category, 'Not Conservative'. The 'other' option was treated as missing data since it couldn't be classified in either group. The politics variable was recoded in this way due to low numbers for some options (eg. Green n=21) and because the Conservative party is the only major party in Canada that is classified as right-wing, while the Liberal, NDP and Green parties are all considered centrist or left-wing (Sherren et al., 2019). This classification best mimics the United States binary of Republican and Democrat.

Control variables include age, gender, education and household income (Table 5). These demographic questions were asked at the end of the survey. Age was asked in categories, starting with 19-24 (19 is the age of majority to consent to a survey in both NB and NS), and then in ten-year categories up to 75+. Gender options were provided as Female, Male and Non-binary. Education was provided as eight options but was recoded into three categories; 'high school or less than high school', 'college or trade apprenticeship' and 'university undergraduate or graduate'. Income was asked in $25,000 categories from 'less than $26,000' to '$100,000 or more'. The demographic data from the survey control questions also allowed the survey population to be compared to the overall population of the region, using Statistics Canada data from the 2016 census provided for each FSA (Statistics Canada, 2017) (Table 5).

Table 5. Demographics of survey respondents and model controls compared to census data for postal code forward sortation areas E4L and B4H, using percent (Statistics Canada, 2017)

Census Category	E4L (Sackville)	B4H (Amherst)	Survey Category	Sackville (*n*=148)	Amherst (*n*=187)
Gender					
Female	52.1	53.0	Female	58.5	52.5
Male	47.9	47.0	Male	41.5	47.5
Age					
20-24	6.8	5.7	19-24	2.1	1.1
25-34	11.1	11.6	25-34	8.5	1.7
35-44	14.1	14.4	35-44	12.0	10.1
45-54	17.7	17.9	45-54	14.8	18.4
55-64	20.1	20.5	55-64	28.2	26.3
65-74	15.2	16.1	65-74	17.6	29.6
75+	15.1	13.8	75+	16.9	12.8
Income category					
under 25000	13.3	21.1	less than 26000	12.6	13.1
25000-49999	18.9	28.1	26000 - 50999	21.0	27.6
50000-79999	22.0	23.6	$51,000 to $75,999	21.8	24.1
80000-100000	10.5	9.8	$76,000 to $99,999	12.6	14.5
100000+	22.0	17.4	$100,000 or more	21.8	20.7
Education category					
High school or less than HS	38	46	High school or less than HS	28	26
College or trade apprenticeship	33	39	College or trade apprenticeship	28	41
University undergraduate or graduate	29	15	University undergraduate or graduate	44	33

2.3.3.3 How Do APUL and Other Dimensions Discussed Above Influence Support for Wind Energy Development?

To examine how support for wind energy is impacted by APUL, place attachment, time in place, politics and being reminded of past landscape change through the experimental treatment; three scales were created from three survey question sets designed to measure support for wind energy development at different geographic scales

(Table 6). The first question set, asked prior to the experimental section of the survey, measures support for wind energy development in general and at the national level. Following PCA, a single scale was created from this question set based on the single dimensionality revealed in the factor analysis. One question, 2f, was dropped as it asked respondents if they believe wind energy provides fewer jobs than other energy sources, and respondents could be supportive of wind development while still agreeing with this statement. Responses to this question were the least correlated with other questions in the set. The resulting scale created from the five remaining questions, referred to as the GENERAL scale, has an alpha value of 0.81.

Table 6. Questions, response options and descriptive statistics for support for wind energy development at three different scales

Dependent Variables	**Descriptive Statistics**					
Likert scale response options from 1 (strongly disagree) to 5 (strongly agree)	1	2	3	4	5	
GENERAL wind support *n*=331	**Distribution (%)**					**Mean (S.D.)**
2a. Wind energy is a cleaner alternative to fossil fuel energy.	0	1	6	29	64	4.56 (0.66)
2b. Canada is already overbuilt with wind farms.*	0	1	13	45	40	4.23 (0.75)
2c. Wind energy is an economic opportunity.	1	3	12	42	40	4.17 (0.88)
2d. Wind energy development is unnecessary because we have enough other sources of energy in Canada.*	1	2	6	47	43	4.29 (0.78)
2e. Wind energy should be further developed in Canada for environmental reasons.	2	2	10	43	43	4.22 (0.88)
Canada Wind Support Cronbach's alpha	0.81					4.29 (0.61)
REGIONAL wind support *n*=330						
5a. I would be happy to see more wind energy development in the Chignecto area.	2	14	17	38	39	4.09 (0.93)
5c. I would like to see no wind turbines in the Chignecto area.*	2	2	9	36	51	4.31 (0.89)
5d. Wind turbines do not fit well in the landscape of the Chignecto area.*	2	3	16	39	39	4.09 (0.95)
5e. I would like any current wind turbines in the Chignecto area to be removed rather than replaced after they reach their 25-year life span.*	2	3	9	39	47	4.27 (0.87)
5f. I believe wind turbines are a negative addition to the Chignecto landscape.*	2	3	12	38	45	4.20 (0.93)
Chignecto Wind Support Cronbach's alpha	0.91					4.19 (0.79)
HOME VIEW wind support *n*=330						
6a. I would prefer not to see wind turbines from my home. *	6	12	26	38	18	3.51 (1.09)
6b. I think wind turbines can be beautiful and wouldn't mind having a view of them from my home.	4	11	22	47	17	3.63 (1.00)
6c. Wind turbines can be a useful landmark and tell me I am getting close to home.	4	6	25	47	17	3.67 (0.96)
6d. I would not mind seeing wind turbines from my home if they are contributing to clean energy and a more sustainable future.	3	5	9	53	30	4.04 (0.90)
6e. I think that wind turbines near my home would have a negative impact on my health. *	3	6	24	40	27	3.83 (0.99)
6f. Seeing wind turbines from my home would ruin my view. *	3	7	16	46	27	3.87 (1.00)
Local Wind Support Cronbach's alpha	0.88					3.76 (0.79)

*reversed

The next question sets were asked after the experimental section of the survey. The first explores support for wind energy at the regional scale, i.e. the Chignecto area. Again, a single scale was created based on the single dimensionality revealed in PCA factor analysis. One question was again dropped from the scale, this time because the question was double-barrelled and may have been confusing to some respondents, a mistake not caught prior to distribution of the survey. The scale created from the five remaining questions is called REGIONAL and has an alpha value of 0.91. The final question set, also asked after the experimental section, was designed to measure support for wind energy development at the local scale, within view of respondents' homes. PCA factor analysis again revealed single dimensionality of this question set and a single scale was created. No questions were dropped from this set and the scale created from the six questions has an alpha value of 0.88. This scale is referred to as HOME VIEW.

Bivariate correlations were conducted between each of the three wind scales and five predictor variables: the APUL scale, the place attachment scale, years lived in the region, politics, and whether or not the respondent received the experimental treatment. These bivariate correlations were conducted separately for people who can see wind turbines from their home and people who cannot to test whether predictors of wind support differ depending on whether or not turbines exist in a respondent's current landscape. One question set provided a picture of a wind turbine and asked people how often they see or hear wind turbines, including if they have ever seen or heard turbines, if they drive past them in the course of a week, if they see or hear them from where they work or study, and if they see or hear turbines from their home, provided with yes or no response options. Seeing or hearing turbines from home was selected as the predictor variable from this question set as it had the greatest variation in responses (compared to ever seeing or hearing turbines or driving past them regularly, which both had a high percentage of yes answers) and was determined to be the most representative of daily exposure to turbines. Significance is reported at the 0.05, 0.01 and 0.00 levels. Although not discussed in detail in this chapter (but shown in Supplemental Table 3) regression analysis was conducted for each of the three wind support scales, using the experimental treatment variable along with all other predictor and control variables. These regressions have small sample sizes when all variables are included, which is why bivariate correlations are focused on here instead. However, the impact of the experimental treatment in wind support regression analysis is discussed in this chapter as it was dropped from later regression models. Other variables impacting support for wind energy are explained and explored further in regression analyses conducted in Chapter 3.

Likert scale questions, including those asked about fit and sadness for past landscape features, support for wind development, and place attachment, are treated as continuous, numeric variables despite the debate around this in social science circles. Means and standard deviations are reported for these variables throughout.

2.4 RESULTS

2.4.1 Sample and Demographics

The mail-out survey achieved a response rate of 40% over the two-month survey period, with 168 of the 335 returned surveys being the experimental version, exactly 50%. In NB, 73 out of 148 completed surveys are the experimental version, with 94 experimental surveys out of 187 completed in NS. With the 335 completed surveys representing a total population of 16,311 people over the age of 19 in the study area, the confidence interval is +/- 5.3 at the 95% confidence level, when responses are split 50/50. Income has a mode of $26,000 to $50,999 and a median of $51,000 to $75,999, with 71 people choosing not to answer this question (Table 5). Age has both a mode and median of 55-64 (Table 5). Education originally had a mode of ‘High school graduate/ General Educational Development (GED)’. After recoding, ‘high school or less than high school’ captures 27% of respondents, ‘college or trade apprenticeship’ has 36% and ‘university undergraduate or graduate’ has 38% (Table 5). Finally, for gender, 55% of respondents identify as female, 45% identify as male and no respondents identify as non-binary (Table 5).

Demographics of the survey respondents were compared to census data for each of the two FSAs to examine how closely the survey population matches the overall population of the region (Table 5). In NB, females are overrepresented in the survey population, with 59% compared to 52% in the overall population. There is an underrepresentation in the NB survey population of younger age groups up to 54, with 37% of the survey population 54 and under compared to 50% of the census population, and an overrepresentation of age groups 55 and up. The income of NB survey respondents matches that of the overall population of E4L relatively closely. Finally, in the survey population in NB there is underrepresentation of the high school or less than high school (28% of the survey population compared to 38% in the census) and the college or trade apprenticeship (28% compared to 33%) groups and overrepresentation of the university group (44% compared to 29%). In NS, gender matches the census population closely, while there is underrepresentation in the survey of ages up to 44 (13% compared to 32%) and overrepresentation of ages 45 to 74 (74% compared to 55%). In the NS survey population, there is underrepresentation of the lowest income category (13% compared to 21%) and slight overrepresentation of the two highest categories. There is underrepresentation in the NS survey population of the high school or less than high school (26% compared to 46%) and overrepresentation of the university group (33% compared to 15%), while the college and trade apprenticeship group is approximately equal. Based on these comparisons, caution should be taken with extrapolating results of this study to younger and less educated residents of the region as well as males in NB.

2.4.2 How Do People Think About Past Landscape Change?

The dependent variables for both the first and second research questions about attachment to past landscapes, the APUL survey questions, are described for the 168 experimental survey respondents. In the APUL section, 84% of respondents report having noticed the dykes, 54% say they have lived in the area prior to the loss of the foundries, 95% have noticed the hay barns and 95% lived in the area prior to the removal of the radio towers (Table 1). All features are perceived as fitting in the landscape, and their loss causing sadness, but to differing degrees. The dykes, which have been around the longest, have the highest mean agreement of fit, at 2.91 out of 3, while the loss of hay barns causes the highest reported sadness, at 2.79. The foundries have the lowest mean for both agreement that they fit well in the area (2.26) and sadness at their loss (2.02). For all landscape features (except for the radio towers where they are the same) agreement about fit in the landscape is higher than sadness at loss. Agreement about fit in the landscape for all four landscape features together is 2.63 (std dev = 0.37), with sadness at their loss 2.48 (std dev = 0.45).

The percent of respondents noticing each of the four landscape features was examined by the number of years lived in the region to determine whether not being familiar with a feature is due to not having lived in the region before it was removed or due to not having noticed it (Supplemental Table 4). The relationship between years in the region and noticing of features was again examined using Spearman correlations, treating noticing of features as a dichotomous variable with one being yes and zero being no (Table 7).

Table 7. Spearman correlations between years lived in region and of noticing features n=167

Landscape feature	Rho value	P-value
Dykes	0.1692	0.0398
Foundry	0.3825	0.0000
Hay barns	0.1374	0.0971
Radio towers	0.2259	0.0058

Examining the impact of years lived in the region on noticing of features, the correlation is found to be the weakest for hay barns (rho=0.14) (Table 7). This is likely due to the fact that a few hay barns still exist in the region today, so people may notice them currently even if they just moved to the area. The correlation is the next weakest for the dykes (rho=0.17), likely for the same reason since some dykes still exist in the region today. The correlation is the strongest for the foundry smoke stacks (rho=0.38), as this feature no longer exists and was removed less recently than the radio towers (rho=0.23). All correlations between noticing of features and years lived in the region are significant at the 0.05 level except for the hay barns.

2.4.3 How Is APUL Related to Familiar Dimensions Such as Place Attachment, Time in Place and Politics?

Overall, people in the Chignecto area report high place attachment, with a mean of 3.99 out of 5 (std dev = 0.84) on the place attachment scale (Table 4). The mean number of years lived in the region is 40.8 years, although this is highly variable for survey respondents, with a standard deviation of 21.9 years (Table 4). Examining place attachment and years lived in the region together, again using the Spearman coefficient, there is a positive correlation between the two variables (rho=0.27), significant at the 0.00 level. This suggests that people who have lived in the region for longer derive a greater sense of identity from the area. Of those who answered the politics question, 73 people identify as Conservative and 125 identify as not Conservative (Table 4).

We used OLS multivariate regression to predict attachment for each of the landscape features and for all four together in the APUL scale (Table 8). Beginning with the predictor variables, place attachment is only a significant predictor for the HAYBARN scale, with a positive correlation significant at the 0.05 level. Conservatism is positively correlated with the FOUNDRY scale ($p<0.01$), the RADIOTOWER scale ($p<0.05$) and the APUL scale ($p<0.01$). Years lived in the region is not significant for any of the five scales. Examining control variables for each of the five scales, having a university education is the only control significant for the DYKE scale, with a negative correlation ($p<0.05$). For the FOUNDRY scale, being male ($p<0.05$) is positively correlated in the regression model, while age is negatively correlated ($p<0.05$). In the regression model for the HAYBARN scale, in addition to the positive correlation with the place attachment predictor, income is negatively correlated ($p<0.05$). For the RADIOTOWER scale, no control variables are significant in the regression model. In the regression model for the APUL scale, being male ($p<0.05$) is the only control variable significant, with a positive correlation. The strongest model is for the FOUNDRY scale, despite the low n of this scale, with an adjusted R-squared value of 0.279. The weakest adjusted R-squared value is for the RADIOTOWER scale, at 0.095.

Table 8. Multivariate (OLS) regression output for predicting attachment to each past utilitarian landscape feature and four features combined scales from 1 to 3 (standardised coefficients)

Variable	Dykes *n*=66	Foundry *n*=40	Barns *n*=72	Radio *n*=73	Combined *n*=77
Predictors:					
Place attachment	0.030	0.132	0.280*	0.015	-0.049
Conservative	0.163	0.502**	0.139	0.327*	0.403**
Years in region	-0.114	-0.068	-0.331	-0.101	-0.137
Controls:					
Male	0.215	0.357*	-0.051	0.132	0.274*
Age	0.251	-0.389*	0.068	0.169	0.007
Income	0.265	-0.266	-0.341*	-0.118	-0.110
College/ trade ^	-0.308	-0.090	-0.293	-0.194	-0.214
University ^	-0.545*	-0.345	0.009	-0.269	-0.239
Constant	2.462	2.641	2.941	2.341	2.827
Adjusted R^2	0.141	0.297	0.109	0.095	0.102

^ Dichotomous with high school/ less than high school as reference
*significant at 0.05
**significant at 0.01

2.4.4 How Do APUL and Other Dimensions Discussed Above Influence Support for Wind Energy Development?

Support for wind energy from people in the Chignecto region is highest at the national level, with a mean of 4.29 out of 5 for the GENERAL scale (st dev = 0.61) (Table 6). Support for wind energy at the regional level is the next highest, with the REGIONAL scale having a mean of 4.19 (st dev = 0.79). Mean support for wind energy development within view of respondents' homes, the HOME VIEW scale, is lower than the other two scales but still positive, with a mean of 3.76 (st dev = 0.79).

We examined the impact of the five predictor variables of interest on the three wind support scales separately for people who can see wind turbines from their home and people who cannot. Beginning with people who can see turbines (Table 9), place attachment has a significant positive correlation for GENERAL ($p<0.00$) and REGIONAL ($p<0.01$) but is not significant for HOME VIEW. The APUL scale is significant and positive for REGIONAL (p<0.05) and HOME VIEW (p<0.05) but not for GENERAL. Years lived in the region, Conservative politics, and the experimental treatment are not significant for any of the three wind support scales for people who can see wind from their home.

Table 9. Bivariate Spearman correlations for predicting support for wind at three different scales for people who can and cannot see turbines from their home

	Can see from home			Cannot see from home		
Predictor:	**GENERAL**	**REGIONAL**	**HOME VIEW**	**GENERAL**	**REGIONAL**	**HOME VIEW**
Place attach.	0.3214*** *n*=132	0.2387**	0.1124	0.1934** *n*=194	0.1407	0.1252
APUL	0.1484 *n*=72	0.2320*	0.2604*	-0.1050 *n*=94	-0.0838	0.0721
Years in region	0.0173 *n*=125	0.0414	0.0615	-0.1459* *n*=184	-0.1608*	-0.0607
Conser-vative	-0.1057 *n*=72	-0.0272	-0.0387	-0.2839** *n*=120	-0.3233***	-0.0681
Exp. treatment	0.0508 *n*=132	-0.0548	-0.0497	0.0071 *n*=195	0.0143	0.0391

*significant at 0.05
**significant at 0.01
***significant at 0.00

For people who cannot see wind turbines from their home, place attachment has a significant positive correlation with GENERAL (p<0.01) but is not significant for REGIONAL or HOME VIEW. The APUL scale is not significant for wind support at any level for people who cannot see turbines from their home. Years lived in the region has a significant negative correlation with REGIONAL (p<0.05) and is not significant for the other two scales. Conservative politics has a significant negative correlation with GENERAL (p<0.01) and REGIONAL (p<0.00) for people who cannot see wind from their home and is not significant for HOME VIEW. Finally, the experimental treatment is not significant for any of the three scales for people who cannot see wind from their home.

Although the regression models for wind support have small sample sizes, which is why this chapter focuses on bivariate correlations for wind support instead, the experimental treatment is significant for GENERAL, but not for the other two scales (Supplemental Table 3). Receiving the experimental treatment has a positive impact on support for GENERAL, significant at $p<0.05$, and no significant impact on REGIONAL or HOME VIEW when included with all other predictor and control variables in regression.

2.5 Discussion

2.5.1 How Do People Think About Past Landscape Change?

Respondents believe all four landscape features explored in this study fit well in the landscape and are sad at their loss, despite the four features being diverse in both structure and history. These sentiments were also reflected in many of the written responses. Although built landscapes in Canada often evolved over a shorter time frame than those in Europe (Niewojt, 2007), my results suggest residents demonstrate attachment to rural landscape features, as in European studies (Antrop, 2005; Park & Selman, 2011). The four landscape features are utilitarian objects rather than historic monuments or other protected heritage features, yet people are still saddened by their loss. As one respondent reflected:

> …I truly miss the days of the barns and cattle along with the RCI towers out on the marshes. The foundries have all closed due to changes in our economy. I do believe the dykes should stay and they should be repaired. Times change and people do not like changes. (respondent #772).

The results of factor analysis show that if a resident thinks a feature fits well in the landscape, they also don't want it to be removed, suggesting a resistance to overwrite past landscapes to make space for new needs, even if these past features are no longer serving their intended purpose. As explained by Antrop (2005), landscapes result from reorganisation by consecutive societies to adapt the land to their changing needs. Each of the four features were built to meet a societal need at the time of construction, but none are optimally serving that need today. As explored by Nadai and van der Horst (2010) and Park and Selman (2011), landscapes are now facing new challenges, such as increased demands for food security or renewable energy. Accommodating these new challenges may require overwriting some past landscapes through the removal or modification of landscape features (Sherren, in press). People may be both resistant to the loss of past features as well as the addition of new ones, as suggested in this quotation:

> Very disappointed hay barns on the marsh are all but gone!! Miss the radio towers on the marsh as they were such a great landmark. Always great to see when coming back to the marsh, especially at night…I don't see anything 'pretty' about a bunch of windmills dotting the beautiful wind swept marsh, grasses, duck blinds, birds dikes, etc. (respondent #238).

