THE ROLE OF MUNICIPAL LEVEL GOVERNMENT IN ACCELERATING 100% RENEWABLE ENERGY USE: A CASE STUDY OF OXFORD COUNTY, ONTARIO

by

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A thesis submitted to the School of Urban and Regional Planning

In conformity with the requirements for

the degree of Master of Urban and Regional Planning

Queen’s University
Kingston, Ontario, Canada

(October, 2019)

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Abstract

Climate change will have severe impacts on the biosphere that human society depends on, with repercussions increasing in step with the quantity of greenhouse gases emitted into the atmosphere. These impacts can be avoided by drastically reducing emissions from human society by transitioning to a 100% renewable energy system (100% RE) and reducing the quantity of energy needed overall. In 2016 Oxford County, Ontario set a goal to reach 100% RE by 2050. Using Oxford as a case study, this thesis describes best practices for transitioning to 100% RE for local governments in Canada. This thesis identifies the current progress toward reaching 100% renewable energy in Oxford County and existing strategic gaps that need to be addressed to achieve their goal of 100% RE by 2050 at the community level. It also sets out best practices and recommendations for future research in regards to achieving 100% RE in municipalities across Canada. This thesis also extends thinking on conceptual and theoretical approaches to achieving 100% RE in particular relation to municipal land use planning. The methods used in this analysis are based on the constant comparative method, utilizing a triangulation of (a) literature, (b) policy documents and (c) interviews with 17 expert informants from Canada and abroad. The value of communicative planning, planning tools and the various roles of planners are defined in the context of contributing to a 100% RE transition. Oxford County’s energy and land use planning policies were reviewed and compared against those of other jurisdictions. Engagement, dwelling density, mixed use development, energy mapping, building retrofits and energy efficient building codes can all serve as effective tools to reduce GHG emissions when properly utilized. Oxford County has laid the ground work for a 100% RE future, though much work will need to be done to help it reach this ambitious goal. The policies of other jurisdictions provide some guidance. Over the past decade, the concept of utilizing land use planning to develop low GHG emission communities has become part of mainstream discourse. More recently, plans to reach 100% RE at the community level have become a globally phenomenon. This research is part of an emerging trend in research and policy, recognizing land use planning as an integral part of 100% RE Plans.
Acknowledgements

I would like to thank:

My parents for your unending love and support;

Dr. Graham Whitelaw for all your time and effort in helping me develop and clarify my ideas;

Paul Bell and Aidan Kennedy for your comradery, and the inspiring energy you bring to your work;

Jay Heaman for encouraging me to pursue this topic of study and for all of your help along the way;

and all of those who informed the development of this thesis as informants.

I would also like to acknowledge that this thesis was written on traditional Anishinaabe, Haudenosaunee, Musqueam, and Sinixt territory.
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List of Abbreviations

100% RE – 100% Renewable Energy
CCA – Community Choice Aggregation
CEM – Community Energy Management
CEP – Community Energy Plan
EDP – Energy Planning District
ENGO – Environmental Non-Governmental Organization
ESC – Energy Step Code (British Columbia)
GHG – Greenhouse Gas
MURB – Multi-Unit Residential Building
NGO – Non-Governmental Organization
NZE – Net Zero Energy
NZR – Net Zero Ready
OCP – Official Community Plan (British Columbia)
OP – Official Plan (Ontario)
RE – Renewable Energy
RNG – Renewable Natural Gas
WFC – World Future Council
Chapter 1

Introduction

1.1 Background

1.1.1 Climate Change Impacts

To date, human activities have caused an estimated 1.0°C of global warming above pre-industrial levels, with global warming likely reaching 1.5°C between 2030 and 2052 if current emissions trends continue. Humanity’s emissions will cause warming that will persist for hundreds to thousands of years. Without any further increase in emissions, there is medium statistical confidence that these emissions alone will not cause global temperatures to rise to 1.5°C (IPCC, 2018).

The impacts of climate change are projected to be severe, with increasingly serious repercussions occurring as aggregate atmospheric greenhouse gas content continue to increase. Global climate models predict both steady increases in aridity and the extent of dry lands for the remainder of the 21st century (Dai, 2012; Feng & Fu, 2013; Sherwood & Fu, 2014; Huang, Yu, Guan, & Wang, 2015; Schlaepfer, et al., 2017)as well as dramatic droughts in some regions (Burke & Brown, 2007; Orlowsky & Seneviratne, 2013). Droughts can lead to substantial losses of freshwater, as was witnessed during the 2006-2009 drought in the California Central Valley, where a loss of 26 to 31 km³ of stored groundwater occurred (Famiglietti, et al., 2011; Scanlon, Longuevergne, & Long, 2012; Taylor, et al., 2012). Warming and water deficits have also led to other problems, such as a doubled rate of tree mortality in Western North American forests (Daniels, et al., 2011).

Climate change will also result in more frequent and intense hurricanes as well as coastal flooding. Projections focusing on the late 21st century show an increase in both strength and
number of intense hurricanes (Wuebbles, Kunkel, M., & Zobel, 2014). The rate of sea level rise in and around New York City is projected to accelerate through the year 2100, with a >99% probability that it will increase the frequency and severity of coastal flooding events (Horton, Little, Gornitz, Bader, & Oppenheimer, 2015). Impacts on marine species have also been detected at all latitudes with mostly irreversible consequences (Gattuso, et al., 2015). Warming water can negatively affect the growth, body size, behaviour, immune defense, feeding and reproductive success of many marine species (Gattuso, et al., 2015; Pörtner, 2014) which can have significant impacts on food webs (Gilbert & DeLong, 2014). If these impacts proliferate, problems of food security will worsen, most notably in coastal areas.

Limiting warming to 1.5°C rather than 2°C will reduce impacts including increased heat and acidity in the oceans, decreased oceanic oxygen levels, and further reduce risks to marine biodiversity, fisheries and ecosystems. Further, “climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C” (IPCC, 2018, p. 9).

Models show that achieving a goal of limiting heating to around 1.5°C requires a 45% reduction in GHG emissions by 2030 from 2010 levels. Thus, policy that aims to reduce GHG emissions by 45% between 2010 and 2030 should be the standard by which governments approach emissions reduction (IPCC, 2018).

Finally, since the impacts of climate change are projected to become more dangerous and unpredictable as global GHG emissions continue to rise, focusing on strategies to mitigate climate change by reducing GHG emissions will get to the root of the problem while reducing the amount of work that will be required to adapt to these impacts. One of the areas critical to mitigation is reducing GHG emissions from energy production.
1.1.2 Renewable Energy Progress

Over the past decade, renewable energy (RE) has come a long way, from serving as a niche energy supply to claiming over 55% of all new power generation added globally in 2016. Though this development has largely come from photovoltaic solar panels and wind turbines, it also includes biogas, biomass and waste, geothermal, small hydro and marine energy generation. Furthermore, despite “global new investment” in RE falling by 23% in 2016 to $241.6 billion USD, the amount added to the grid was still 8.6% higher than the previous year (UNEP, 2016, p. 11). This is partially due to the significant decline in cost that RE has experienced in recent years. Between 2015 and 2016, the estimated life cycle cost for onshore wind, offshore wind and PV solar dropped ($/MWh) by 18%, 28% and 17% respectively (FS-UNEP, 2017). This is partially due to increases in manufacturing efficiency, and fine tuning resulting from the general maturation of these technologies. For example, since 1997 onshore wind turbines have become more than twice as efficient at converting wind energy to electricity during peak generation periods, while crystalline-silicon photovoltaic cells have increased their average ability to harness the sun’s energy from 17.5% in 2010 to 19.8% in 2015 (FS-UNEP, 2017). Conversely, the number of new coal-fired power stations added globally fell by 62% in 2016 over the previous year, with most of this reduction coming from India and China (Shearer, Ghio, Myllyvirta, Yu, & Nace, 2017).