The attachment to these past and dwindling features partially supports the U-shaped curve proposed by Wolsink (2007) in the context of wind, as the attachment to all four past landscape features explored in this study suggests community members have come to value these features over time. However, this study did not test whether residents were initially resistant to these additions to their landscape, as most of the features have existed in the landscape longer than a human lifetime. Future research could focus on features that have been both constructed and removed within the lifetime of residents to explore whether people protest both their construction and removal, as suggested in the theory of climax thinking (Sherren, in press). One such example is the Mactaquac hydroelectric dam and headpond, which nearby residents grew attached to in the decades following construction and elected to restore rather than remove (Sherren, Beckley, et al., 2016). Similar resistance to dam removal has been observed in New England, where many dams built in the 19th and early 20th centuries are now being considered for removal (Fox et al., 2016). As most of these dams provide little economic benefit to surrounding communities and would be costly to repair, dam removal may appear to be a logical choice for both ecological and economic reasons (Fox et al., 2016). However, conflicts have arisen concerning removals, as surrounding communities value the dams as part of their history and identity and the landscapes created by the dams for their aesthetics, despite the dams no longer serving their functional purpose (Fox et al., 2016). While dams and dam removal represent landscape alteration on a larger scale than that explored in my study, they similarly demonstrate the attachment of community members to anthropogenic landscapes, even when these landscapes are no longer serving their intended purpose. Landscapes can shift from utility to amenity and become a part of people's cultural identity.

In general, based on high Cronbach's alpha values of the five scales, if a person believes a feature fits well in the landscape, they are more likely to also be sad at its loss; the low alpha value (0.29) of the DYKE scale suggests something different is happening (Supplemental Table 5). A possible explanation may be that, unlike the other three features, the dykes still serve a practical purpose in the landscape and are not being removed everywhere but in some places being modified to better protect against flooding. Some people may believe the dykes fit well in the landscape yet understand the traditional dykelands must be modified to protect the region, as the problems facing the dykelands are frequently discussed in the local news (Corfu, 2017; McClearn, 2018). Quotes from the survey support this idea, for example: "I think it is a great idea to remove some dykes and reclaim marshland." (respondent #12) and: "The mayors of Sackville and Amherst are correct that the CNR and Trans Canada Highway are at risk in the near future. They have done well to stir up an engineering study on the future of the dykes!" (respondent #199). Alternatively, some participants may not be aware that the dykes are disappearing from the region as they are less prominent in the landscape than the other features explored in this study, also contributing to the different response pattern for this feature.

Responses to the FOUNDRY and RADIOTOWER are less positive and more varied than responses to the HAYBARN and DYKE scales. Furthermore, the correlation between the FOUNDRY and the RADIOTOWER scales (rho=0.393) is the highest correlation between any of the four feature scales, suggesting people who have attachment to the foundries also have attachment to the radio towers. The foundry smoke stacks and the radio towers share certain physical characteristics, as tall, industrial towers that are not shared with the dykes or hay barns, which are agricultural and may appear more natural or less intrusive in the landscape. The greater variation in attachment to the foundries and radio towers may be due to residents' different interpretations of technology in the landscape. Previous studies have explored how people's interpretations of place influence their perceptions of built landscape features. Park and Selman (2011) explain that people's vision of their landscape impacts whether they view changes as positive or negative, depending on whether the change fits with their vision or contradicts it. McLachlan (2009) explores interpretations of both place and technology in two case studies of renewable energy developments in the UK, a Wave Hub and a biomass plant, arguing that interpretations differ among people and influence how well they believe a development fits in a place. Among other interpretations, place may be seen as either nature or a natural resource, and technology as either industrial or at one with the environment (McLachlan, 2009). Eaton, Burnham, Running, Hinrichs and Selfa (2019) tested the symbolic fit hypothesis in the context of bioenergy crops in the Northeast United States (US) through surveys of landowners. They found that viewing bioenergy crop production as a way to address environmental issues combined with a protectionist or utilitarian viewing of one's land increased support for bioenergy crops, while seeing little benefit from bioenergy crops for the community decreased support (Eaton et al., 2019). While my study involved the removal rather than construction of technology in the landscape, people's interpretation of both their surroundings and the technology again influence their attitudes towards landscape change, and these differing interpretations are most evident in the FOUNDRY and RADIOTOWER scales, the two most technologically modern features.

2.5.2 How Is APUL Related to Familiar Dimensions Such as Place Attachment, Time in Place and Politics as Well as Other Factors?

Regression analysis revealed attachment to these two more industrial features to be correlated with certain demographics. Being male is positively associated with the FOUNDRY scale as well as the overall APUL scale, and is the only demographic control significant in the APUL scale regression. Some of the people who completed the survey may have worked in the foundries before they shut and therefore have greater attachment to this feature, with men more likely to have worked there than women. In some de-industrialised towns in NS, former industrial workers and their families keep artifacts removed from the working landscape on their front lawns to commemorate the industrial past and to celebrate place identity and individual worker value, suggesting that people who have worked in these industries have an attachment to them (Summerby-Murray, 2002). While industrial heritage is largely at odds with Sackville's current university town image, or the region's pre-industrial image of rural, agricultural landscape that is often portrayed, some people value industrial heritage as an expression of local identity and anti-modern resistance (Summerby-Murray, 2002). The industrial past can be viewed as a time of solidity, employment and material prosperity, prior to the instability introduced by modern restructuring (Summerby-Murray, 2002; 2007).

Previous studies have examined the impact of gender on support for various landscape changes and developments. A recent national study of public support for different types of energy development in Canada found males to have greater support for hydroelectric, nuclear, natural gas, shale gas, oil from oil sands and oil from other sources (Sherren, Parkins, Owen, & Terashima, 2019). The impact of gender on support for renewable energy sources other than hydroelectricity was not significant (Sherren et al., 2019). Similar to the foundries, large-scale energy developments can be representative of human progress, even if, like the foundries, they come with environmental costs. In a study of dykeland restoration by Sherren, Loik and Debner (2016), females were more likely to reject the restoration of salt marshes from abandoned agricultural dykelands, preferring to protect the land in its current state despite it being an anthropogenic landscape (Sherren, Loik, et al., 2016). In my study, gender is not a significant predictor for the DYKE scale and, as previously mentioned, the dykes differ from the other landscape features and further study of attachment to the Chignecto dykelands should be conducted. Previous studies have noted that it can be difficult to separate gender from other variables (Sherren et al., 2019), and, as noted by Bradshaw (2018), gender is socially constructed and intersects with other factors such as age, class and ethnicity. However, the significant impact of gender on certain landscape features in my study (despite a relatively small sample size, particularly for the FOUNDRY scale), suggests that males and females view some developments in the landscape differently, with men having greater attachment to more modern symbols of technology, even if they are no longer in operation. This may be due in part to environmental values, as past studies have noted that women have greater concern for the environment, either because they are naturally pre-disposed from birth to be more altruistic and pro-environmental or because culture and socialisation often leads to women displaying attributes that support environmental conservation, such being more risk-adverse ("Gender in conservation", 2019)

Conservatism is the other variable significant in the combined APUL scale, with a stronger association than gender. Conservatism is also a significant predictor for the FOUNDRY and RADIOTOWER scales. As the radio towers were built during the Second World War to transmit Canadian radio overseas (Foster, 2014), some people may view them as symbolic of militarism and nationalism. The foundries are also associated with militarism, as they contributed to wartime production of munitions (Summerby-Murray, 2002). As stated by Summerby-Murray (2002), industrial heritage often embraces cultural hegemony, nationalism and patriotism and may romanticise the past, ignoring environmental damage or harmful social structures resulting from these industries. Davidson and Haan (2012) explored the role of gender and politics on climate change beliefs in Alberta, a province economically dependent on the greenhouse-gas intensive oil industry with a history of conservative politics. They explain that the oil industry is typically associated with male-dominant occupations (Davidson & Haan, 2012), as was the case for the foundry industry in the Chignecto area. Initially, Davidson and Haan (2012) found gender to be a significant predictor of climate change beliefs. However, after adding political ideology to their model, they found no standalone difference between genders, instead finding decreased concern for climate change to be significantly associated with conservative politics, with men in Alberta more likely to be politically conservative than women (Davidson & Haan, 2012). While we also found a positive correlation between male and Conservative (rho=0.0854), this correlation is not significant, and both male and conservativism remain significant in regression. This may suggest that being male and holding conservative beliefs are less strongly associated in our study region than in Alberta, as the economy of the Chignecto region is largely de-industrialised and not currently dependent on a single, male-dominated industry (Davidson & Haan, 2012; Summerby-Murray, 2002; 2007). However, the greater attachment by both men and conservatives to the foundries, an industry that caused more environmental harm than the other industries studied, may be due in part to the lower environmental concern from these groups, which we did not ask about.

Along with the strong associations between conservative politics and the FOUNDRY, RADIOTOWER and APUL scales, the DYKE and HAYBARN scales are also associated with conservatism, although not at a significant level. This suggests attachment to past features in general may be associated with conservatism. Previous studies have demonstrated that Conservatives have a greater focus on the past, while Liberals are more future-focused (Baldwin & Lammers, 2016; Robinson, Cassidy, Boyd, & Fetterman, 2015). Robinson et al. (2015) studied news websites and State of the Union addresses in the US and found that Conservatives reference the past more than the future while Liberals reference the future more than the past. They explain that Conservatives often focus on values of conservation and tradition, while Liberal values endorse openness to change (Robinson et al., 2015). Similarly, Baldwin and Lammers (2016) found that past-framing of environmental issues increased environmental concern among Conservatives. They explain that Conservative ideology emerged from a desire to protect the status quo against progressive change, with a preference for the past over the future, while Liberals aim to replace the current society with a newer system (Baldwin & Lammers, 2016). A desire to protect the past is reflected in my study, as Conservatives demonstrate a preference for preserving historic landscape features. As Summerby-Murray (2002) explains concerning Sackville's industrial past, heritage representations can provide structure, simplicity and a sense of place to communities that have undergone change through de-industrialisation, consistent with Conservative values of preserving the past.

The significance of some independent variables despite the relatively small sample sizes of the five scales suggest certain types of people demonstrate a preference for preserving these past landscapes, while others do not. In the written response section, some respondents reflected on the continually changing nature of the landscape, for example:

> Much of the Chignecto landscape has been radically altered over the past 3 centuries, by construction of dykes, agriculture, railway and highways, the recently-removed Radio Canada International towers, etc. Wind turbines are yet another instance of human alteration of the landscape. (Indeed "landscape" is a human cultural concept.)... (respondent #195).

Similarly, another respondent stated, "The landscape has always been changing, as it has to." (respondent #496). The lack of universal attachment to the foundries and radio towers and the reflection of some respondents on the necessity of change in landscapes suggests that some community members view change more positively than others. The potential for people and communities to adapt their preferences for landscapes through societal change has also been reflected in previous studies, such as the Mactaquac Dam removal study conducted by Keilty et al. (2016), which found that people became attached to the new landscape created by the dam, despite the initial disruption. Similarly, the dam removal study in New England found that communities became accustomed to the altered landscape and couldn't imagine the landscape being beautiful without the dams (Fox et al., 2016). Although most dams in the New England region differ from the Mactaquac Dam because they are older than a single human generation, the attachment to these altered landscapes suggests that baselines for landscape preferences can shift between generations as well as within (Fox et al., 2016; Keilty et al., 2016). As explained by Park and Selman (2011), people can be attached to a landscape, even if it is always changing. While some people in the Chignecto region may be more attached to certain features and resistant to change than others, there is potential for preferences to evolve over time.

Results of regression analysis suggest that APUL is independent from both time lived in the region and place attachment, further supporting the idea that people can adapt to change within a generation. Correlations between noticing of features and years lived in the region are significant for all features except the hay barns, which, like dykes, still exist in the region today (Table 7). This suggests that noticing each of the four features is due to being present in the region more than being observant or unobservant. However, while time in the region is significant for noticing features, it is not a significant predictor for attachment in any of the five regression models, suggesting that having lived in the area and noticed the features is not enough to develop attachment to them, controlling for all else. Some people may have spent their entire life in the region and observed it change over the years, potentially leading to a greater acceptance of change through either the loss of past features or the addition of new ones. A quote from one respondent demonstrates their recognition of continuous change in the region and their acceptance of new developments:

> I have lived here 84yrs, I have seen this area progress from oil lamps, mud roads and horse and wagon or foot power to the present. I feel that the ever present wind

> in this area should be utilised to the fullest to our benefit. The wind generators, towers enhance the landscape, in my opinion of the most beautiful place on earth. (respondent #301).

Mean place attachment in the Chignecto area is similar to that found by Raymond et al. (2010), who also found a significant positive relationship between time lived in the region and place attachment in their study of the Adelaide and Mount Lofty Ranges in South Australia, a comparably rural area. While previous studies have examined the relationship between years in the region and place attachment, few have looked at the impact of place attachment on APUL. From my regression analysis, place attachment is not a significant predictor for any of the five scales except for HAYBARN ($p<0.05$). Place attachment to the Chignecto region may be significantly correlated with the hay barns as this landscape feature has been celebrated through paintings and photography, such as the work by Thaddeus Holownia, leading people to view the barns as highly symbolic of the area. Overall, the lack of correlation between APUL and both place attachment and time in the region suggests that residents may be attached to the Chignecto area itself rather than the specific features of the region, suggesting the adaptability of individuals to change and the potential for shifting baselines within a single generation.

2.5.3 How Do APUL and Other Dimensions Discussed Above Influence Support for Wind Energy Development?

Although Chignecto place attachment is not a significant predictor for APUL, it is correlated with support for wind energy development in some situations. As has been suggested in previous studies (Bell, Gray, & Haggett, 2005; Jones & Eiser, 2010; Wustenhagen et al., 2007) support for wind energy in my study is highest at the general or national scale, with lower support for development within sight of home. Although support decreases from the GENERAL to REGIONAL to HOME VIEW scales, my study still finds relatively high support for wind energy development at the local level, contrasting previous studies that have suggested low success rates of proposed wind energy developments are due to opposition from nearby communities (Bell et al., 2005). Of course, the turbines are already in place in my study. As explained by Devine-Wright

(2009), high place attachment may result in opposition to nearby developments due to the social-psychological disruption caused by these developments. Place attachment in my study is positively correlated with wind development at all levels in bivariate analysis, although this is only significant at the GENERAL and REGIONAL scales for people who can see turbines and at the GENERAL scale for people who cannot. These results suggest that place attachment increases support for wind development overall, and although people with high Chignecto place attachment would prefer this development be located elsewhere in Canada, those who currently see it from their homes are not opposed to more development also located within view of their residence. This result contradicts the study by Devine-Wright and Howes (2010), which found higher local place attachment to have a negative impact on support for a nearby off-shore wind development. Place attachment is also a stronger predictor of support for residents who can see turbines from their home, suggesting these existing turbines may have become a part of people's sense of place.

Importantly, APUL is a significant positive predictor of wind support at the REGIONAL and HOME VIEW scales for respondents who can see turbines from their homes, suggesting that turbines may become a part of people's climax landscapes, and residents with higher APUL similarly develop attachment to current features and support further development of these features. APUL is not a significant predictor for wind development at the GENERAL scale for people who can see turbines, or for wind development at any scale for those who cannot see turbines, further supporting the idea that community members with high attachment to past and current features support further development of wind in their landscape based on attachment to the turbines, rather than due to increased support of wind energy in general. These results support the theories of acquired aesthetics (Selman, 2010) and shifting baselines explored in the context of hydroelectricity (Keilty et al., 2016) in which local residents develop attachment to anthropogenic landscapes over time.

While support for wind development from people who can see turbines from home is influenced by APUL, support from those who cannot see turbines is instead influenced by politics. As discussed previously, conservatism is negatively correlated with environmental concern (Davidson & Haan, 2012), so people who do not have personal experience with wind turbines in their landscape may instead base their opinion on their broader beliefs. Politics does not have a significant impact on support at any scale for residents who live within view of turbines, suggesting these people base their support on personal experience with turbines rather than their general beliefs. A recent study conducted by Walker, Stephenson and Baxter (2018) explored the politics of wind energy in NS compared to in Ontario, surveying residents within a two-kilometre radius of turbines in both provinces. They found support from residents living near turbines in NS to be significantly higher and less politicised than in Ontario, echoing the results of my study, which found support to be generally high and non-politicised from people within view of turbines.

In addition to conservatism, years lived in the region also has a negative impact on support for wind at the GENERAL and REGIONAL scales from people who cannot see turbines from home. Although place attachment and time lived in the region are positively correlated, both in my study and in previous research (Brown et al., 2004), they have opposite impacts on support, suggesting opportunities for further study. The negative impact of years lived in the region on support may be due to a correlation between time lived in the region and older age, as Park and Selman (2011) found older people to be more resistant to landscape change. None of the five predictor variables are significant in predicting support at the HOME VIEW scale for people who cannot see wind turbines. This also suggests opportunity for further study because, although support for wind development within view of respondents' homes is relatively high compared to some previous studies (Musall & Koik, 2011), understanding factors influencing support for development within view of people's homes is critical for further development of wind energy resources without causing disruption to surrounding residents.

The experimental treatment does not have a significant impact on any of the three wind support scales for people who can see wind turbines or for people who cannot, suggesting that being reminded of previous landscape changes in the region does not impact support for current or future changes in the context of wind. The study by Hanley et al. (2009) used a similar experimental treatment to examine the impact of information about past forest landscapes on preferences for future landscape change and found the experimental treatment to increase support for future changes. However, the Hanley at al.

(2009) study explored landscape change in the context of modifications to woodland cover in National Parks, different from the utilitarian features of people's everyday landscapes explored in our study.

The significance of the experimental treatment on the GENERAL scale (Supplemental Table 3) is an interesting and confusing result, as we hypothesised the treatment to impact support for wind development at the regional or local scale rather than support for wind energy in general. To test this hypothesis, the GENERAL questions were asked prior to the experimental treatment, while the REGIONAL and HOME VIEW sets were after. The impact of the experimental treatment on the GENERAL scale but not the other two scales is either due to chance alone ($p<0.05$) or suggests that a significant number of people completed the survey backwards. If the latter is true, being reminded of previous landscape change around their home increases respondents' support for wind energy development at the GENERAL scale, if it is not, being reminded decreases support at smaller scales. This result is highly inconclusive and warrants further exploration. If a significant number of people completed the survey in reverse order, the experimental treatment may also have impacted the other two wind scales had the survey been completed in the sequence we intended.

2.6 CONCLUSIONS

Results from this study help better understand one component of climax thinking, attachment to past utilitarian landscape features. Through studying people's attachment to past features, we can better understand their acceptance of change in the landscape, which may be useful in predicting acceptance of future developments such as renewable energy infrastructure. The results of this study suggest that climax thinking, in the context of attachment to past utilitarian landscapes, is independent from place attachment and time lived in the region. People may have lived in the region for a long time, and have high attachment to this place, yet still be accepting of change in the context of loss of past utilitarian features. The significance of gender and politics on attachment to past utilitarian landscapes, particularly the foundries and radio towers, suggests potential for framing of future wind energy or other developments as continuations of the region's industrial heritage. Preliminary analyses of applications to wind farm development suggest factors influencing support differ between people who can and cannot see turbines from their home, with people who can see them including turbines in their attachment to the landscape while people who cannot see them base their support or opposition on broader political beliefs. As stated by Keilty et al. (2016), each person is unique, with their own unique sense of place, and it is never appropriate to force change on communities and tell them they will get used to it. However, by understanding the factors influencing acceptance of change in landscapes and the adaptability of people to change, we can better plan for future developments in landscapes, as significant modifications will be required in coming decades to meet societal needs.

CHAPTER 3 SURPRISES IN DRIVERS OF WIND DEVELOPMENT SUPPORT ACROSS SCALES WITHIN A REGION HOSTING WIND ENERGY

3.1 INTRODUCTION

Increased production of energy from renewable sources will require the construction of significant new infrastructure, and people may support or oppose these new developments at the national, regional or local scale. While the term acceptance is often used when discussing public attitudes towards renewable energy infrastructure, Batel, Devine-Wright and Tangeland (2013) differentiate between acceptance and support in the context of community perceptions of renewable energy. Support indicates an active and positive opinion of a project, while acceptance can involve people living with a development they may not support but do not actively oppose, implying a sense of non-agency (Batel et al., 2013). Bell, Gray and Haggett (2005) suggest that, while the majority of people support renewable energy development in general, most do not support it without qualification and believe there are certain controls that should be placed on developments. These qualifications can include diverse factors and can vary depending on the proximity of the development, with different costs and benefits at each scale.

At the national scale, several studies report high public support for renewable energy development. In the UK, Jones and Eiser (2010) report 83 – 85% public support for renewable energy, while Bell et al. (2005) report 80% support for wind development. Similarly, Rand and Hoen (2017) describe 70 – 90% public support for wind energy in North America, while a Canadian study found public support for solar, wind and hydroelectric power to be 90% or greater, compared to just 19% for coal (Insightrix, 2011, as cited in Hall, Ashworth, & Devine-Wright, 2013). More recently, in a study of 3000 Canadians, Sherren, Parkins, Owens and Terashima (2019) found support or strong support for further development at the national scale to be 83% for solar, 75% for wind and 74% for hydro. It should be noted, however, that Aitken (2010) critiques the assumption of high general support for renewables, stating that many studies lack information on how national scale polls are conducted and that public opinion is flexible rather than static and should therefore be measured more frequently. In addition to public opinion, support for renewable energy at the national scale is influenced by targets and requirements for reductions of fossil fuel use, such as the Kyoto Protocol (Batel et al., 2013), and questions of how best to meet our growing energy demands (Firestone & Kirk, 2019). At the regional scale, support can again be influenced by fossil fuel reduction requirements, as many jurisdictions set their own targets (Richards, Noble, & Belcher, 2012). Regionally, job creation, rural development, and perceptions of economic benefits can also be important factors influencing support (Musall & Koik, 2011; Nadai & van der Horst, 2010).

At the local scale, defined in this paper to mean within view of an individual's home, the visual impact of infrastructure and perceptions about fit in the landscape are often key factors influencing support or opposition (Musall & Koik, 2011; Rand & Hoen, 2017). Jones and Eiser (2010) found that higher concern about the landscape impacts of a renewable energy development led to lower support for the development. When renewable energy is developed in sparsely populated areas it is often met with little resistance, as in the case of most wind development in Saskatchewan (Richards et al., 2012). However, the US Department of Energy notes that the majority of optimal wind farm sites in the United States, meaning those with good wind resources and far from communities yet close to loads and transmission, have already been developed and future wind energy development will require more contentious siting decisions (Rand & Hoen, 2017). Additionally, renewable energy has fewer Megawatt Hours (MWh) produced from each plant, necessitating a greater number of project proposals dispersed across landscapes and more siting decisions to maintain supply (Wustenhagen, Wolsink, & Burer, 2007).

While the benefits of renewable energy largely occur at the global or national scales, impacts are often felt at the local scale, such as bearing the visual implications of wind turbines or the flooding of land from a hydro development (Wolsink & Breukers, 2010). Developers and other proponents of renewable energy may view negative local perceptions as a 'gap' between general public support and local opposition, labelling local resistance as NIMBYism (Wolsink & Breukers, 2010). However, many studies suggest that the limited scope of NIMBY fails to accurately describe the complexity of resistance to the new landscapes associated with renewable energy infrastructure, and most current research looks beyond NIMBYism to understand support for or opposition to renewable energy (Devine-Wright, 2005; Wolsink, 2006).

Factors influencing support from communities around renewable energy developments can include perceptions of the infrastructure in the landscape as well as beliefs concerning the distribution of both energy and benefits from the development. The theory of place attachment proposes that local people or groups have an emotional bond with the place they live and that the changes to the surrounding landscape caused by renewable energy infrastructure can disrupt this attachment, causing resistance to such developments (Devine-Wright, 2009). Perceptions of infrastructure in the landscape can be influenced by proximity to the development, although studies have found differing results concerning how exposure to renewable energy infrastructure influences support or opposition to the development (Rand & Hoen, 2017; Sherren et al, 2019). A related concept, climax thinking, proposes that many individuals view their surroundings as the optimal endpoint reached after years of human progress and assume that further change to the landscape would be negative (Sherren, in press). Climax thinking includes a difficulty imagining past landscapes, future landscapes or our impacts on landscapes and people that exist elsewhere (Sherren, in press). A geographical and psychological distance between energy generation and consumption is common in fossil fuel electricity generation (Adams & Bell, 2014). The concept of local energy could help address this unequal distribution of costs and benefits, with local renewable energy developments serving nearby communities and/ or driving more sustainable choices (Sherren, in press).

Local use of energy and ownership of the development may be important factors in renewable energy support. People living around a renewable energy development may be more supportive of it if the energy generated is used to meet local demand rather than exported (Brennan, Van Rensburg, & Morris, 2017; Rand & Hoen, 2017). In addition to the distribution of energy from a development, the ownership of the development and distribution of benefits can influence support. Studies have found that community ownership or co-ownership of a development increases positive attitudes towards local renewable energy (Musall & Koik, 2011). When developments are owned by private corporations, funds may be donated to the local community to increase support through community benefits, although these funds can be controversial as they are sometimes seen as bribes (Walker, Wiersma, & Bailey, 2014). Additional benefits can occur for the community through the creation of jobs from a renewable energy development, including both direct and indirect employment during the construction and operation phases of the project (Slattery, Lantz, & Johnston, 2011). These various factors with potential to influence support for renewable energy developments are discussed in more detail in the background section.

For this study, I focus on one source of renewable energy, wind. Wind energy has been identified as a renewable source with significant potential for further development, yet can also be controversial, particularly at the local scale as turbines are highly visible in the landscape (Rand & Hoen, 2017). Within Canada and around the world, electricity from wind energy has increased over recent years and is predicted to continue to rise. While wind accounted for only 1% of Canada's electricity generation in 2007, it reached 6% by 2017, with significantly higher proportions in some regions of the country (Rand & Hoen, 2017; Richards et al., 2012). Although hydroelectricity, another renewable source, accounts for the majority of Canada's electricity generation at around 60% (Richards et al., 2012), hydroelectric developments have significant environmental impacts due to the flooding of land (Gullberg, Ohlorst, & Schreurs, 2014). Similarly, solar power has considerable lifecycle impacts and requires a larger land area than wind energy; a recent study in the US found that a majority of people would rather live near a wind farm than near a solar development (Firestone & Kirk, 2019). Wind is recognised as one of the least environmentally harmful sources of electricity as it does not emit carbon dioxide, other greenhouse gases or harmful pollutants; does not require water for operation; does not produce hazardous waste; and does not require mining for fuel (Slattery et al, 2011). The significant potential of wind energy to meet future renewable energy needs can best be realised by understanding the factors influencing support from people living around developments.

In this study, we explore how the above factors influence support for current and future wind energy development at the national, regional and local scales from people living around an existing wind farm in a rural region of Atlantic Canada. As identified by Rand and Hoen (2017), most wind energy acceptance studies in North America have focused on proposed or hypothetical developments, rather than existing wind farms.

Furthermore, Rand and Hoen (2017) recognise that the North American wind energy literature lacks detailed exploration of the attitudes of people living closest to turbines. To address these gaps and better understand factors influencing support for wind energy in Atlantic Canada, we designed and distributed a mail-out survey to residents in the Chignecto area of Atlantic Canada. The region includes two towns: Amherst, NS, where a wind farm was constructed in 2012; and Sackville, NB, where a wind farm proposal was rejected around the same time. Through this study, we examine some of the variables commonly thought to drive support for wind energy development—and test some new variables—at the national, regional and local (within view of respondents' homes) scales. Specifically:

1. How do perceptions of local use versus export of energy influence support for wind energy development at the national, regional and local scales?

2. How do local benefits, including community ownership, profits to the community and job creation influence support for wind energy development at the national, regional and local scales?

3. What impact do other factors, including place attachment, proximity to turbines, politics and demographics, have on support for wind energy development at the national, regional and local scales?

3.2 Background

The following section explores potential factors influencing support for or opposition to renewable energy developments. Several possible explanations of community support for renewable energy development relate to the distribution of energy and benefits from the development, including local use versus export of energy, community ownership, community benefits and job creation. Alternative explanations to these distribution factors include place attachment, proximity to infrastructure, politics and demographics.

3.2.1 Local Use

Residents in a host community may be more accepting of a renewable energy development if the energy generated is used locally rather than exported. As stated by Rand and Hoen (2017), North American wind energy survey respondents consistently express concern that the energy produced from local wind farms is consumed elsewhere rather than staying in the local region. Additionally, local generation of renewable energy and local use of this energy may be valued by surrounding communities if it offsets fossil fuel or nuclear generation in the region. A study conducted in Greece by Kaldellis, Kapsali, Kaldelli and Katsanou (2013) found high support for wind farms, small-scale hydro and solar power in a region with poor air quality caused by the long-term operation of a thermal power plant and the mining of lignite used for fuel. Similarly, a study conducted by Firestone and Kirk (2019) in the US found that 90% of individuals living within 8 km of a wind turbine would prefer the wind development over a fossil fuel plant located the same distance away, suggesting people would prefer their energy to come from a local renewable source than a local fossil fuel development.

Local use of renewable energy can also address energy security concerns by replacing imported fuel or electricity (Kaldellis et al., 2013). In NS in 2007, prior to the introduction of renewable energy targets, 75% of the province's electricity generation came from imported coal, leaving the province vulnerable to volatile fuel costs (Adams, Wheeler, & Woolston, 2011). Local generation of electricity provides greater control to communities, a motivating factor for the creation of local energy cooperatives in the Netherlands (Hufen & Koppenjan, 2015). When increasing numbers of Dutch energy users switched to energy labelled as 'green', electricity producers in the Netherlands could not meet demand and began importing renewable energy (Hufen & Koppenjan, 2015). As citizens desired greater control over the electricity they used, local cooperatives were established by communities to develop and distribute renewable energy (Hufen & Koppenjan, 2015). However, as noted by Hufen and Koppenjan (2015), electricity networks in the Netherlands were built for the central production of energy, and local production of renewable energy necessitates changes in this distribution infrastructure. As in the case of cooperatives in the Netherlands (Hufen & Koppenjan, 2015), Musall and Koik (2011) found that local ownership of a wind farm in Germany helped instill an idea of 'energy citizenship' in the community.

The desire of people and communities to take ownership of and responsibility for their energy use and generation choices may contribute to both increased support for renewable energy and decreased electricity consumption. Energy infrastructure in the landscape can provide a visual reminder of the impacts of electricity use to nearby residents. As noted by Adams and Bell (2014), the centralised energy systems typical of fossil fuel generation result in spatial and psychological distance between electricity generation and consumption, as fuels are often both extracted and combusted in remote locations and the impacts of their use can be out of sight, out of mind for many electricity consumers. Rand and Hoen (2017) suggest that negative attitudes concerning the visual impact of wind turbines may occur in part because people are accustomed to an electricity system that is largely invisible to them. This idea supports the theory of climax thinking, an element of which states that some people have difficulty imagining the impact their choices, including energy choices, may have on landscapes and people elsewhere (Sherren, in press). A recent Canada-wide study of support for various types of electricity production found noticing of any type of energy infrastructure to be a significant predictor of increased support for renewable sources, supporting the idea that visible infrastructure can increase awareness about the impacts of energy generation (Sherren et al., 2019). Therefore, the presence of renewable energy infrastructure near communities can provide visual reminders that energy must be generated, helping to raise consciousness about the consequences of electricity use (Nadai & van der Horst, 2010). Adams and Bell (2014) report that energy generated by proximate infrastructure can lead to consumers placing a higher value on this energy and altering their behaviour to reduce electricity consumption.

Antrop (2005) explains that globalisation and urbanisation have led to densely crowded urban areas and sparsely populated rural regions, with the rural areas often seen as empty space used to meet urban needs, including energy needs. Therefore, the costs, risks and impacts of energy generation, both fossil fuel and renewable, are often unevenly distributed amongst locations and people (Adams & Bell, 2014). This unequal distribution is explored through the concepts of distributive and environmental justice, which focus on the inequitable distribution of public goods, public burdens and environmental impacts (Gross, 2007). Local consumption of renewable energy can help address the unequal distribution of impacts.

3.2.2 Export of Energy

By contrast with the significant literature discussing the importance of local consumption of renewable energy for support, the literature is relatively silent on the impact of seeing it as a commodity, either for excess energy exported outside the host community or for developments created specifically for export. Local use of energy has the potential to reduce consumption, but the reverse can also be true, as Gullberg et al. (2014) propose that increased renewable energy production can potentially lead to higher levels of energy consumption, suggesting potential benefits to exporting renewable energy that is generated beyond local requirements. The sharing of renewable energy between jurisdictions can help address the intermittency issues associated with renewables, making a stronger overall system. Renewable sources, particularly wind and solar power, fluctuate depending on the season, time of day and weather, making it difficult for jurisdictions to rely solely on these sources as there is currently limited technology available to store energy (Gullberg et al., 2014). In a study of limitations to wind energy development in Saskatchewan, Richards et al. (2012) note that wind farms must either be combined with other energy sources capable of increasing or decreasing their production or must be developed in conjunction with other jurisdictions to buy and sell electricity according to fluctuations. Richards et al. (2012) provide the example of interconnected grids in the European Union (EU) for transmitting energy between countries according to supply and demand.

Interconnected grids can also help jurisdictions achieve renewable energy targets by importing from other regions that have already met their targets and have additional renewable resources (Gullberg et al., 2014). There is current discussion between Germany and Norway regarding transmission of energy between the two countries, with development of pumped-storage hydro in Norway to balance the intermittency associated with wind energy and enhance the stability of German renewable energy (Gullberg et al., 2014). Similarly, there is potential for wind development in the Irish Midlands for export to the UK, and Brennan et al. (2017) explain that renewable energy trade has the potential to benefit both countries through improved system efficiency, lower electricity prices and increased energy security. Renewable energy can also be shared between regions within a country, as developments are situated where resources such as wind or hydro are highest, which may not correspond with electrical loads (Slattery et al., 2011). In Atlantic Canada, the Muskrat Falls Dam is being developed in Labrador, a sparsely populated region, and energy will be exported to NS via undersea cables to help NS meet their renewable targets (Emera Newfoundland and Labrador, 2019).

Despite the potential benefits of renewable energy developed for export, it can also raise various concerns for groups in the host jurisdiction. Local people living around the development may question whether they will experience any of the economic benefits, as in the case of the Irish Midlands (Brennan et al., 2017). Additionally, developments for export can cause temporary increases in electricity prices in the host jurisdiction until the energy producer has paid off debts from the development (Brennan et al., 2017; Gullberg et al., 2014). Energy intensive industries and consumers in Norway have concerns about increased electricity costs resulting from hydro developed for export (Gullberg et al., 2014), as do consumers in British Columbia (BC) concerning the development of the Site C Dam by BC Hydro, the provincial energy supplier (Lee, 2017). Norwegian environmentalists are divided on the issue of hydro power for export, as some state that renewable energy cooperation is essential for a low-carbon future, while others have concerns about the environmental impacts of hydro and argue that Norway should instead prioritise unspoiled nature (Gullberg et al., 2014). Brennan et al. (2017) note that few studies have examined support for renewable energy developments specifically for export. In their survey of individuals in the Irish Midlands around locations proposed for large-scale wind farms to be developed for export to the UK, they found 59% of respondents were opposed to wind development specifically for export, compared to 43% opposed to development for domestic use (Brennan et al., 2017). In stakeholder focus groups, local residents shared concerns that they would experience the costs of the wind farm, while the development would benefit wind farm operators, private corporations, and the UK rather than Irish market (Brennan et al., 2017). While renewable energy production for export has potential benefits including export revenue, addressing intermittency issues and increasing overall renewable production, it can further entrench the unequal distribution of costs and benefits associated with energy production.

3.2.3 Ownership of Developments

Irrespective of whether the electricity generated is used locally or exported, host communities can profit through either local ownership of developments or through benefits provided by the developer. Studies have found community ownership or co-ownership of developments can increase acceptance of renewable energy, as in a German study that used a questionnaire to compare attitudes of residents around two wind farms, one with a community co-ownership model and one with private ownership (Musall & Koik, 2011). They found residents in the town around the community co-owned wind farm to be consistently more positive towards both local renewable energy and renewable energy in general, with generally higher environmental attitudes, concern about climate change, and support for wind energy and other renewable sources (Musall & Koik, 2011). This suggests that local ownership can promote active engagement with renewable energy, as in the case of renewable energy cooperatives in the Netherlands, which grew as a result of dissatisfaction with large energy companies (Hufen & Koppenjan, 2015). In a study of support for large-scale wind farms in Ireland, Brennan et al. (2017) found a strong preference from local residents for state or semi-state led developments over private ownership, perhaps suggesting distrust of private corporations. Adams and Bell (2014) note that most renewable energy in the UK has been developed by the private sector and is motivated by economic interests, leading to the desire for some communities to develop their own energy projects. However, there are certain risks associated with community ownership, including difficulties securing financing for infrastructure, tensions between individuals who can and cannot afford to invest in the project, and concern about competition from commercial developers (Adams & Bell, 2014).

When renewable energy is developed by a private corporation rather than following a community ownership model, profits or benefits may be paid to the community by the developer as compensation for hosting the development. Community benefits typically refer to investments or funds provided by the developer to the community, rather than the direct benefits that may be generated by the project, such as local job creation (Walker et al., 2014). An example of community benefits includes funds voluntarily donated to the local government for public works, such as road maintenance or new recreation facilities (Hall et al., 2013). From their experimental study of the impact of community benefits on support for a hypothetical offshore wind development in England, Walker et al. (2014) found that focusing on collective benefits rather than individual benefits may have the greatest impact on support for development by enhancing perceptions of collective outcome favourability, which was a stronger predictor of support than individual outcome favourability. However, community benefits can also be controversial as they are sometimes seen as a bribe (Walker et al., 2010). In Ireland, 76% of local resident focus group participants believed reduced or free electricity to be the best compensation for wind farm developments (Brennan et al., 2017), and some renewable energy developers have begun providing reduced electricity rates for host communities, an example of an individual rather than collective benefit (Walker et al., 2014). Aitken (2010) states that, concerning wind energy developments in the UK, there is a lack of evidence that increased levels of community benefits from developers result in increased levels of public acceptance. In their framing study of a hypothetical wind development, Walker et al. (2014) found that support for a wind farm was lower under their dual framing condition, community benefits presented alongside perceptions of bribery, compared to their community benefits frame alone.

3.2.4 Jobs and Leases

Residents in the surrounding area can also profit through the creation of jobs and direct economic benefits associated with a renewable energy development. As most wind farms are constructed in rural regions, potentially with limited or declining industries, developments can help increase economic activity in these regions (Slattery et al., 2011). Interview participants in a study of wind farm acceptance in Australia discussed direct financial benefits of wind farms, including rental income to turbine hosts, often farmers (Hall et al., 2013). This revenue can provide farmers an alternative income during times of drought, allow for greater biodiversity conservation on the farm, and enable farmers to remain on their farm after retirement (Hall et al., 2013). In a study of the economic impacts of wind farms in Texas, Slattery et al. (2011) state that lease payments of $3,000 to $7,000 (USD) per MW per year are paid to landowners, while property tax payments to the local government are between $4,000 and $12,000 (USD) per MW.

In addition to direct payments, local employment is often cited by proponents of wind energy as a key benefit of developments (Brennan et al., 2017). Local economic development from a renewable energy project can occur through the creation of both direct and indirect jobs (Slattery et al., 2011). Dalton and Lewis (2011) describe direct jobs relating to a wind farm development as employment with project developers including installation, operation and maintenance; utilities selling the electricity; engineering and specialised wind energy services; turbine manufacturing; and major research and development. Indirect jobs include sporadic work in wind-related activities; intermediates or components from other companies; and providing services (Dalton & Lewis, 2011). Interestingly, in their Canada-wide study, Sherren et al. (2019) found that self or family sectoral employment only led to increased support for conventional energies, not renewable sources.