The trend of increasing renewable and decreasing fossil fuel energy worldwide has been supported by international efforts to reduce greenhouse gas (GHG) emissions. This has been marked by a total of 185 Parties ratifying the Paris Agreement to limit the temperature increase to well below 2°C above pre-industrial levels within this century (UNFCCC, 2019). Despite a groundswell of historically unprecedented enthusiasm from the international community, current pledges for GHG reduction from signatories of the Paris Agreement will still enable
global temperature to rise between 2.9-3.4°C this century, which is not considered a safe global limit (UNEP, 2016).

1.1.3 100% Renewable Energy Goals

Faced with the monumental threats of climate change, pressures from both the public and environmental non-governmental organizations (ENGOs), and the rapid decline in cost of renewable energy, hundreds of municipalities, states, provinces and nations across the world are responding with renewed action, including many in Canada and the United States (Krause, 2012). These actions include passing legislation to ban the sale of gas and diesel vehicles by 2040 in British Columbia (Legislative Assembly of British Columbia, 2019), closing Ontario’s last coal-fired power plant (Ontario, 2015), retrofitting buildings to reduce energy demand, planning greener communities (von Hausen, 2013) and increasing the quantity of renewable energy generation (Fast, et al., 2016). Moreover, municipal governments all over the world are joining networks such as C40 Cities, 100 Resilient Cities, The Sierra Club’s Ready for 100% initiative, and the World Future Council’s 100% Renewable Energy initiative. These networks allow member municipalities to share strategies and learn from one another, as they progress with their respective goals towards major reductions in GHG emissions.

These networks are also playing a critical role in knowledge dissemination. Various municipalities from small agricultural communities to large coastal metropolises work with these organizations (Boselli & Leidreiter, 2017). Some communities are more conservative, while others more progressive. The laws that govern these places have diverse histories that have, in turn, produced widely variable governance structures. However, despite the notable differences between these jurisdictions, commonalities persist and some strategies seem universally applicable. Engaging a municipality’s general population to find out what concerns exist within the community, as well as ensuring that the Mayor and Council are both supportive and have
had a role in the plan’s development are keys to success (Boselli & Leidreiter, 2017).

Furthermore, streamlining the processes that allow interested consumers to install PV solar or reduce their household energy consumption is critical. Any goal to reach 100% RE within a municipality not only requires a transition of energy fuel types away from those that emit GHGs, but also a reduction in aggregate energy consumption.

1.1.4 Land Use Planning

Each municipality has a unique set of both community interests as well as resources, such as agricultural areas, wind strength, and sunshine, that influence the types of renewable energy installations and the locations of those installations that will best suit their goals. The urban and regional planning paradigm in North America has traditionally had little direct interaction with renewable energy. However, recognizing the value of urban planning tools in achieving 100% RE is critical (Boston, Barrs, Pol, & Hendrickson, 2017). The planning documents and policies of a municipality can strongly impact plans for 100% RE because they impact the amount of energy each household requires. By planning new developments with dense populations, mixed land use types, and pursuing concepts such as complete communities (Hodge & Gordon, 2014), urban planning activities can result in a substantial reduction in the mass of GHGs emitted by a community.

This thesis contributes to broad municipal efforts focused on achieving the 100% RE goal by increasing the amount of renewable energy generation within municipal boundaries and reducing municipal aggregate energy consumption by increasing energy efficiency and energy conservation (See Chapter 3.5 for further detail).
1.2 Research Questions

The overall goal of this work is to contribute a better understanding of the role of municipal level government in accelerating RE adoption and application. A case study of Oxford County, Ontario was carried out to explore the efforts of its staff to transition to a 100% RE system by 2050. The research objectives are:

Objective 1: Identify the current progress toward reaching 100% renewable energy in Oxford County and identify any strategic gaps that need to be addressed to achieve their goal of 100% RE by 2050 at the community level.

Objective 2: Set out best practices and recommendations for future research in regards to achieving 100% RE in Oxford County and other municipalities across Canada.