It can be difficult to accurately estimate the number of jobs that will be created by a new wind development as this number is dependent on multiple factors (Dalton & Lewis, 2011; Slattery et al., 2011). Slattery et al. (2011) explain that local ownership of a development or a greater capacity for the community to directly participate in the construction and operation of the project are likely to result in more local job creation. When the surrounding community has the capacity to produce large infrastructure, such as blades and towers, job creation is more likely to remain in the local area rather than occurring elsewhere (Slattery et al., 2011). Previous estimates have found that a 100 MW wind farm employs an average of 80 to 100 workers for one year during the construction phase and 6 to 8 onsite operations and maintenance workers annually for the duration of the development's existence (Slattery et al., 2011). Although highly variable, in their case study of the economic impacts of wind development in Texas, Slattery et al. (2011) found that 22% of jobs during the construction phase and 64% of jobs during the operation phase were filled by people from within an approximately 160 km radius of the wind farm. Participants in the study by Hall et al. (2013) in Australia also noted that direct jobs are highest during the construction phase of a wind development but decreased significantly during the long-term operation. However, indirect jobs and benefits to local economies are often maintained beyond this period due to workforce expenditure on local goods (Hall et al., 2013).

A wind development in South Australia added 3.3% to the surrounding area's Gross Regional Product (GRP) during the construction phase in 2009 and is expected to increase the GRP by 1.4% during the ongoing maintenance and operation (Hall et al., 2013). Wind farms can also have variable impacts on tourism (Hall et al., 2013). Although developments can have negative impacts on tourism due to increased traffic on local roads during construction or by altering the rural landscape, they also have the potential to become tourist attractions (Hall et al., 2013). In their study of the German wind farm with a community co-ownership model, Musall and Koik (2011) note that the community has received positive media attention and recognition as a progressive community, potentially increasing tourism. While increasing the amount of energy obtained from renewable sources is likely to increase jobs in these sectors, it may also decrease jobs in the fossil fuel sector (Longo et al., 2008). However, in their comparison of job creation across different energy sources in various countries, Dalton and Lewis (2011) note that jobs/MW of onshore wind energy in Europe is comparable to jobs/MW for both solar and wave energy, while job creation from conventional thermal energy sources is typically significantly lower (Dalton & Lewis, 2011).

3.2.5 Other Factors Influencing Support

In addition to the factors discussed above, several other variables such as place attachment, exposure and political values can influence support for renewable energy developments from surrounding communities. Devine-Wright (2009) proposed place attachment as an alternative to NIMBYism, suggesting that local opposition to renewable energy infrastructure often results from place-protective attitudes, as new developments can threaten local people's emotional attachment to their home and surrounding landscape. In a comparison study of two towns located an equal distance from an off-shore wind development in Wales, Devine-Wright and Howes (2010) found support for the development to be higher in the town that was viewed lass favourably by its inhabitants, suggesting support is inversely related to place attachment. As explained by McLachlan (2009), differing opinions of renewable energy technology in the landscape can be influenced by symbolic interpretations of both the place and the technology. The impact of place attachment on support for renewable energy infrastructure is typically explored in the context of local developments, as the theory was proposed to explain how disruption to local people's sense of place can lead to resistance to local developments, despite generally high support for renewable energy.

The impact of proximity and exposure to renewable energy infrastructure has also been explored in past studies, although with varying results. In their review of North American wind energy research, Rand and Hoen (2017) report that some studies have found residents who see turbines more frequently are less likely to have positive attitudes towards the development. Similarly, in their study of public attitudes towards wind energy in Texas, Swofford and Slattery (2010) found that people living closest to the wind farm had the lowest levels of support, while people living further away had stronger support. Conversely, a study in Ontario by Baxter, Morzaria and Hirsch (2013) found that 69% people in a community with an existing wind farm development would vote in favour of local turbines, compared to only 25% of people in a community without a development. People in the community with the existing development had a greater preference for electricity from wind, more positive views concerning community benefits from the wind farm, and lower concern about health risks (Baxter et al., 2013). The opposite was found by Sherren et al. (2019), where the way that Ontario introduced wind energy made exposure unrelated to support, alone among renewable technologies. In their study of a wind turbine in Delaware, Firestone, Bates and Knapp (2015) also found no correlation between proximity and liking the look of the turbine. Some researchers have suggested that self-sorting may occur over time, with people who dislike turbines moving away from them and people with greater support moving closer (Rand & Hoen, 2017).

The impact of political values on support for renewable energy has also been explored in past studies, again with varying results. Davidson and Haan (2012) examined the impact of political ideology on climate change beliefs in Alberta, finding that people with conservative politics had significantly lower concern about climate change compared to those with non-conservative politics. Similarly, a study in Australia by Tranter (2011) found greater environmental concern among Labor and Green party supporters, while a study in Norway by Karlstorm and Ryghaug (2014) found political party preference to be a significant predictor of attitudes towards renewable energy technology. In their study of public perception of hydraulic fracturing in the US, Clarke et al. (2016) found political ideology to be an increasingly strong predictor of support as distance from a development increased. However, a recent study in the US by Firestone and Kirk (2019) found no statistical difference in support for wind energy between Republican and Democratic states. In a Canadian study exploring the politics of wind energy in Ontario compared to in NS, Walker, Stephenson and Baxter (2018) found support in Ontario to be significantly lower overall and more politicised compared to support in NS, which was generally high across the province's three main political parties, as well as higher amongst nearby residents in NS as compared to Ontario.

Finally, demographic variables have frequently been shown not to be significant predictors of renewable energy support. In their review of North American research, Rand and Hoen (2017) report that gender, income and education level usually do not explain variations in support for wind energy. Similarly, in their study of a wind turbine in Delaware, Firestone et al. (2015) found no statistically significant correlation between liking the look of the wind turbine and age, income, employment, retirement status, sex, level of education, voting preferences, household size, primary versus secondary homeowners, and years owning their property. However, regarding gender, women have consistently been found to demonstrate higher pro-environmental attitudes than men (Xiao & McCright, 2013), and a study by Sherren, Beckley, Greenland-Smith and Comeau (2017) concerning dam removal in NB found differences between men and women in both preferences about energy infrastructure decisions and reasons for these preferences.

3.3 Methods

3.3.1 Study Area

The wind development selected for this study is located in Nova Scotia, a province in Atlantic Canada which in 2009 set targets to reach 25% renewable electricity generation by 2015 and 40% by 2020 (Adams et al., 2011). These targets were developed from the 2007 Environmental Goals and Sustainable Prosperity Act (EGSPA), which aims to address greenhouse gas emissions and energy security (Adams et al., 2011). At the time EGSPA was developed, 88% of electricity generation in NS came from fossil fuels, with 75% from imported coal (Adams et al., 2011). While only 1% of the province's energy needs were being met by wind energy in 2007, wind was identified as a key area with potential for further development, as NS is a coastal province with substantial wind resources (Adams et al., 2011; NS Power, 2019). Significant wind and other renewable energy development has occurred since 2007, with the province meeting their 25% target in 2015 and on track to meet their 40% target by 2020 (NS Power, 2019). As of April 2019, an average of 30% of the province's electricity needs were being met by renewable sources, with 18% from wind energy (NS Power, 2019). Large commercial wind farms in NS are either owned (partially or completely) by NS Power, the province's energy supplier, or by independent power producers, who sell the energy to NS Power (NS Power, n.d.). Smaller wind farms may be constructed through the Community Feed-In Tariff (COMFIT) Program, a program run by the provincial government from 2011 to 2016 to enable community organisations to become involved in wind energy generation (NS Power, n.d.).

For this study, I focus on a wind development located near the Town of Amherst in the Chignecto area on the border between NS and NB. The Chignecto area is a low-lying and windy region located on the Bay of Fundy, an inlet of the Atlantic Ocean. The area includes the towns of Sackville, NB (population 5,331), Amherst, NS (population 9,413), as well as surrounding homes and farms. This region was selected for this study because a wind farm was constructed near Amherst in 2012, while another wind farm proposed closer to Sackville was rejected around the same time (John Higham, personal communication, June 27, 2018; "Maritime Wind", 2012). The two towns have different histories and demographics, with the presence of Mount Allison University in Sackville contributing to a population with a younger age, higher university education, and higher income compared to Amherst (Statistics Canada, 2017). Additionally, this study region was selected due to its history of landscape change and utilitarian landscape features, in particular the Radio Canada International towers that were removed in 2014, around the same time as the construction of the wind farm, providing a unique natural experiment. Perceptions of landscape change in the region and attachment to utilitarian landscape features, as well as their impact on support for wind energy development, are discussed in the previous chapter.

A 15-turbine, 31.5 MW wind farm was constructed by the Toronto-based company Sprott Power near the Town of Amherst in 2012 ("Maritime Wind", 2012).[1] This development is a commercial wind farm operated by Sprott Power (now Capstone Infrastructure) with no community ownership, and the energy is sold to NS Power under a 25-year contract ("Maritime Wind", 2012). The chief operating officer of Sprott Power at the time of construction stated that the wind farm powers 10,000 homes in the Amherst area, further explaining that all wind farms in NS are serving local load rather than generating power for export ("Maritime Wind", 2012). The 15-turbine wind farm is situated approximately three kilometres west from the Amherst town centre and approximately ten kilometres southeast from the Sackville town centre. It is visible across much of the area due to the flat topography of the marsh. After constructing the initial 15 turbines, Sprott Power applied to construct an additional 15 turbines in the region, but this application was rejected (Cole, 2012). However, an additional three turbines have been constructed under the COMFIT program since 2012, with all 18 turbines existing prior to the distribution of the survey (Cole, 2019). Based on a review of newspaper archives, community consultation meetings do not appear to have occurred for the 15-turbine wind farm, but public comments were accepted from May 1, 2008 to May 15, 2008 for the original wind farm proposed by Acciona (Government of NS, 2017). There were meetings held concerning two of the turbines built under COMFIT, the Amherst Community Wind Farm developed by Natural Forces (Mathieson, 2012).

3.3.2 Survey Design and Implementation

We designed a survey to measure support for wind energy development among the people living in the vicinity of a wind farm, and distributed it to randomly selected homes in the Chignecto area (Appendix B and C). The survey began with a letter introducing the purpose of the study and explaining how the information collected would be used. The surveys were designed as three double-sided pages that folded open to make

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[1] The Amherst wind farm was originally proposed by a different company, Acciona, with approval granted in 2008, including an Environmental Impact Assessment (Cole, 2011). However, due to economic difficulties, the development was never completed by Acciona and was instead acquired by Sprott Power in 2011 (Cole, 2009; Transcontinental Media, 2011).

one wide sheet. Question sets asking about exposure to wind turbines; support for current and future wind energy development at the general/ national, regional and local/ within view of home scales; place attachment to the Chignecto region; beliefs concerning the distribution of energy and benefits from wind farms; and demographics were included in all surveys. These question sets are explained in further detail below in the Data and Analyses section. Half the surveys also contained an experimental section asking about past landscape change in the Chignecto area not used here; results concerning attachment to past landscapes in the region are discussed in the previous chapter. All questions were asked as multiple choice or Likert-scale questions, except for two optional written response questions. These written questions allowed respondents to elaborate on any themes mentioned in the survey or provide additional information that had not been mentioned previously. Written responses were provided by 153 out of the 335 survey respondents and were used to better understand respondents' beliefs concerning the issues discussed in the surveys, with some quotes provided in the discussion section to elaborate on key themes.

Using the multiple reminder mail-out method (Dillman, 1978), we distributed surveys to 1000 randomly selected homes in the region, defined by the postal code Forward Sortation Areas (FSAs) of B4H on the NS side and E4L on the NB side. Addresses were obtained from two different sources as the study area crosses two provinces. On the NB side, a GCADB provided by the provincial government through Service NB was used, while an Assessed Value and Taxable Assessed Value History dataset available on the Data Zone website, a Nova Scotian open government data website, was used on the NS side. Postal code data was obtained from the Dalhousie University GIS Centre, using version 2017.3 from DMTI Spatial, as neither the NB nor NS dataset contain postal codes. Address data was clipped to the study region using GIS and address lists were exported to Excel with 3214 addresses in E4L and 4030 in B4H, for a total of 7244 addresses. To proportionally represent the two regions, 440 addresses were selected from E4L and 560 from B4H using the random number function in Excel, for a total of 1000 randomly selected addresses.

The mail-out survey period began on May 28th, 2018, with an initial postcard informing the 1000 randomly selected residents they would be receiving a survey.

Inspired by the Dillman (1978) method, this was followed by the first copy of the survey, a reminder postcard, a second identical copy of the survey, and a final reminder postcard, each mailed one to two weeks apart with the final reminder postcard sent on July 10th, 2018. Completed surveys were accepted until August 1st, 2018. Undeliverable postcards and surveys were returned for 67 addresses in NS and 90 in NB, with the proportion of undeliverable surveys likely higher in NB than in NS due to differences in the datasets used to acquire address data in each province. Since the NS dataset includes property information, we were able to exclude addresses that were unlikely to be occupied (i.e. without bathrooms). The NB dataset does not include this information, so we weren't able to exclude addresses on the NB side. The 157 undeliverable surveys were subtracted from the initial 1000 surveys to have 335 completed and returned during the study period out of 843 deliverable, giving a response rate of 40%. For more details on address selection and survey mail-out, please see Chapter 2.

3.3.3 Data and Analyses

3.3.3.1 Dependent Variables

The statistical software STATA was used to analyse responses from completed surveys. Three question sets were designed to measure support for wind energy development at the general/ national, regional and local/ home view scales (Table 6, Chapter 2). The first of these question sets included six questions asking about support for wind energy in general and at the national scale. These questions were asked on a five-point Likert scale and were phrased in both positive and negative directions. The next question set focused on wind energy development in the Chignecto region. This question set again included six Likert-scale questions, asked in positive and negative directions. Finally, the last wind support question set asked about support for wind turbines within view of respondents' home, phrased to be applicable to both respondents who currently see wind turbines from their home and those who do not currently see turbines. Again, this question set included six questions asked both positively and negatively on a five-point Likert scale. Support was measured at three different scales as previous research has found both levels of support and the factors influencing support to vary depending on the proximity of the development (Rand & Hoen, 2017; Wolsink & Breukers, 2010).

Principal component analysis (PCA) with varimax rotation was conducted for each of the three question sets to determine clusters within the data and to create scales. Questions asked in the negative direction were reversed so all questions positively measured support for wind energy from one to five. Factor analysis revealed one factor for the general wind support question set, so a single scale was created based on the single dimensionality. One question was dropped from the scale, 2f 'Wind energy provides fewer jobs than other energy sources', as this question was the least associated with the other questions in the set. Respondents could be supportive of wind development while still agreeing that it provides fewer jobs than other energy sources, so this question was instead moved to be a predictor variable. Mean responses to the five remaining questions were combined to make a scale, the GENERAL scale (alpha = 0.81). For the regional wind support question set, PCA again revealed one factor, so a single scale was created based on the single dimensionality of the question set. One question, 5b, was dropped from the scale as this question was determined to be double-barrelled, a mistake which had not been caught prior to survey distribution but which may have been confusing to respondents. The five remaining questions were combined to make the REGIONAL scale (alpha = 0.91). Finally, PCA for the question set asking about wind development within view of respondents' homes revealed a single factor, so the questions were again combined into a single scale. No questions were dropped from this set and the scale created from the mean of the six questions is the HOME VIEW scale (alpha = 0.88). These three scales measuring support for wind energy at each of three levels are the dependent variables of the study.

3.3.3.2 Key Predictor Variables

The key predictor variables are derived from a question set that asks about distributional justice, energy use, ownership and benefits (Table 10). All questions were again asked on a five-point Likert scale. Some questions were combined into scales based on conceptual similarities and alpha values, while others were kept as individual questions to create a total of six predictor variables concerning the distribution of energy and benefits. These six predictors are referred to as the Key Predictor Variables.

Table 10. Questions, response options and descriptive statistics for Key Predictor Variable questions and scales derived from Question 8 and Question 2

Key Predictor Variables	Descriptive Statistics					
Likert scale response options from 1 (strongly disagree) to 5 (strongly agree)	1	2	3	4	5	
Local Energy Use scale: n=333	**Distribution (%)**					**Mean (S.D.)**
8a. I would more strongly support wind farm development in the Chignecto area if the energy generated is used locally.	1	3	12	39	45	4.22 (0.87)
8b. I would more strongly support wind farm development in the Chignecto area if the energy generated is used to replace coal or other fossil fuel energy generation within the region.	1	2	10	39	48	4.30 (0.83)
8e. I like the idea of generating the energy I use locally.	0	1	8	49	42	4.32 (0.68)
Local Energy Use scale Cronbach's alpha	0.76					4.28 (0.65)
Local Benefits scale: n=330						
8g. I would more strongly support wind farms in the Chignecto area if they were owned locally through cooperatives or municipal corporations.	1	6	29	42	22	3.78 (0.90)
8h. I would more strongly support wind farms in the Chignecto area if profits were distributed to local municipalities.	2	2	18	46	33	4.06 (0.86)
Local benefits scale Cronbach's alpha	0.79					3.92 (0.80)
Energy as a Commodity: n=328						
8c. Energy is just a commodity; if we can develop it to sell elsewhere (eg. New England), then we should.	8	26	30	26	9	3.03 (1.11)
Energy Not for Export: n=328						
8d. We have enough energy from other sources; more wind turbines would be unnecessary because the additional energy would just be exported.	28	46	20	5	1	2.05 (0.87)
Fewer Jobs from Wind: n=324						
2f. Wind energy provides fewer jobs than other energy sources.	7	13	58	18	3	2.96 (0.86)
Reminder of Energy Use: n=326						
8f. Seeing wind turbines from my home reminds me that electricity I use has to be generated somewhere.	3	8	25	48	16	3.67 (0.93)

Three questions in this set asked about respondents' desire for energy generated from wind to be used locally or to offset fossil fuel generation within the region. These questions were selected as predictor variables as Rand and Hoen (2017) report that survey respondents living around a wind farm often express a desire for the energy generated by their local development to be used by the community rather than exported. The mean of these three questions was used to create a scale called Local Energy Use (alpha = 0.76).

Two questions in the set asked about respondents' desire for local ownership of the wind farm or for profits from the wind farm to be distributed locally. Musall and Koik (2011) report that residents around a wind farm with a community co-ownership model report greater support than residents around a privately-owned wind farm, while Walker et al. (2014) found that benefits donated to the community by a private developer can increase support for the development, but may also be seen as a bribe. These two questions were combined, again using mean, to create the Local Benefits scale (alpha = 0.79).

Another two questions in this set, phrased in opposite directions, were designed to measure the extent to which people view energy as a commodity, potentially for export. These commodity and export questions were used as a study conducted in Ireland found lower support from community members for wind energy developed for export to the UK compared to wind energy developed for local use (Brennan et al., 2017), while other research discusses the potential benefits of transmitting renewable energy between jurisdictions (Gullberg et al., 2014; Richards et al., 2012). Although these two questions include similar ideas, they have conceptual differences, different response patterns and a low alpha value (0.35) when combined, so were kept separate. The two questions are not overly correlated with each other (rho= -0.19) and both maintain significance in regression. The first is referred to as Energy as a Commodity while the second is referred to as Energy Not for Export.

As mentioned earlier, the question from the GENERAL support set that asked respondents if they believe wind energy provides fewer jobs than other sources was moved to be included in the Key Predictor Variables, Fewer Jobs from Wind. This question was selected as Slattery et al. (2011) state that proponents of wind energy often identify job creation as an important benefit for rural communities, while critics argue that wind developments have limited long-term economic impacts.

Finally, one question asked respondents if seeing wind turbines from their home reminds them that the electricity they use has to be generated somewhere. This question, the Reminder of Energy Use variable, was selected to be a predictor variable as Adams and Bell (2014) suggest that consumers place a higher value on energy generated by nearby infrastructure, leading to reduced consumption. Furthermore, the theory of climax thinking suggests that people with a greater understanding that the impacts of their energy consumption must occur somewhere may be more willing to accept infrastructure within view of their home (Sherren, in press).

3.3.3.3 Alternative Predictor Variables

In addition to the Key Predictor Variables, alternative predictor variables include exposure to turbines, place attachment and politics. The first question set on the survey included a picture of a wind turbine and asked people how often they see or hear wind turbines. This question set asked participants if they have ever seen or heard turbines, if they drive past them in the course of a week, if they see or hear them from where they work or study, and if they see or hear turbines from their home. Questions were provided with Boolean (yes or no) response options. As some respondents commented on the survey, this question set could be improved in future research by asking separately about seeing and hearing. A few respondents noted that they see turbines regularly but have never heard them. From this question set, seeing or hearing turbines from home was used as the predictor variable to measure exposure to turbines as it was determined to be the most representative of daily exposure to turbines. It also had the greatest variation in responses, compared to ever seeing or hearing turbines or driving past them regularly, both of which had a high percentage of yes answers. This question was treated as a binomial variable, with not seeing turbines from home as zero and seeing turbines as one. Regular exposure to wind turbines was selected as a predictor variable as previous studies have found conflicting results concerning the impact of proximity and exposure to turbines on support for wind energy. For instance, Swofford and Slattery (2010) report that people living closer to a wind farm in Texas had lower levels of support than those further away, while a study by Baxter et al. (2013) in Ontario found that people living in a community with a nearby wind farm reported higher levels of support than those in a community without.

Five statements were used to measure place attachment to the Chignecto region, adapted from a study by Raymond, Brown and Weber (2010) that measured place attachment in the Adelaide and Mount Lofty Ranges of South Australia. These statements were originally phrased in both the positive and negative direction but were recoded to all be in the positive direction and combined to create a scale from one (low place attachment) to five (high place attachment) (Table 4, Chapter 2; alpha 0.88). The Place Attachment scale was used as a predictor because various studies have explored place attachment as an alternative to NIMBYism for explaining opposition to renewable energy developments from nearby communities (Devine-Wright, 2009).

We asked respondents what party best represents their political views, whether or not they vote, at the end of the survey; some people are reluctant to respond to political questions and may have stopped the survey had it been asked earlier. Response options were provided as the four main political parties in the region, Conservative, Liberal, New Democratic Party (NDP) and Green, as well as an option for other (Table 4, Chapter 2). Politics was used as a predictor variable because some studies have found a correlation between political ideology and concern about climate change or support for renewable energy development (Davidson & Haan, 2012; Karlstorm & Ryghaug, 2014), while others have found no statistically significant correlation between support for wind energy and politics (Firestone & Kirk, 2019). This question had the lowest response rate of all survey questions, with 198 respondents selecting a political party, 107 people choosing not to answer, and 30 people selecting ‘other’. The question was then recoded to be a dichotomous variable with ‘Conservative’ as one category and ‘Not Conservative’ as the other category, including Liberal, NDP and Green. Since the ‘other’ option could not be accurately classified in either group, it was treated as missing data. This classification was used to mimic the US binary of Republican and Democrat, as the Conservative party is the only major party in Canada classified as right-wing, while the Liberal, NDP and

Green parties are considered centrist or left-wing (Sherren et al., 2019). As well, the variable was recoded due to low numbers for some options (eg. Green n=21).

3.3.3.4 Control Variables

Province, years lived in the region, gender, age, education and household income are used as control variables (Table 1, Chapter 2). Province was recorded based on the postal code of respondents. Years lived in the region was asked as a written response question asking respondents the number of years and months they have lived in the Chignecto area, and then converted to a decimal years. Gender was asked with options provided as Female, Male and Non-binary. Age was asked in categories, starting with 19-24, and then in ten-year categories up to 75+. Education was recoded into three categories; "high school or less than high school", "college or trade apprenticeship" and "university undergraduate or graduate" from eight options originally provided on the survey. Income was also asked in categories, starting with "less than $26,000" and then in $25,000 categories up to "$100,000 or more". As well as acting as controls, demographic data also allowed the survey population to be compared to the overall population of each FSA, using Statistics Canada data from the 2016 census to assess representativeness (Table 5, Chapter 2) (Statistics Canada, 2017).

3.3.3.5 Correlation and Regression Analysis

We began the analysis of associations between variables with Spearman correlations for each of the predictor and control variables with each of the three wind support scales (Table 11). This was used to measure the strength and direction of bivariate relationships between the dependent and independent variables. Spearman correlations were used for all correlations for consistency and ease of reporting as many of the variables are categorical rather than continuous. Significance is reported at the 0.05, 0.01 and 0.00 levels. A correlation matrix was also used to examine bivariate relationships between all predictor and control variables to check for collinearity, again using Spearman correlations (Supplemental Table 6). None of these are high enough to question independence and risk multicollinearity. The highest correlation between independent variables is between years lived in the region and age, with a Spearman rho value of 0.53. The highest correlation between Key Predictor Variables is between the Local Energy Use scale and the Local Benefits scale (rho=0.50). These values are acceptable collinearity for all variables to remain in the analysis.

Finally, we conducted multivariate linear regression using Ordinary Least Squares (OLS) regression to create a model for each of the three wind support scales using the predictor and control variables (Table 12). OLS regression was used because the scales are continuous variables. The multivariate models include the six Key Predictor Variables, the three other predictor variables, and the six control variables. Significance is again reported at the 0.05, 0.01 and 0.00 levels and adjusted R-squared values are reported for each of the three models. Throughout the analysis, Likert-scale questions, including those used in each of the three wind support scales, those used as Key Predictor Variables, and those asked about place attachment, are treated as continuous, numeric variables. Means and standard deviations are reported for these variables.

3.4 RESULTS

3.4.1 Samples and Demographics

Over the two-month mail-out survey period, a total of 335 surveys were completed out of the 843 deliverable for a response rate of 40%. Of these, NS had a response rate of 38% with 187 completed out of 493 deliverable, while NB had a response rate of 42% with 148 out of 350 deliverable. The 335 completed surveys represent a total population of 16,311 people over the age of 19 in the study area. When responses are split 50/50, this gives a confidence interval of +/- 5.3 at the 95% confidence level. Years lived in the region has a mean of 40.8 years, with a standard deviation of 21.9 years (Table 4, Chapter 2). For gender, 55% of respondents identify as female, 45% identify as male and no respondents identify as non-binary. Age has both a mode and median of 55-64. After recoding the education variable into three categories, 27% of respondents are in the ‘high school or less than high school’ category, 36% in the ‘college or trade apprenticeship’ category, and 38% in the ‘university undergraduate or graduate’. Income has a mode of $26,000 to $50,999 and a median of $51,000 to $75,999. Comparing demographics of the survey respondents to census data for each of the two FSAs, the survey population represented the overall population relatively closely, with some notable differences (Statistics Canada, 2017). In NB, females are overrepresented in the survey population. In both provinces, older age groups and people with a university education are overrepresented in the survey population, while younger age groups and people in the high school or less than high school education group are underrepresented. In NS, there is underrepresentation of the lowest income category and slight overrepresentation of the two highest categories in the survey population. These comparisons suggest that caution should be taken with extrapolating results of this study to younger and less educated residents of the region as well as males in NB and lower income residents in NS. Please see Chapter 2, Table 5 for more detail on demographics and how the survey population compares to the census population of the region.

3.4.2 Dependent Variables

Support for wind energy development at the national, regional and local scales is found to be generally high from the communities living around the Amherst wind farm (Table 6, Chapter 2). Support declines slightly from the national to regional to local scale. The GENERAL scale has the highest mean of 4.29 on the five-point scale, followed by the REGIONAL scale with a mean of 4.19 and then the HOME VIEW scale at 3.76. The GENERAL scale also has the lowest variation, with a standard deviation of 0.61, while the REGIONAL and HOME VIEW scales both have standard deviations of 0.79. Of all wind support questions from the three scales, statement 6a 'I would prefer not to see wind turbines from my home' has the lowest mean at 3.51 (std dev = 1.09), but this mean is still positive (after recoding to be in the positive direction), reflecting support for wind energy. The highest mean of all wind support questions is 2a 'Wind energy is a cleaner alternative to fossil fuel energy', at 4.56 (std dev = 0.66).

3.4.3 Key Predictor Variables

The Key Predictor Variable questions reveal, not surprisingly, that local communities have an interest in the distribution of energy and benefits generated by a nearby wind development (Table 10). Of the six Key Predictor Variables, the Local Energy Use scale has the highest mean at 4.28 (std dev = 0.65). The Local Benefits scale, measuring respondents' desire for local ownership of wind turbines or for profits from wind energy to be shared with the local municipality, also has a positive mean of 3.92 (std dev = 0.80). Interestingly, while respondents are highly in agreement with the local use of energy generated from the wind farm, some are also supportive of energy being exported, including internationally to New England. Respondents are almost exactly split regarding statement 8c, ‘Energy is just a commodity; if we can develop it to sell elsewhere (eg. New England), then we should’, with a slightly positive mean of 3.03 (std dev = 0.80) and a mode of neutral, selected by 30% of respondents. Statement 8d was asked in the inverse direction and the majority of people disagree with this statement, ‘We have enough energy from other sources; more wind turbines would be unnecessary because the additional energy would just be exported’, with a mean of 2.05 (std dev = 0.87) and 74% of respondents disagreeing or strongly disagreeing. Although these questions are similar, Statement 8c is only focused on viewing energy as a commodity for export while 8d also asks about an increase in wind energy generation, so disagreement with 8d may in part be due to a general desire to increase total electricity generation from renewable sources even if this is shared with other jurisdictions. For Statement 2f, ‘Wind energy provides fewer jobs than other energy source’, respondents are again divided, with a mean slightly below neutral at 2.96 (std dev = 0.86) and a mode of neutral, with 58%. Finally, Statement 8f, ‘Seeing wind turbines from my home reminds me that electricity I use has to be generated somewhere’, has a positive mean of 3.67 (std dev = 0.93) with 64% of respondents agreeing or strongly agreeing.

3.4.4 Alternative Predictor Variables

Examining the alternative predictor variables, 40% of respondents report seeing wind turbines from their home, while 60% report they do not. For the other wind turbine exposure questions, 97% of respondents report ever having seen turbines (the 3% who do not may either be people who are confined to their home or may have not read the question carefully), while 92% report driving past them in the course of a week and 31% say they can see turbines from their place of work or study. As the turbines are located nearer to Amherst, seeing the turbines from home is correlated with living in NS (rho = 0.29, $p<0.00$). Respondents overall report high place attachment to the Chignecto area, with a mean of 3.99 out of 5 (std dev = 0.84) on the Place Attachment scale (Table 4, Chapter 2). Finally, for politics, 37% of those who responded identify as Conservative while 63% identify as Liberal, NDP or Green, classified as Not Conservative (Table 4, Chapter 2).

3.4.5 Correlations

All six Key Predictor Variables are strongly correlated with each of the three wind support scales (0.01 alpha level or greater) in bivariate analysis using Spearman correlations (Table 11). The Local Energy Use scale is positively correlated with the three wind support scales ($p<0.00$), with the strongest correlation with the GENERAL scale (rho=0.46). The Local Benefits scale is also positively correlated with the three wind support scales, again with the strongest correlation with the GENERAL scale (rho=0.32, $p<0.00$) and weaker correlations with the REGIONAL and HOME VIEW scales ($p<0.01$). The Energy as a Commodity statement has a positive correlation with all three scales ($p<0.00$) and is most strongly correlated with the REGIONAL scale (rho=0.26). The Energy Not for Export statement has a strong negative correlation with the three wind support scales ($p<0.00$). This correlation is strongest for the REGIONAL scale (rho= -0.60), followed closely by the GENERAL scale (rho= -0.59). These are the two strongest correlations in the bivariate analysis. The correlation between the Energy Not for Export variable and the HOME VIEW scale (rho= -0.44) is also the strongest correlation for the HOME VIEW scale with any of the six Key Predictor Variables. The Fewer Jobs from Wind statement is also negatively correlated with the three wind support scales, again at the $p<0.00$ level for all three. The strongest correlation for this variable is with the GENERAL scale (rho= -0.32). Finally, the Reminder of Energy Use variable is positively correlated with the three scales ($p<0.00$), again with the strongest correlation with the GENERAL scale (rho=0.34).

Table 11. Bivariate correlations for predictor and control variables for each of three Wind Support scales. All correlations are Spearman correlations for consistency and ease of reporting as many of the variables are categorical rather than continuous.

Variable	GENERAL	REGIONAL	HOME VIEW
Distribution predictors:			
Local Energy Use scale n=333	0.4617***	0.3406***	0.2724***
Local Benefits scale n=330	0.3242***	0.1811**	0.1780**
Energy as a Commodity n=328	0.1865***	0.2567***	0.2070***
Energy Not for Export n=328	-0.5906***	-0.6009***	-0.4418***
Fewer Jobs from Wind n=324	-0.3167***	-0.2409***	-0.2310***
Reminder of Energy Use n=326	0.3442***	0.2912***	0.3385***
Alternative predictors:			
See turbines from home n=329	-0.0078	-0.0716	0.0859
Place attachment n=334	0.2495***	0.1711**	0.1256*
Conservative n=197	-0.2154**	-0.2011**	-0.0306
Controls:			
Nova Scotia n=334	-0.0530	-0.0258	0.0717
Years in region n=317	-0.0725	-0.0775	0.0069
Male n=320	-0.0036	-0.0097	-0.0361
Age n=320	-0.0480	-0.0490	-0.0143
HS/ less than HS n=319	-0.1845***	-0.0960	-0.0294
College/ trade n=319	0.0893	0.0060	0.0785
University n=319	0.0801	0.0813	-0.0506
Income n=263	0.0957	0.0875	-0.0290

*significant at 0.05
**significant at 0.01
***significant at 0.00

Examining the three alternative predictor variables (Table 11), seeing turbines from home is not significantly correlated with any of the three wind support scales. Place attachment is positively correlated with the three wind support scales, at the $p<0.00$ level for the GENERAL scale, the $p<0.01$ level for the REGIONAL scale, and the $p<0.05$ level for the HOME VIEW scale. Conservatism is negatively correlated with the three scales, although this is only significant for the GENERAL scale and the REGIONAL scale ($p<0.01$), with the strongest correlation at the GENERAL scale (rho= -0.22). For the demographic control variables, the only significant correlation between any of the eight control variables with any of the three wind support scales is between the GENERAL scale and the high school or less than high school education variable, with a negative association (rho= -0.18, $p<0.00$) (Table 11).

3.4.6 Regression

Although all six Key Predictor Variables are significant in the correlations, many of these variables lose significance in the OLS regression analysis (Table 12). This may be due in part to the decreased sample size in regression analysis. The sample size decreased in regression because not all respondents answered all survey questions, and it was not consistently the same questions that were left blank, nor the same respondents that left them blank. The politics variable received the fewest number of responses, with only 198 out of 335 survey respondents answering this question. Other variables were also left blank by significant numbers of respondents, such as income, with 264 responses. Participants could only be included in the regression analysis if they responded to all variables used in the model (although scales were created using averages, allowing respondents to still be included if they had left blank one or more of the questions used in a scale). While the sample size could have been increased by removing some of the variables from the model (for example, removing politics increased to n=240), we chose not to exclude variables as we believe them to all be important predictors or controls. We tested removing politics and removing income and neither significantly improved the strength of the models or changed the pattern of the results.

However, despite some variables losing significance in regression, others emerge as strong predictors. Beginning with the GENERAL scale, the Local Benefits Scale has a positive association (p<0.01), while the Energy Not for Export statement and the Fewer Jobs from Wind statement both have negative associations significant at the p<0.00 level. For the REGIONAL scale, the Energy as a Commodity statement and the Reminder of Energy Use statement both have positive associations significant at the p<0.05 level, while the Energy Not for Export statement has a strong negative association (rho= -0.53, p<0.00). For the HOME VIEW scale, the Energy Not for Export variable again has a strong negative association (rho= -0.30, p<0.00) while the Reminder of Energy Use has a strong positive association (rho=0.33, p<0.00).

Table 12. Mulitvariate (OLS) regression for predictor and control variables for each of three Wind Support scales (standardised coefficients)

Variable	GENERAL n=162	REGIONAL n=161	HOME VIEW n=161
Distribution predictors:			
Local Energy Use scale	0.143	0.117	-0.086
Local Benefits scale	0.185**	0.073	0.093
Energy as a Commodity	0.034	0.141*	0.106
Energy Not for Export	-0.308***	-0.531***	-0.302***
Fewer Jobs from Wind	-0.234***	-0.097	-0.125
Reminder of Energy Use	0.115	0.130*	0.331***
Other predictors:			
See turbines from home	0.096	0.032	0.083
Place attachment	0.195**	0.056	0.097
Conservative	-0.029	0.015	0.030
Controls:			
Nova Scotia	-0.074	0.030	0.063
Years in region	-0.107	0.023	-0.004
Male	0.001	-0.068	-0.068
Age	0.113	-0.008	-0.014
College/ trade #	0.159*	0.038	0.018
University #	0.130	0.003	-0.092
Income	0.060	0.049	-0.023
Constant	2.93***	3.49***	3.22***
Adjusted R2	0.4734	0.4836	0.2671

Dichotomous with high school/ less than high school as reference
*significant at 0.05
**significant at 0.01
***significant at 0.00

Many of the alternative predictor variables also lose significance in the regression models, with only one significant association remaining between the Place Attachment variable and the GENERAL scale (rho=0.20, $p<0.01$) (Table 12). Finally, for the control variables, the association between the education variable and the GENERAL scale persists, though weakens ($p<0.05$) (Table 12). None of the alternative predictor variables and none of the control variables are significant for either the REGIONAL scale or the HOME VIEW scale.

The REGIONAL scale has the highest adjusted R-squared value, with the predictor and control variables included in the regression model accounting for 48% of the variation in this dependent variable, support for wind energy in the Chignecto area (Table 12). This is followed closely by the regression model for the GENERAL scale, with an adjusted R-squared value of 0.47. The HOME VIEW scale regression model has the lowest adjusted R-squared value of the three wind support models, at 0.27.

3.5 DISCUSSION

3.5.1 Support at General, Regional and Home View Scales

We set out to understand wind energy support at three scales and the factors influencing this support from residents living within the vicinity of an existing wind farm using a mail-out survey distributed to homes in the Chignecto area. We observe overall high support for current and future wind energy development from survey respondents. The means of each of the three wind support scales are relatively high, demonstrating positive attitudes towards wind energy development. Furthermore, the single dimensionality revealed in the PCA factor analyses and the high alpha values of each of the three wind support scales suggest people were consistent with their responses in each wind support question set. Aitken (2010) critiqued the assumption of high general support for wind energy as studies often lack details on how public support at the national scale is measured, and suggested that national-level support be measured more frequently. My study provides insight on support for national-level wind energy development from a community around a relatively new wind farm. Although support is positive for all three scales, it declines slightly from the GENERAL to REGIONAL scale and more significantly from the REGIONAL to HOME VIEW scale, reflecting past studies that have found people are generally in favour of wind energy development but less so near their homes (Bell et al., 2005; Devine-Wright, 2005; Hall et al., 2013). While this declining support may suggest some degree of NIMBYism, support is still relatively high at the local scale and few people report strongly negative views of the wind farm in the written response questions. Instead, many written responses reflected support for wind energy in the region, for example:

> Personally, I don't care if I can see turbines or not. I just think they are useful in generating energy. If it makes my energy consumption a little cheaper as well as environmentally friendly, I'm all for it. (respondent #272).

A review of newspaper archives from the region similarly did not identify any significant opposition to the development. Furthermore, there is no correlation between seeing turbines from home and support at any of the three scales in either the bivariate correlations or the regression analysis. As noted by Devine-Wright (2005) in his critique of NIMBYism as an explanation for local opposition to developments, although the 'proximity hypothesis' suggests that those living closest to a wind farm will have the most negative attitudes, past studies have found varying results. Some previous studies have found support for a development to be negatively correlated with closeness (Swofford & Slattery, 2010), as would be expected under the proximity hypothesis, while others have found a lack of correlation between proximity and support (Firestone et al., 2015). In case studies of existing and proposed wind farms in Ireland and Scotland, Warren, Lumsden, O'Dowd and Birnie (2005) found people living closer to wind turbines to report higher support than those living further away, suggesting inverse NIMBY. The lack of correlation between seeing turbines regularly and support in our study suggests that the lower support at the HOME VIEW as compared to GENERAL or REGIONAL scales is not due to NIMBYism.

Similar to a study in Ontario, which found support for local wind turbines to be higher in a town with an existing wind farm built four years earlier than in a town with no current or proposed turbines (Baxter et al., 2013), our results support the U-shaped curve of support for wind energy infrastructure proposed by Wolsink (2007). While general support for wind energy is usually high, communities near a proposed development may oppose it (Wolsink, 2007). However, while support may remain low throughout the planning and construction phases, it often increases a few years after completion as the community adjusts to the development (Wolsink, 2007). Similarly, Warren et al. (2005) found support to be greater around existing wind farms compared to proposed locations, as living around existing wind turbines often dispelled concerns about anticipated impacts that people had prior to construction. Although a wind farm proposed near Sackville, NB was originally rejected by that town around the same time as the Amherst wind farm was approved, there is no difference in current support between the two provinces in the survey. In a discussion with the mayor of Sackville, John Higham, he suggested that people in Sackville are significantly more supportive of wind energy today and would be less likely to reject a new development proposal as they have experienced the Amherst wind farm and now have fewer concerns regarding the negative impacts of turbines (personal communication, June 27, 2018). This supports the concept of climax thinking, as people may believe they will be unable to adapt to change in the landscape prior to experiencing this change (Sherren, in press).

Support across the region despite the rejection of a past proposal in Sackville may also be due to general acceptance of the existing wind farm and a lack of community conflict caused by the development. In their study of the psychosocial impacts of wind developments in Ontario, Walker, Baxter and Ouellette (2015) found that wind development could lead to community conflict in some cases, particularly in communities with existing conflict that was likely to be exacerbated by the wind development. In their study in the UK, Jones and Eiser (2009) found the perceived opinion of others in the community to be an important predictor of support, particularly in the area around an existing development. People in Sackville may have developed more favourable attitudes towards wind over the years since construction of the Amherst development due to social norms if they have perceived high support for wind energy from others in the region (Jones & Eiser, 2009). Future work in the Chignecto area could include interviews or focus groups specifically with Sackville residents concerning how their attitudes towards wind energy have changed since the construction of the Amherst wind farm. Furthermore, future work could distribute the same survey to a region with comparable demographics but no existing or proposed wind farm nearby to compare support for wind energy from those who see turbines regularly compared to those who do not, as the majority of people in the current study are regularly exposed to turbines even if they cannot see them from their home.

3.5.2 Common Predictors Fail

In addition to the lack of correlation between proximity to turbines and support for wind energy, a number of other variables that have previously been linked to support for wind energy also lack significance in this study, particularly in the HOME VIEW regression. These include the impact of general wind support on local support, place attachment, politics, local use of energy, community benefits, and job creation. In their study in the UK, Jones and Eiser (2009) found there to be a strong correlation between general attitudes towards wind energy and support for a local development, suggesting that people who do not want wind energy near their home generally do not support it anywhere. In our study, there is only a moderate correlation between the GENERAL and HOME VIEW scales (rho=0.52). Support is also influenced by different factors at different scales and many of the common ones are revealed as weak. While past studies have found place attachment to be a predictor of support for renewable energy infrastructure within view of people's homes (Devine-Wright and Howes, 2010), this variable is not significant at the REGIONAL or HOME VIEW scale in our study, discussed in more detail in the following section. Similarly, political orientation, although significant at the GENERAL and REGIONAL scales in bivariate correlations, is not significant for any of the three scales in regression, contrasting previous studies that have found it to be a significant predictor of environmental concern and support for renewable energy (Davidson & Haan, 2012; Karlstorm & Ryghaug, 2014). While past research has found that people around wind turbines often report a desire for the energy generated to be used locally (Brennan et al., 2017; Rand & Hoen, 2017) local energy use is significant in bivariate correlations but loses significance in regression analysis for all three scales. Community ownership, the distribution of profits to the host community, and local job creation have similarly been shown to influence support at the local scale (Hall et al., 2013; Musall & Koik, 2011; Slattery et al., 2011; Walker et al., 2014), but although the Community Benefits variable and Fewer Jobs From Wind variable are significant in bivariate correlations, they lose significance at both the REGIONAL and HOME VIEW scales in regression.

While many factors that have previously been shown to have a significant impact on support for wind energy are not significant in this study, a few strong predictors that have received little prior attention emerge in regression at the REGIONAL and HOME VIEW scales. Agreement with developing additional renewable energy beyond local needs for export to other jurisdictions and agreement that seeing wind turbines from home provides a visual reminder of electricity generation are strongly correlated with support for wind energy at the HOME VIEW scale, providing new insight into support for infrastructure within view of residents' homes, discussed in more detail in following sections.

3.5.3 Place Attachment

While place attachment has been proposed as an alternative to NIMBYism to explain opposition at the local scale (Devine-Wright, 2009), regression analysis in our study instead found place attachment to the Chignecto region to be a positive predictor of support only at the GENERAL scale. Other studies have found that place attachment at the local scale can decrease support for renewable energy infrastructure nearby as people with high local place attachment have greater concern about the impact of new developments on their local landscape (Devine-Wright and Howes, 2010). Residents with high place attachment to the Chignecto region may be more supportive of renewable energy overall due to greater concern about climate change but would prefer it to be developed elsewhere, although they are still not opposed to it locally. While wind energy has positive environmental impacts at the global scale through the reduction of greenhouse gas emissions from fossil fuel sources, it can have negative impacts at the local scale as it disrupts the natural landscape of the region and can raise concern about the impact on wildlife, particularly birds (Warren et al., 2005). As stated by Pasqualetti, Gipe and Righter (2002, p. 3), environmental-based opposition to development at the local scale can result from concern about natural landscapes being transformed into 'landscapes of power'. In our study, environmental concern at the local scale was reflected in several written responses mentioning bird mortality, for example,

> We all need energy to live. I would rather look at the wind turbines than a nuclear reactor or smoke stacks from a coal fired plant. Sometimes you hear rumours that the wind turbines kill a lot of birds. I do love the birds and would hate to think that was true. (respondent #470).

Attachment to the Chignecto region, a historically natural area with a unique agricultural saltmarsh ecosystem, may be positively correlated with environmental concern and support for renewable energy in general. In their study on the effect of place attachment at different scales on support for renewable energy, Devine-Wright and Batel (2017) found that people with stronger attachment at the local, national and global scales together ('Glocals') reported greater levels of climate change concern and greater willingness to take action regarding both supply and demand of energy compared to people with low place attachment at all scales ('Nocals') or people with attachment at the national but not local or global scales. While we only explored place attachment at the regional scale, the Devine-Wright and Batel (2017) study suggests that high local place attachment may occur alongside place attachment at the national and global scales ('Glocals'), and future research could include questions concerning these other scales of place attachment.

In addition to the possible explanation explored above suggesting a relationship between place attachment and environmental concern, the lack of association between place attachment and support at the REGIONAL and HOME VIEW scales may suggest that the wind farm neither disrupts nor enhances local people's attachment to the Chignecto region. As well, the wind farm has existed in the region for several years so people may now view the turbines as a part of the landscape rather than a disruption or enhancement. Previous studies concerning place attachment have often focused on how acceptance of a local development relates to symbolic interpretations of both the place and the technology (McLachlan, 2009). Devine-Wright and Howes (2010) found a negative relationship between place attachment and an offshore wind development in Wales, as residents in the town viewed the region as natural and the development as industrial. Similarly, Park and Selman (2011) found that positive attitudes towards rural landscapes were the strongest barrier to accepting change in these regions. However, place attachment is not always negatively correlated with support for local renewable energy developments, as Devine-Wright (2011) found a positive relationship between place attachment and a tidal energy development in the UK, suggesting a good fit between symbolic interpretations of the place and the project. Further study is needed to understand the complex relationship between place attachment to the Chignecto region and support for wind energy at different scales, especially as few previous studies have explored the impact of place attachment on support for renewable energy developments beyond the local scale. Further study could include questions about environmental attitudes to test whether place attachment is serving as a proxy for environmental concern in this study. Additionally, future study could include interviews or focus groups to explore local people's symbolic interpretations of both the landscape and the wind turbines.

3.5.4 Local Benefits and Jobs Do Not Resonate

As with the Place Attachment variable, both the Local Benefits predictor and the Fewer Jobs from Wind predictor are found to be significant at the GENERAL scale but not at the REGIONAL or HOME VIEW scales in regression analysis. This is another surprising result as we had expected residents to be more supportive of turbines near their home if the local area received benefits, either through local ownership, profits distributed to the local municipality, or job creation. In their study in the UK, Jones and Eiser (2009) note that community profits were most attractive to people who were favourable towards wind energy, suggesting that a desire for the municipality to profit from the development should be positively correlated with local support. A possible explanation for this unexpected result in our study is that the potential collective economic benefits and job creation from wind development may increase support in general, but not at the local scale as people in the region have not experienced these benefits from the Amherst wind development. Past studies have found community ownership, co-ownership or local renewable energy cooperatives to increase support for renewable energy (Hufen & Koppenjan, 2015; Musall & Koik, 2011). In their study of wind farms in Australia, Hall et al. (2013) noted that most wind companies proactively contributed to local activities or infrastructure through voluntary community funds, as distributional justice has been shown to be an important predictor of support. However, the 15-turbine Amherst wind farm was developed by a private corporation, and residents in the surrounding region may not have benefited from the development due to neither community ownership nor a benefits fund. Similarly, although the two-turbine Amherst Community Wind Farm was built under the COMFIT program, it was developed as a partnership between the company Natural Forces and the Pictou Landing First Nation, so while this smaller project does involve community co-ownership, it was not in partnership with the town of Amherst (Natural Forces, 2019). A review of newspaper archives found no mention of funds given to the municipality, and there was similarly no discussion of community benefits from any survey respondents in the written response asides from a few mentions that the development provides taxes for the municipality. As one respondent stated simply, "There are no profits…" (respondent #282).

Alternatively, local benefits may not increase support at the REGIONAL or HOME VIEW scales as these benefits can be seen as bribes, as noted by Aitken (2010). As Brennan et al. (2017) report greater support for state-led developments over private developments and the Amherst wind farm was developed by a private corporation, people may be suspicious if community benefits were offered from the company. Another alternative explanation for the lack of impact of the Local Benefits variable on support at the REGIONAL or HOME VIEW scales is that people would prefer individual benefits over collective benefits as compensation for wind development near their home. This contrasts the hypothetical framing study by Walker et al. (2014) in England, which found collective benefits to have a greater impact on support for a wind development than individual benefits. However, in focus groups around a proposed wind development in Ireland, 76% of participants believed reduced electricity rates to be the best form of compensation (Brennan et al., 2017). Jones and Eiser (2009) also found that reduced electricity rates could further increase support among individuals who were already in favour of wind development. Although reduced electricity rates were not asked about in any of our survey questions, 22 out of the 153 written response questions included a mention of the cost of power. Many of these responses stated that they believe the wind development should decrease electricity rates in the region, but this has not yet occurred. For example:

> It is difficult to assess wind energy since it has not shown any difference in my power bill. If I could see economic personal results that were positive, then the look of them and use of land for them would be agreeable due to cleanliness + decrease pollution for residents now + residents to come. (respondent #256).

Similarly, another response stated, “Lower the cost of electricity in the areas where the turbines are located.” (respondent #789). In response to Statement 8h concerning profits being distributed to the local municipality, another respondent stated, “If profits would lower local power bills and taxes.” (respondent #473). This last response suggests that the resident would prefer individual benefits through decreased electricity rates and taxes than collective benefits from the profits being contributed to a community fund. Future research should include a question directly asking about reduced electricity rates.

While the beliefs about job creation variable is a predictor for general wind support, survey respondents may not have experienced job creation at the local level. Many respondents may be unsure about the number of jobs created by renewable energy and how this compares to other forms of energy generation as this can be difficult to quantify, even in literature (Dalton & Lewis, 2011). While Slattery et al. (2011) found there to be significant regional job creation in their study of Texas wind farms and Dalton et al. (2011) note that jobs/MW of wind energy is comparable to most other renewable energy sources and higher than fossil fuel generation, regional job creation from wind farms can be variable (Slattery et al., 2011). While one newspaper article from the region stated that 140 people were employed at the site during construction, most of whom were from NS, it did not mention how many were from the local area or how many jobs remained after the construction phase (“Maritime Wind”, 2012). As one respondent noted, wind energy has the potential to result in regional economic development through various mechanisms, but this has largely not occurred in the Chignecto area:

> Understand that wind energy is becoming more economically efficient as the related technologies improve and are adopted by more users. Suspect there are fewer jobs in this industry than in oil-based industry because no extraction or refining workers are necessary nor are there truck drivers, shipping employees or pipeline workers. As well, I believe most of the turbines are manufactured out-of-country so the jobs here will be construction- and maintenance-based. The

> conveyance of resulting electricity is common to all forms of energy. However, the Chignecto area would benefit from the education programs related to wind energy jobs plus the work opportunities. As well, if wind energy makes electricity less expensive here, perhaps other manufacturing industries might be attracted to our area. Currently, though, NS Power seems more focused on covering all its development costs in the short-term rather than lowering electricity costs to consumers. (respondent #555).

Furthermore, due to the relatively small sample size, it is plausible that none of the 335 survey respondents work in the wind industry so have not experienced any employment benefits from the wind farm, although Sherren et al. (2019) found employment in the sector to not be a predictor for wind support nationally. Overall, while local ownership, profits to the municipality, and local job creation all increase support for wind energy in a hypothetical sense, it is likely that none of these benefits have been experienced by survey respondents from the Amherst wind farm so do not increase support at the REGIONAL or HOME VIEW scales. This hypothesised explanation could be explored in future study by including questions asking local residents if they have experienced any benefits from the wind farm through profits to the community or job creation.

3.5.5 Local Use and Export of Energy

The Energy Not for Export variable is a strong predictor of support for wind energy at all three scales, in both bivariate correlations and regression analysis, and is an especially strong predictor in the REGIONAL support regression model, with the Energy as a Commodity variable also significant in the REGIONAL regression model. While the Local Energy Use variable is significant in the bivariate correlations for the three dependent variables, it loses significance in all three regression models, suggesting that the Energy Not for Export variable may erase the significance of the Local Energy Use variable in regression. While people believe more on average that energy generated by the wind farm should be used locally than exported (Local Energy Use scale mean of 4.28 compared to a mean of 3.95 for support for export when Statement 8d is reversed), acceptance of wind development above and beyond local needs is a much stronger predictor of support. The moderately strong correlation between the Local Energy Use variable and the Energy Not for Export variable (rho= -0.30, $p<0.00$) supports the idea that some people who support local energy use also support further development above and beyond local needs. As this predictor is strongest at the REGIONAL scale, it may suggest that people believe the Chignecto region has enough wind resources to meet their local needs and develop additional wind energy for export. This idea is supported by written responses such as, "I believe we have enough opportunity in this area to provide clean energy to the Chignecto area and sell off the remainder." (respondent #739). Many survey respondents emphasised the significant wind resources of the region, for example, "The area is so windy, it just makes sense to add more turbines in this area!" (respondent #349). As in the case of Ireland, which is estimated to have enough wind resources to meet 19 times their own energy needs (Warren et al., 2005), the Chignecto region (and much of NS) also has significant export potential due to its high wind resources and relatively low population.

It seems clear that the capacity to view energy as a commodity like any other is important for wind development support, as long as local needs have been met first. While past studies have found local ownership and use of energy to increase energy citizenship and support for renewable sources (Hufen & Koppenjan, 2015; Musall & Koik, 2011), few studies have examined support for developing additional wind resources after local needs have been met. Several people expressed this idea in the written response, for example, "As long as our needs are met first before export." (respondent #258). Similarly, another respondent stated, "I just feel that the energy should be used in our area first. If extra can sell it elsewhere." (respondent #477). Meeting provincial needs was also emphasised in some of the written responses, for example, "I feel as though wind energy created in our province should stay within our province to benefit us. Once we are developed and benefitting then send it elsewhere." (respondent #473). In their study of wind farms in Ireland, Brennan et al. (2017) found lower support for wind development for export as compared to domestic use. However, the proposed wind farms in their study were strictly for export to the UK and they did not explore the option of meeting local needs first and then exporting additional energy (Brennan et al., 2017). Furthermore, the proposed wind farms explored in the Brennan et al. (2017) study were on a much larger scale than the Amherst wind development, with 400 to 750 turbines. The case of Norwegian pumped storage hydro development for export to Germany is one example of exporting excess renewable energy as Norway has already met their own renewable energy needs and has further hydro potential that could be exported, but Gullberg et al. (2014) only explored general support in each country rather than local support around proposed developments.

As NS will soon be importing hydropower from Labrador to meet their renewable energy target of 40% by 2020, support for exporting additional renewable energy from the Amherst wind farm to other jurisdictions provides an interesting case to study. Some people may be in favour of exporting additional wind energy from the region, for instance to power hungry New England, as they recognise the value of transmitting renewable energy between jurisdictions to meet targets and increase global renewable energy use. Alternatively, others may be opposed to wind energy being exported outside the province while NS is importing hydropower. However, it should be noted that hydropower does not have the intermittency problem inherent in wind energy (Gullberg et al., 2014). Support from the surrounding community for the development of additional wind resources for export after local needs have been met should be further explored in future research. While this variable provides interesting insight into the way individuals view energy, an unfortunate limitation of this question must be acknowledged. The statement is double-, or potentially triple-, barrelled and some people may have been responding to part rather than all of the statement. Some respondents may be disagreeing with the first part of the statement, ‘we have enough energy from other sources’ or the second part, ‘more wind turbines would be unnecessary’, rather than the entire statement asking about the additional energy being exported. Therefore, this variable may have a strong association with the wind energy support scales in part because it is also asking about overall support for wind energy. However, we hope that the majority of participants based their response on the entire statement, including the part about export, and therefore this variable remains a valuable predictor. To address the potential confusion in the current statement, a rephrasing for future research could read, ‘I support wind development beyond what is required to meet local energy needs for export of clean energy to other jurisdictions.'. This topic could also be explored in greater depth through interviews or focus groups with local residents and local government.

3.5.6 Support Within View of Home

While several strong predictors of support for wind energy have emerged from this study, particularly at the GENERAL and REGIONAL scales, the regression model is weaker at the HOME VIEW scale. Only two variables are significant in the Local Wind Support regression model, the Energy Not for Export variable discussed above, and the Reminder of Energy Use variable, which is the strongest predictor in the local model. The Reminder of Energy Use variable is not significant at the GENERAL scale and is weaker at the REGIONAL scale. The significance of this variable at the HOME VIEW scale suggests that people who support wind turbines within view of their home care where their energy comes from and are thinking about their consumption patterns, suggesting they are willing to live with the visual costs of clean energy production rather than pushing the impact of their energy use onto others. This idea is supported by Adams and Bell (2014) who report that consumers may place a higher value on energy generated by nearby infrastructure, therefore reducing their consumption. Additionally, it supports the case of local energy cooperatives in the Netherlands, in which people reported a desire to be involved in their energy production (Hufen & Koppenjan, 2015). The spatial dimension of climax thinking proposes that individuals may be unable to fully imagine landscapes or people in other locations, therefore pushing the impacts of providing for their needs onto others (Sherren, in press). Recognising that the energy we use requires generation with inevitable impacts, and being willing to live with those impacts even within view of home, suggests less climax thinking (Sherren, in press). The idea of taking responsibility for our energy use, including the landscape impacts of energy generation (though interestingly not energy for export), is expressed in this respondent's quote from the written response:

> …Society needs to accept the impact our lifestyles have on our environment + if wind power can be harnessed, I feel it should be but in an environmentally friendly way. It should not be used as a money-making export. These turbines have an impact on the environment + erecting them in large numbers for profit

> should not be allowed. More public education is needed for society to learn how to lessen our impact + what other choices are viable. We have developed an overuse of lights + space + we need to learn conservation. (respondent #411).

Alternatively, however, increased renewable energy generation may sometimes result in a rebound effect and higher energy consumption if people believe their electricity comes from a source with minimal impact (Gullberg et al. 2014).

Contrary to much recent work, the two variables significant in the HOME VIEW regression both suggest that support within view of respondents' homes is influenced by environmental concern and a desire to produce more clean electricity, whoever uses it, more than by concern about financial benefits such as job creation or profits to the community. This idea is further supported by the fact that, within the local wind support question set, the statement with the highest mean is 6d, 'I would not mind seeing wind turbines from my home if they are contributing to clean energy and a more sustainable future.'. Many respondents also mentioned the environmental benefits of wind energy in their written responses, for example:

> I love NS developing a clean source of energy. Reducing our dependence on fossil fuels will help create a sustainable energy source and cleaner, healthier environment for our children, hopefully encouraging them to remain in the area as adults. (respondent #642).

These results suggest that the people who are willing to accept wind energy within view of their home are those who have greater concern about the environmental impacts of energy generation. In their comparison study of factors influencing support for wind energy from people living around proposed wind developments compared to a control group with no proposed development, Jones and Eiser (2009) found a belief in anthropogenic climate change to increase acceptance for local wind development from people around the proposed sites, but not from those in the control group. As our study didn't specifically ask respondents about their level of environmental concern, future research could test the hypothesis that people with greater concern about the environmental impacts of their energy use are more willing to accept wind turbines within view of their home by asking questions related to the environmental impacts of energy generation. However, Jones and Eiser (2009) note that, while supporters usually focus on the benefits of wind energy at the global scale, including the reduction of greenhouse gas emissions, opponents are often more focused on specific problems that turbines may create at the local scale. Therefore, they suggest that focusing on the negative impacts that climate change will have at the local scale may be more effective in combatting local opposition (Jones & Eiser, 2009). The effects of climate change are being felt strongly in the Chignecto area, with rising sea levels and strong storm surges causing flooding, damaging local infrastructure and threatening the historic dykelands (Corfu, 2017). Experiencing these impacts of climate change at the local scale may be contributing in part to a recognition of the importance of renewable energy amongst Chignecto residents, an idea that could be further explored in future research.

3.5.7 Recommendations for Further Work

In addition to including more questions asking about environmental concern to potentially capture additional variation in support at the HOME VIEW scale, a few other variables could also be included in future research to hopefully increase the adjusted R-squared value of the Local Wind Support model. Some of the variation in support for wind turbines within view of the respondents' home is likely due to personal preference concerning the look of turbines. Differing opinions regarding the aesthetics of wind turbines were revealed in the written response. Several respondents were enthusiastic about the look of the turbines, for example, "…Windmills add to the majesty of the marsh + are a good addition to the landscape." (respondent #612) and, "I personally find they add beauty to the landscape and, to me, they represent a safer use of the environment." (respondent #665). Others were more grudgingly accepting of the turbines in the landscape, for example, "I don't think the wind turbines are nice to 'look' at but if they are better for the environment and would produce energy for local use, it would be easier to accept the fact that they are a bit of an 'eye-sore'." (respondent #680). Only a few respondents expressed dislike concerning the look of the turbines, for example, "I don't see anything 'pretty' about a bunch of windmills dotting the beautiful windswept marsh, grasses, duck blinds, birds dikes, etc…" (respondent #238). These written responses suggest that personal preference concerning aesthetics may influence people's support for wind energy in view of their home and future research could include a question asking participants if they like the look of turbines to use as a predictor for local support.

Although some questions on the survey focused on the aesthetics of turbines in the landscape, these were included in the wind support scales as dependent variables rather than predictors. We chose to include statements such as, 'I think wind turbines can be beautiful and wouldn't mind having a view of them from my home', with dependent variables as we were originally trying to predict factors influencing perceptions of the look of turbines in the landscape. In their study of wind energy perceptions in South Dakota, Fergen and Jacquet (2016) found that residents believe turbines in motion to be more beautiful than static turbines, suggesting perceptions of turbine aesthetics are influenced in part by economic and environmental values. However, some variation in opinion may simply be due to personal preference, rather than other factors such as place attachment or symbolic representation of the turbines. As noted by Warren et al. (2005), landscape preferences are highly subjective, and often a significant influencer of support. The aesthetics of a wind farm in Scotland was the most frequently cited attribute both positively and negatively, although twice as many people found it attractive as unattractive (Warren et al., 2005). Therefore, future research could include a question about the look of turbines as a predictor rather than dependent variable.

Finally, one factor that may help explain variation in support at the HOME VIEW scale that wasn't included in the current study is perceptions of procedural justice. In their study of wind energy in Ontario, Fast and Mabee (2015) found residents' trust in wind companies and planning authorities to be a key factor influencing support, and trust was dependent in part on perceptions of procedural justice and planning regimes. Similarly, another study in Ontario by Walker et al. (2015) found that greater satisfaction with procedural justice led to higher support, while a poor planning process could increase residents' psychosocial stress and exacerbate tensions in the community. However, in their experimental study of a hypothetical offshore wind farm in England, Walker et al. (2014) found that procedural justice was not a strong predictor of support compared to collective or individual outcome favourability. Questions concerning the approval process and procedural justice were not included in out survey as the study wasn't focused on one particular wind project so much as the general presence of turbines in the region. Although no one included any mention of a consultation process, lack of consultation, or other factors related to procedural justice in the written response, a letter to the editor from a resident of the region in 2012 expressed concern that 15 turbines had appeared on the marsh without any prior notice or consultation (Clarkson, 2012). Future study could include questions asking about perceptions of procedural justice and the consultation process (or lack thereof) as another predictor potentially influencing support at the local scale.

3.6 Conclusions

The results of this study provide insight into how the residents living around an established wind farm view wind energy in general, wind turbines near their home, and the distribution of energy and benefits from wind development. Although support declines slightly from the GENERAL to REGIONAL to HOME VIEW scales, it is relatively high at all three, suggesting people living around the Amherst wind development are generally supportive of wind energy. This relatively high support from local people in the Chignecto has occurred despite an apparent lack of community consultation, no community ownership, minimal benefits or profits to the community, no reduction in energy rates, and minimal local job creation. Additionally, other predictors that have been significant in previous research, such as regular exposure to turbines or place attachment, have minimal significance in our study. Instead, new predictors emerged concerning the distribution of energy. While all six Key Predictor Variables are significant for the three scales in bivariate correlations, many lost significance in the regression. The Energy Not for Export maintained significance in regression at all three scales, suggesting that people with high support for wind energy are willing to support development beyond local need. This further suggests that those with high support recognise that increasing global renewable energy will require cooperation between jurisdictions, as some areas have more renewable resources than others and transmitting excess renewable energy across borders can help reduce the intermittency issues inherent in wind and other renewable sources. At the HOME VIEW scale, a willingness to take responsibility for the impacts of energy use and generation emerged as another particularly strong predictor of support. This supports the idea that acceptance of nearby renewable energy infrastructure can help people take ownership of their energy use and reduce the ‘out of sight, out of mind’ mentality that exists when the impacts of electricity generation occur in remote locations. The results of this study provide new insight into support for wind development, particularly at the local scale, suggesting that people with high support are willing to live with the visual impacts of renewable energy generation, recognising the impact of both their own energy use and the value in exporting additional renewable energy.

CHAPTER 4 CONCLUSION

As renewable energy is increasingly developed to address the sustainability challenges associated with our current, fossil-fuel dominated energy system, new infrastructure such as wind turbines will have significant landscape impacts for surrounding communities. Since this infrastructure is usually highly visible and place-dependent, resulting in it often being situated in areas of human habitation, understanding support from nearby residents is important. Unlike fossil fuel generation, which is often located in remote regions where impacts are not visible to electricity consumers, the visibility of renewable energy infrastructure offers a new way of thinking about energy generation and landscapes. This study aimed to better understand perceptions of energy landscapes from communities situated near a wind farm to provide insight into how we can increase renewable energy generation without imposing it on local communities who oppose developments. We designed and distributed a mail-out survey focused on landscape change and support for wind energy to residents in the Chignecto area around the Amherst wind farm. The results of this thesis provide some new insights into perceptions of landscape change and support for wind energy.

Chapter 2 explored attachment to past utilitarian landscapes in the Chignecto area focusing on the experimental treatment section of the survey. We found that people in the region demonstrate attachment to nearby utilitarian landscape features, even when these features are no longer serving their intended purpose. Furthermore, attachment to past landscape features is independent from place attachment and from years lived in the region, providing an alternative perspective for understanding support or opposition to built landscape change. This finding supports the theory of climax thinking (Sherren, in press), as support for change is impacted by an ability to conceive of landscapes as a continuum, rather than simply a lack of attachment to the place. Opinions concerning the radio towers and foundries are more varied than those concerning the dykes and hay barns, which are viewed almost universally positively, suggesting that attachment to the more prominent and industrial features may be due in part to their symbolic meaning as representative of human progress and technology.

In addition to the symbolic meaning of these features, the correlation between attachment to past landscape features and conservatism suggests potential framing opportunities to increase support for wind development among people who may otherwise have lower support. While conservatism is typically associated with lower environmental concern (Davidson & Haan, 2012; Tranter, 2011), suggesting lower support for wind energy from an environmental perspective, our study found Conservatives to demonstrate greater attachment to past landscape features, supporting previous studies that have found conservative politics to focus on a return to the past (Baldwin & Lammers, 2016; Robinson, Cassidy, Boyd, & Fetterman, 2015). Therefore, to potentially increase support for wind farms from a group who may not support renewable energy based on environmental concern, turbines could be ascribed with symbolic meaning linking them to past industrialism with comparisons made to previous towers present in the landscape, the foundry smoke stacks and radio towers, both of which have greater attachment from Conservatives.

Examining support for wind energy, briefly in Chapter 2 and in more detail in Chapter 3, we found relatively high support for wind energy at the national, regional and local scales from the people living in the region around the Amherst wind farm, with support influenced by different factors at the different scales. As discussed in previous studies (Devine-Wright, 2005; Wolsink, 2006), our results support the idea that opposition to renewable energy infrastructure from nearby communities cannot be explained by the concept of NIMBYism. For people who can see turbines from their home, wind turbines are included in their current landscape, so it makes sense that people with greater attachment to past utilitarian landscape features also report greater support for wind energy at the local and regional level. Interestingly, the experimental treatment only increased support for wind energy in general, not at the regional or local scales. This is surprising as we had hypothesised that being reminded of past landscape change in the region would increase support for future regional landscape change, and therefore included the experimental treatment after the section asking about general wind support but before asking about regional and local wind support.

We further found predictors used in past studies, including place attachment (Devine-Wright, 2009) and local ownership or community benefits (Hall, Ashworth, & Devine-Wright, 2013; Mussal & Koik, 2011), to lack significance for support within view of respondents' homes. Instead, new predictors emerged at the local scale, suggesting a person's support for wind turbines within view of their home is influenced by an openness to renewable energy export and a willingness to live with the visual impacts of generation as a reminder of electricty consumption. As in the case of the radio towers and foundry smoke stacks, support for wind turbines in the Chignecto landscape seems influenced by the symbolic meaning of these features, in this case the production of clean energy for use within the area and for export to other regions.

Together, results from the two parts of this study suggest that people in the Chignecto region are not opposed to utilitarian features in their landscape and may develop attachment to these landscape features over time. This support or attachment is influenced by the symbolic meaning people attach to these features, with the foundries and radio towers representing past, industrial times and the turbines representing clean energy and providing a reminder of the impacts of electricity generation. As discussed by Selman (2010), local people are more likely to support nearby renewable energy infrastructure if they support the underlying value and necessity of developing renewable resources in the global effort to slow climate change. Explored in the context of dykes in our study, the effects of climate change are being felt strongly in the Chignecto region with sea level rise and increased storm surges causing flooding. As stated by Jones and Eiser (2009), while people who support wind energy often due so based on global benefits, those who oppose it frequently cite costs to the local environment. However, the local costs of global climate change are being felt strongly in the Chignecto region, damaging both the built and natural landscape. Recognition of the immediate impacts of climate change and the value of generating clean energy may be contributing to generally high support for wind turbines in the region.

This study also supports aspects of climax thinking, which suggests that people are more likely to support renewable energy infrastructure in their landscape if they can imagine past landscapes, future landscapes and landscapes that occur elsewhere, even if they have not personally experienced these alternate landscapes (Sherren, in press). The climax thinking framework past dimension hypothesises that people may resist change if they believe their surrounding landscape to be at a stable endpoint and that being reminded of past landscape versions will reduce opposition to new changes. We found, consistent with this, that those with stronger attachment to past landscape features support local wind development when wind turbines are part of their current 'climax' landscape. However, being reminded of past landscapes only increased support at the general/ national scale, an inconclusive result that should be further studied in the future. The spatial dimension hypothesises that a 'local energy' ethic will result in increased support for renewables. Consistent with this, we found agreeing that the wind turbines provide a reminder that the energy we use must be generated somewhere was one of the only significant predictors of support at the home scale. The wind farm provides a visual reminder of the impacts of energy use, and people who recognise the landscapes or impacts that may occur elsewhere as a result of their energy use have greater support for wind turbines in view of their home, including for export beyond local needs.

This study has some limitations which should be acknowledged, and provide opportunities for future research. With 335 surveys completed and returned out of the 843 that were successfully delivered, our study achieved a response rate of 40%. Although this would have been considered a poor response rate in the 1970s, response rates in survey research have declined significantly over recent decades and 40% is approximately average today (Stedman, Connelly, Heberlain, Decker, & Allred, 2019). In another study of wind energy with residents living near wind farms in Ontario and NS, a mail-out survey conducted in 2015 achieved a response rate of only 18% (Walker, Stephenson, & Baxter, 2018). As in our study, in which only 59% of the 335 respondents provided an answer to the politics question, respondents in the Walker at al. (2018) study were similarly reluctant to share which party they support, with only 56% providing a response. Future research should explore alternative ways to inquire about politics to increase the response rate to this question and avoid decreasing the sample size when this variable is included in regression. Additionally, the inconclusive impact of the experimental treatment and the possibility that a significant number of respondents completed the survey in reverse should be further explored in future research. In their study of the impact of knowledge of the past on preferences for future landscape change, Hanley et al. (2009) conducted their survey in person, ensuring it was completed in the intended order.

Based on the results of our study, there is potential to increase future support for renewable energy infrastructure from local communities by emphasising the importance of renewable energy to address the global issue of climate change. While fossil fuel generation usually occurs in remote locations and the immediate, visual impacts are often not seen by electricity consumers, it should be stressed that the broader impacts of climate change are being felt around the world, with increasingly tangible effects on communities, including sea level rise and flooding in the Chignecto area. Furthermore, framing the importance of renewable energy for preserving the past and current state of our planet rather than proceeding to an uncertain future caused by climate change may help leverage support from people with conservative politics and a past-focused world view. Using these framing strategies to attach symbolic meaning to wind turbines and other renewable energy developments may help increase community support for nearby infrastructure, reminding them of their local landscape continuum and leading to increased renewable energy development without imposing it on communities who do not support it. In turn, the visual reminder of energy generation provided by this infrastructure may decrease the 'out of sight, out of mind' mentality of fossil fuel generation, potentially leading to decreased energy use and further contributing to a more sustainable future.

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APPENDIX A SUPPLEMENTAL TABLES

Supplemental Table 1. Bivariate correlations for each landscape feature and all four features together with predictor and control variables (Spearman rho values)

Variable	Dykes *n*=141	Foundry *n*=91	Barns *n*=159	Towers *n*=159	Combined *n*=167
Predictor:					
Place attachment	0.1472	0.0541	0.2301**	0.0388	0.0942
Years in region	0.2518**	0.1291	0.0918	0.2391**	0.1870*
Conservative	0.1798	0.3333*	-0.0036	0.3050**	0.3170**
Control:					
Male	0.2502**	0.1400	0.0931	0.0422	0.1437
Age	0.3236**	-0.1521	0.0636	0.1352	0.0899
Income	-0.1144	-0.1650	-0.1101	-0.2302*	-0.1891*
High school/ less than HS	0.1078	0.1796	0.0407	0.1228	0.1215
College/ trade	0.0763	0.0515	-0.0445	-0.0231	-0.0241
University	-0.1649	-0.2149	0.0095	-0.0841	-0.0826

*significant at 0.05
**significant at 0.01
Combined scale is an average from 1 to 3 for a person's answers to the eight landscape feature questions

Supplemental Table 2. Bivariate correlation matrix for predictor and control variables used in predicting attachment to past utilitarian landscapes (Spearman rho values)

Variable	Place attach.	Years in region	Conservative	Male	Age	Income	HS/less	College/ trade
Place attachment *n*=335	-							
Years in region *n*=318	0.2691***	-						
Conservative *n*=198	-0.0358	0.2450***	-					
Male *n*=321	0.1007	0.1782 **	0.0854	-				
Age *n*=321	-0.0004	0.5345***	0.0345	0.2279***	-			
Income *n*=264	0.1218*	-0.2282***	0.0485	0.0902	-0.2136***	-		
High school/ less than HS *n*=320	-0.0861	0.2222***	0.0486	0.0249	0.1556 **	-0.3766***	-	
College/ trade *n*=320	0.0191	0.0815	0.0704	0.0485	-0.0150	-0.0601	-0.4474***	-
University *n*=320	0.0595	-0.2814***	-0.1090	-0.0706	-0.1269*	0.3943***	-0.4690***	-0.5801***

*significant at 0.05
**significant at 0.01
***significant at 0.0

Supplemental Table 3. Multivariate (OLS) regression for predictor and control variables for each of three wind support scales including experimental treatment (standardised coefficients)

Variable	GENERAL *n*=162	REGIONAL *n*=161	HOME VIEW *n*=161
Predictors:			
Experimental	0.129*	0.040	0.071
See turbines from home	-0.082	0.028	0.076
Place attachment	0.196**	0.056	0.097
Conservative	-0.027	0.016	0.032
Local Energy Use scale	0.146	0.117	-0.086
Local Benefits scale	0.208**	0.080	0.106
Energy as a Commodity	0.036	0.141*	0.106
Energy Not for Export	-0.303***	-0.530***	-0.300***
Fewer Jobs from Wind	-0.220***	-0.094	-0.119
Reminder of Energy Use	0.104	0.127	0.326***
Controls:			
Nova Scotia	-0.082	0.027	0.058
Years in region	-0.110	0.021	-0.006
Male	0.001	-0.069	-0.068
Age	0.118	-0.006	-0.010
College/ trade #	0.166*	0.040	0.023
University #	0.145	0.007	-0.084
Income	0.043	0.043	-0.032
Constant	2.80***	3.44***	3.12***
Adjusted R2	0.4870	0.4816	0.2673

Dichotomous with high school/ less than high school as reference
*significant at 0.05
**significant at 0.01
***significant at 0.00

Supplemental Table 4. Percent of respondents noticing each landscape feature by years lived in the region (in 5 year categories) *n*=318

		Percent having noticed			
Years in region	**Number of respondents**	**Dykes**	**Foundry**	**Hay barns**	**Radio towers**
0-4	15	50%	13%	88%	50%
5-9	20	78%	33%	100%	100%
10-14	16	80%	20%	90%	100%
15-19	15	86%	29%	86%	100%
20-24	18	80%	60%	100%	100%
25-29	21	67%	43%	86%	100%
30-34	14	88%	63%	100%	100%
35-39	15	91%	36%	100%	100%
40-44	31	85%	73%	92%	100%
45-49	22	100%	42%	92%	100%
50-54	40	94%	69%	100%	94%
55-59	7	100%	33%	100%	100%
60-64	33	86%	77%	100%	100%
65-69	24	86%	88%	100%	100%
70-74	10	100%	80%	100%	100%
75+	17	78%	88%	100%	100%

Supplemental Table 5. Number of responses (1=disagree, 2=neutral, 3=agree) for fit and sadness for each past utilitarian landscape feature

Dykes *n*=140

		Fit 1	Fit 2	Fit 3
Sad	1	0	1	7
	2	0	9	32
	3	0	3	88

Foundries *n*=90

		Fit 1	Fit 2	Fit 3
Sad	1	16	7	4
	2	1	34	8
	3	0	4	24

Haybarns *n*=158

		Fit 1	Fit 2	Fit 3
Sad	1	1	0	2
	2	0	14	11
	3	0	0	128

Towers *n*=158

		Fit 1	Fit 2	Fit 3
Sad	1	20	4	1
	2	2	35	11
	3	1	14	67

Supplemental Table 6. Correlation matrix for Key Predictor Variables, Alternative Predictor Variables, and Dependent Variables used in predicting wind support (Spearman rho values)

Variable	Local energy use scale	Local benefits scale	Energy as a comm-odity	Energy not for export	Fewer jobs from wind	Reminder of energy use	See turbines from home	Place attach-ment	Conserv-ative	Nova Scotia	Years in region	Male	Age	Income
Local energy use scale *n*=333	-													
Local benefits scale *n*=330	0.4968 ***	-												
Energy as a comm-odity *n*=328	-0.0524	-0.0037	-											
Energy not for export *n*=328	-0.3025 ***	-0.1867 ***	-0.1937 ***	-										
Fewer jobs from wind *n*=324	-0.1051	-0.0719	-0.0918	0.2312 ***	-									
Remind-er of energy use *n*=326	0.2463 ***	0.1545 **	0.1486 **	-0.2248 ***	-0.1055	-								
See turbines from home *n*=329	0.0577	-0.0074	-0.0301	0.1235 *	0.0390	0.0188	-							
Place attach-ment *n*=334	0.1220 *	0.0344	-0.0221	-0.1653 **	-0.1348 *	0.0569	0.1354 *	-						
Conserv-ative *n*=197	-0.0971	0.0582	0.0050	0.2324 **	0.1232	-0.0964	0.1476 *	-0.0358	-					

Nova Scotia *n*=334	0.0730	0.0804	-0.0121	0.0936	0.0394	0.0166	0.2898 ***	-0.0539	0.2969 ***	-				
Years in region *n*=317	-0.0033	0.0342	0.0372	0.0172	-0.0583	0.0386	0.0758	0.2691 ***	0.2450 ***	0.1231 *	-			
Male *n*=320	-0.0527	-0.0256	0.0910	0.0012	0.1461 **	-0.0067	0.0878	0.1007	0.0854	0.0593	0.1782 **	-		
Age *n*=320	-0.0743	0.0198	0.0640	0.0281	0.0111	0.1076	-0.0286	-0.0004	0.0345	0.0802	0.5345 ***	0.2279 ***	-	
Income *n*=263	-0.0641	0.0076	0.1180	-0.0871	0.0433	-0.1323 *	0.0167	0.1218 *	0.0485	0.0108	-0.2282 ***	0.0902	-0.2136 ***	-
HS/ less than HS *n*=319	-0.0340	-0.0032	-0.1260 *	0.0871	0.0073	0.0182	0.0692	-0.0861	0.0486	-0.0220	0.2222 ***	0.0249	0.1556 **	-0.3766 ***
College/ trade *n*=319	0.0772	0.0552	-0.0277	0.0068	-0.0120	0.0321	0.0495	0.0191	0.0704	0.1345 *	0.0815	0.0485	-0.0150	-0.0601
Univer-sity *n*=319	-0.0451	-0.0515	0.1405 *	-0.0855	0.0051	-0.0479	-0.1120	0.0595	-0.1090	-0.1127 *	-0.2814 ***	-0.0706	-0.1269 *	0.3943 ***

*significant at 0.05
**significant at 0.01
***significant at 0.00

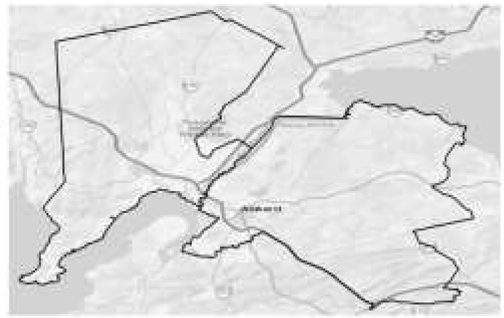
APPENDIX B CONTROL SURVEY

SURVEY: HOW DO YOU FEEL ABOUT LANDSCAPE CHANGE IN THE CHIGNECTO AREA?

You have been randomly selected to participate in a survey on change in the landscape of the Chignecto area, particularly wind farm development. My name is Ellen Chappell and I am working on a Master's of Environmental Studies at Dalhousie University. As a resident of the region, you have been invited to participate in this study and I would greatly appreciate your valuable input to assist with my research. You will have the option to provide a contact phone number or email address to be entered in a draw. **The first 100 respondents will be entered to win one of five $50 Visa gift cards.** Subsequent respondents will be entered to win one of five $20 Visa gift cards. Please only complete the survey if you are age 19 or over and have not previously completed this survey.

The survey will take approximately 15 minutes and is mostly composed of multiple choice questions. You are asked to share your opinions and there are no right or wrong answers. We hope you answer all the questions, but if you aren't comfortable with any question, just leave it blank and move on to the next. It would be appreciated if you could return this survey in the postage-paid envelope. You will also have the option to provide an email address to receive the results from my study. Your contact information will be stored separately from your survey responses after I receive them so your responses remain confidential.

Personally identifying information will not be asked for in the survey. Survey responses will only be reported as overall results and individual responses will never be made public. There are a few written answer questions in this survey, which are optional. If you choose to answer these questions, your answers may be quoted anonymously. As surveys are anonymous, you will not be able to withdraw your responses after submission. If you have any ethical concerns about your participation in this survey, please contact Dalhousie's Research Ethics Office by email (ethics@dal.ca) or by phone (902) 494-3423. If you have any other questions or concerns, please email me or my supervisor, Dr. Kate Sherren (kate.sherren@dal.ca).



You are receiving this survey if your postal code begins with either B4H or E4L. Throughout this survey this area is referred to as "the Chignecto area".

You should have already received a postcard letting you know that you have been randomly selected. We will be using multiple reminders to ensure the responses we get are representative of the residents of the Chignecto area. A reminder will come in the mail in about 10 days. This survey has a unique number that will be used to ensure that people who have already completed the survey or have chosen to opt out of the survey do not receive additional reminders. Ideally you will return the survey completed, but if you do not wish to participate you can tick the box below and return the survey to be taken off the reminder list or you can simply ignore this survey and following reminders.

☐ I do not wish to participate in this survey.

☐ I do not live in the Chignecto area (postal code E4L or B4H).

THANK YOU!

Ellen Chappell, MES
ellen.chappell@dal.ca

This research is supported by the Social Sciences and Humanities Research Council of Canada and Dalhousie University.

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1. How often do you see or hear wind turbines? See photo at right. Please tick yes or no for each statement.	Yes	No
a. Have you ever seen or heard wind turbines? *(If no, skip to Question 2)*	○	○
b. In the course of a week, do you drive past wind turbines?	○	○
c. Can you see or hear wind turbines from where you work or study?	○	○
d. Can you see or hear wind turbines from your home?	○	○

2. How do you feel about wind energy? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. Wind energy is a cleaner alternative to fossil fuel energy.	○	○	○	○	○
b. Canada is already overbuilt with wind farms.	○	○	○	○	○
c. Wind energy is an economic opportunity.	○	○	○	○	○
d. Wind energy development is unnecessary because we have enough other sources of energy in Canada.	○	○	○	○	○
e. Wind energy should be further developed in Canada for environmental reasons.	○	○	○	○	○
f. Wind energy provides fewer jobs than other energy sources.	○	○	○	○	○

3. How do you feel about the Chignecto area? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. The Chignecto area means a lot to me.	○	○	○	○	○
b. I live in the Chignecto area but do not feel attached to it.	○	○	○	○	○
c. I feel the Chignecto area is a part of me.	○	○	○	○	○
d. I identify strongly with the Chignecto area.	○	○	○	○	○
e. I would prefer not to live in the Chignecto area.	○	○	○	○	○

4. How do you feel about wind energy in the Chignecto area? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. I would be happy to see more wind energy development in the Chignecto area.	○	○	○	○	○
b. I would not like to see any additional wind turbines in the Chignecto area, but I am okay with the current number.	○	○	○	○	○
c. I would like to see no wind turbines in the Chignecto area.	○	○	○	○	○
d. Wind turbines do not fit well in the landscape of the Chignecto area.	○	○	○	○	○
e. I would like any current wind turbines in the Chignecto area to be removed rather than replaced after they reach their 25-year life span.	○	○	○	○	○
f. I believe wind turbines are a negative addition to the Chignecto landscape.	○	○	○	○	○

5. Do you support wind energy within sight of your home? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. I would prefer not to see wind turbines from my home.	○	○	○	○	○
b. I think wind turbines can be beautiful and wouldn't mind having a view of them from my home.	○	○	○	○	○
c. Wind turbines can be a useful landmark and tell me I am getting close to home.	○	○	○	○	○
d. I would not mind seeing wind turbines from my home if they are contributing to clean energy and a more sustainable future.	○	○	○	○	○
e. I think that wind turbines near my home would have a negative impact on my health.	○	○	○	○	○
f. Seeing wind turbines from my home would ruin my view.	○	○	○	○	○

6. Is there anything you would like to add concerning how you feel about wind energy development?

7. **Does it matter to you where the energy generated by turbines will be used or owned?** Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. I would more strongly support wind farm development in the Chignecto area if the energy generated is used locally.	○	○	○	○	○
b. I would more strongly support wind farm development in the Chignecto area if the energy generated is used to replace coal or other fossil fuel energy generation within the region.	○	○	○	○	○
c. Energy is just a commodity; if we can develop it to sell elsewhere (eg. New England), then we should.	○	○	○	○	○
d. We have enough energy from other sources; more wind turbines would be unnecessary because the additional energy would just be exported.	○	○	○	○	○
e. I like the idea of generating the energy I use locally.	○	○	○	○	○
f. Seeing wind turbines from my home reminds me that electricity I use has to be generated somewhere.	○	○	○	○	○
g. I would more strongly support wind farms in the Chignecto area if they were owned locally through cooperatives or municipal corporations.	○	○	○	○	○
h. I would more strongly support wind farms in the Chignecto area if profits were distributed to local municipalities.	○	○	○	○	○

8. Is there anything not mentioned above that you would like to add about wind turbines, the landscape of the Chignecto area or landscape change where you live?

9. Demographics: (Please tick the circle next to your answer.)

a. How old are you? 19-24 ◯ | 25-34 ◯ | 35-44 ◯ | 45-54 ◯ | 55-64 ◯ | 65-74 ◯ | 75+ ◯

b. What is your gender? a. Female ◯ | b. Male ◯ | c. Non-binary ◯

c. What is the highest level of formal education that you have completed?

Elementary / some high school ◯	Trade-apprenticeship ◯
High school graduate / GED ◯	Some university ◯
Some college ◯	University undergraduate degree ◯
College graduate ◯	University graduate degree ◯

d. What was your approximate total household income before tax in 2017?

less than $26,000 ◯	$76,000 to $99,999 ◯
$26,000 to $50,999 ◯	$100,000 or more ◯
$51,000 to $75,999 ◯	Prefer not to answer ◯

e. What party best represents your political views, whether or not you vote?

Green ◯ | NDP ◯ | Liberal ◯ | Conservative ◯ | Other ◯

f. How long have you lived in the Chignecto area?

Years: | Months:

g. What is your postal code? (This is only used to calculate your proximity to the wind turbines and won't be reported in survey results.)

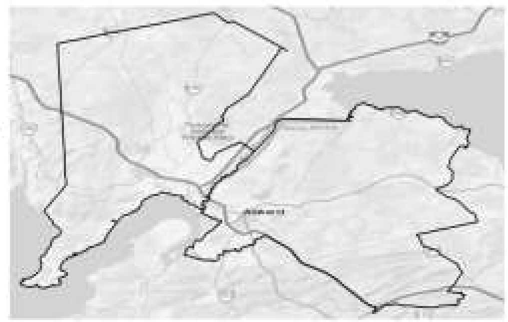
APPENDIX C EXPERIMENTAL SURVEY

SURVEY: HOW DO YOU FEEL ABOUT LANDSCAPE CHANGE IN THE CHIGNECTO AREA?

You have been randomly selected to participate in a survey on change in the landscape of the Chignecto area, particularly wind farm development. My name is Ellen Chappell and I am working on a Master's of Environmental Studies at Dalhousie University. As a resident of the region, you have been invited to participate in this study and I would greatly appreciate your valuable input to assist with my research. You will have the option to provide a contact phone number or email address to be entered in a draw. **The first 100 respondents will be entered to win one of five $50 Visa gift cards.** Subsequent respondents will be entered to win one of five $20 Visa gift cards. Please only complete the survey if you are age 19 or over and have not previously completed this survey.

The survey will take approximately 15 minutes and is mostly composed of multiple choice questions. You are asked to share your opinions and there are no right or wrong answers. We hope you answer all the questions, but if you aren't comfortable with any question, just leave it blank and move on to the next. It would be appreciated if you could return this survey in the postage-paid envelope. You will also have the option to provide an email address to receive the results from my study. Your contact information will be stored separately from your survey responses after I receive them so your responses remain confidential.

Personally identifying information will not be asked for in the survey. Survey responses will only be reported as overall results and individual responses will never be made public. There are a few written answer questions in this survey, which are optional. If you choose to answer these questions, your answers may be quoted anonymously. As surveys are anonymous, you will not be able to withdraw your responses after submission. If you have any ethical concerns about your participation in this survey, please contact Dalhousie's Research Ethics Office by email (ethics@dal.ca) or by phone (902) 494-3423. If you have any other questions or concerns, please email me or my supervisor, Dr. Kate Sherren (kate.sherren@dal.ca).



You are receiving this survey if your postal code begins with either B4H or E4L. Throughout this survey this area is referred to as "the Chignecto area".

You should have already received a postcard letting you know that you have been randomly selected. We will be using multiple reminders to ensure the responses we get are representative of the residents of the Chignecto area. A reminder will come in the mail in about 10 days. This survey has a unique number that will be used to ensure that people who have already completed the survey or have chosen to opt out of the survey do not receive additional reminders. Ideally you will return the survey completed, but if you do not wish to participate you can tick the box below and return the survey to be taken off the reminder list or you can simply ignore this survey and following reminders.

☐ I do not wish to participate in this survey.

☐ I do not live in the Chignecto area (postal code E4L or B4H).

THANK YOU!

Ellen Chappell, MES
ellen.chappell@dal.ca

This research is supported by the Social Sciences and Humanities Research Council of Canada and Dalhousie University.

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1. How often do you see or hear wind turbines? See photo at right. Please tick yes or no for each statement.	Yes	No
a. Have you ever seen or heard wind turbines? *(If no, skip to Question 2)*	◯	◯
b. In the course of a week, do you drive past wind turbines?	◯	◯
c. Can you see or hear wind turbines from where you work or study?	◯	◯
d. Can you see or hear wind turbines from your home?	◯	◯

2. How do you feel about wind energy? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. Wind energy is a cleaner alternative to fossil fuel energy.	◯	◯	◯	◯	◯
b. Canada is already overbuilt with wind farms.	◯	◯	◯	◯	◯
c. Wind energy is an economic opportunity.	◯	◯	◯	◯	◯
d. Wind energy development is unnecessary because we have enough other sources of energy in Canada.	◯	◯	◯	◯	◯
e. Wind energy should be further developed in Canada for environmental reasons.	◯	◯	◯	◯	◯
f. Wind energy provides fewer jobs than other energy sources.	◯	◯	◯	◯	◯

3. How do you feel about the Chignecto area? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. The Chignecto area means a lot to me.	◯	◯	◯	◯	◯
b. I live in the Chignecto area but do not feel attached to it.	◯	◯	◯	◯	◯
c. I feel the Chignecto area is a part of me.	◯	◯	◯	◯	◯
d. I identify strongly with the Chignecto area.	◯	◯	◯	◯	◯
e. I would prefer not to live in the Chignecto area.	◯	◯	◯	◯	◯

4. Perceptions of past landscape changes: Please read the following information about previous landscape uses and features in the Chignecto area and then respond to the questions by ticking your response.

a. Dykes: Dykes were constructed by the Acadians in the 1600s and 1700s to drain the salt marsh and to create agricultural land. Today, some dykes are being moved or breached to return the salt marsh to its original habitat and to help protect against rising sea levels.

	Yes	No
Have you noticed the dykes in the Chignecto area? *(If no, skip to Question 4b.)*	◯	◯

The dykes fit well in the Chignecto landscape.	Disagree ◯	Neutral ◯	Agree ◯
I am sad at the loss of the dykelands.	Disagree ◯	Neutral ◯	Agree ◯

b. Foundries: Foundries were established in the Chignecto area for metal processing in the mid-1800s. While some buildings remain, none of the tall smoke stacks remain.

	Yes	No
Did you live in the Chignecto area prior to the loss of the foundries? *(If not, skip to Question 4c.)*	◯	◯

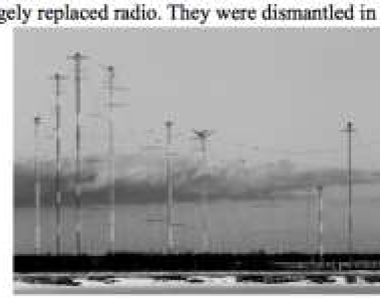
The foundries fit well in the Chignecto landscape.	Disagree ◯	Neutral ◯	Agree ◯
I am sad to see the loss of the foundry stacks.	Disagree ◯	Neutral ◯	Agree ◯

c. Hay barns: Hay barns were constructed through the 1800s and 1900s to store hay harvested from the marsh to feed horses in the area and for export. At one time there were more than 400 hay barns, but the few remaining today are collapsing.

	Yes	No
Have you noticed hay barns in the Chignecto area? *(If no, skip to Question 4d.)*	◯	◯

The hay barns fit well in the Chignecto landscape.	Disagree ◯	Neutral ◯	Agree ◯
I am sad to see the loss of the hay barns.	Disagree ◯	Neutral ◯	Agree ◯

d. RadioTowers: The Radio Canada International (RCI) towers were built during WWII to transmit radio to Canada and overseas, and remained until the Internet largely replaced radio. They were dismantled in 2014.



	Yes	No
Did you live in the Chignecto area prior to the removal of the RCI towers? *(If not, skip to Question 5.)*	◯	◯

The RCI towers fit well in the Chignecto landscape.	Disagree ◯	Neutral ◯	Agree ◯
I am sad to see the loss of the RCI towers.	Disagree ◯	Neutral ◯	Agree ◯

5. How do you feel about wind energy in the Chignecto area? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. I would be happy to see more wind energy development in the Chignecto area.	○	○	○	○	○
b. I would not like to see any additional wind turbines in the Chignecto area, but I am okay with the current number.	○	○	○	○	○
c. I would like to see no wind turbines in the Chignecto area.	○	○	○	○	○
d. Wind turbines do not fit well in the landscape of the Chignecto area.	○	○	○	○	○
e. I would like any current wind turbines in the Chignecto area to be removed rather than replaced after they reach their 25-year life span.	○	○	○	○	○
f. I believe wind turbines are a negative addition to the Chignecto landscape.	○	○	○	○	○

6. Do you support wind energy within sight of your home? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. I would prefer not to see wind turbines from my home.	○	○	○	○	○
b. I think wind turbines can be beautiful and wouldn't mind having a view of them from my home.	○	○	○	○	○
c. Wind turbines can be a useful landmark and tell me I am getting close to home.	○	○	○	○	○
d. I would not mind seeing wind turbines from my home if they are contributing to clean energy and a more sustainable future.	○	○	○	○	○
e. I think that wind turbines near my home would have a negative impact on my health.	○	○	○	○	○
f. Seeing wind turbines from my home would ruin my view.	○	○	○	○	○

7. Is there anything you would like to add concerning how you feel about wind energy development?

8. Does it matter to you where the energy generated by turbines will be used or owned? Please select one option beside each statement depending on whether you agree or disagree.	Strongly disagree ☹	Disagree	Neutral	Agree	Strongly agree ☺
a. I would more strongly support wind farm development in the Chignecto area if the energy generated is used locally.	○	○	○	○	○
b. I would more strongly support wind farm development in the Chignecto area if the energy generated is used to replace coal or other fossil fuel energy generation within the region.	○	○	○	○	○
c. Energy is just a commodity; if we can develop it to sell elsewhere (eg. New England), then we should.	○	○	○	○	○
d. We have enough energy from other sources; more wind turbines would be unnecessary because the additional energy would just be exported.	○	○	○	○	○
e. I like the idea of generating the energy I use locally.	○	○	○	○	○
f. Seeing wind turbines from my home reminds me that electricity I use has to be generated somewhere.	○	○	○	○	○
g. I would more strongly support wind farms in the Chignecto area if they were owned locally through cooperatives or municipal corporations.	○	○	○	○	○
h. I would more strongly support wind farms in the Chignecto area if profits were distributed to local municipalities.	○	○	○	○	○

9. Is there anything not mentioned above that you would like to add about wind turbines, the landscape of the Chignecto area or landscape change where you live?

10. Demographics: (Please tick the circle next to your answer.)

a. How old are you? 19-24 ○ | 25-34 ○ | 35-44 ○ | 45-54 ○ | 55-64 ○ | 65-74 ○ | 75+ ○

b. What is your gender? a. Female ○ | b. Male ○ | c. Non-binary ○

c. What is the highest level of formal education that you have completed?

Elementary / some high school ○	Trade-apprenticeship ○
High school graduate / GED ○	Some university ○
Some college ○	University undergraduate degree ○
College graduate ○	University graduate degree ○

d. What was your approximate total household income before tax in 2017?

less than $26,000 ○	$76,000 to $99,999 ○
$26,000 to $50,999 ○	$100,000 or more ○
$51,000 to $75,999 ○	Prefer not to answer ○

e. What party best represents your political views, whether or not you vote?

Green ○ | NDP ○ | Liberal ○ | Conservative ○ | Other ○

f. How long have you lived in the Chignecto area?

Years: | Months:

g. What is your postal code? (This is only used to calculate your proximity to the wind turbines and won't be reported in survey results.)