Objective 3: Extend thinking on conceptual and theoretical approaches to achieving 100% RE in particular relation to municipal land use planning.

1.3 Oxford County Case

Oxford County is located along the 401 Highway in South-Western Ontario, between London and Kitchener, comprising an area of over 2000 km². Oxford is comprised of three urban municipalities including the City of Woodstock, the Town of Tillsonburg and the Town of Ingersoll, as well as five rural municipalities, including the Townships of Zorra, East Zorra-Tavistock, Blandford-Blenheim, South-West Oxford and Norwich (see Table 1). The 2016 Census showed that Oxford County has a population of 110,862. Ingersoll’s population density is highest at 100.7 people/km², while the rural Township’s mean density is 22.1 people/km² (Statistics Canada, 2016) (see Table 1).

Manufacturing plays a prominent role in Oxford County’s economy. Ingersoll and Woodstock are home to automotive assembly plants for General Motors and Toyota, respectively. Several companies that produce parts for these assembly plants also have factories in Oxford County. There was also a factory in Tillsonburg owned by Siemens Wind Division that produced blades for wind turbines on a per-contract basis between 2010 and its eventual closing in July of 2017.
Oxford County also has a very substantial agricultural sector (Oxford County, 2018a).

On June 22, 2016, the Warden and Members of Oxford’s County Council unanimously voted to support the ongoing development of the Draft Oxford County 100% Renewable Energy Plan (Oxford County, 2016). Oxford County has invested significant resources in its efforts towards achieving a 100% RE future, which has led to substantial achievements. Its RE team has effectively engaged with various groups, organizations and citizens, while forming Smart Energy Oxford; a multi-stakeholder steering committee actively seeking to develop a prosperous path towards 100% RE. They have also attracted green businesses and hosted developer information sessions on sustainable construction, sent delegations to present at international conferences and have supported the development of renewable energy within the County. Details of these achievements will be discussed further in Chapter 4.

**Table 1: Oxford County Statistics.** Household counts, population and population density per km² for each of the 8 municipalities within Oxford County. (Statistics Canada, 2016). *(1) Household counts are private dwellings occupied by usual residents, (2) Uncorrected for census count adjustments.*

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Household Counts (1)</th>
<th>Population (2)</th>
<th>Population Density per km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Woodstock</td>
<td>17,151</td>
<td>40,902</td>
<td>835.3</td>
</tr>
<tr>
<td>Town of Tillsonburg</td>
<td>7,127</td>
<td>15,872</td>
<td>710.8</td>
</tr>
<tr>
<td>Town of Ingersoll</td>
<td>5,088</td>
<td>12,757</td>
<td>1000.7</td>
</tr>
<tr>
<td>Blandford-Blenheim</td>
<td>2,728</td>
<td>7,399</td>
<td>19.4</td>
</tr>
<tr>
<td>East-Zorra Tavistock</td>
<td>2,703</td>
<td>7,129</td>
<td>29.4</td>
</tr>
<tr>
<td>Norwich</td>
<td>3,712</td>
<td>11,001</td>
<td>25.5</td>
</tr>
<tr>
<td>South-West Oxford</td>
<td>2,687</td>
<td>7,664</td>
<td>20.7</td>
</tr>
<tr>
<td>Zorra</td>
<td>3,070</td>
<td>8,138</td>
<td>15.4</td>
</tr>
<tr>
<td>County of Oxford</td>
<td>44,266</td>
<td>110,862</td>
<td>54.4</td>
</tr>
</tbody>
</table>

The study area selected is Oxford County, Ontario. In many parts of Ontario, the local governing bodies are divided into upper- and lower-tier municipalities, with the upper tiers having more authority than the lower tiers. The upper tier municipality is typically a County,
while towns, cities and rural township within a County would each be considered lower-tier
municipalities (often smaller settlements including villages and hamlets are jurisdictionally
considered part of a rural township). In Oxford County, the Official Plan is a County-level
document that includes a section for each lower-tier municipality, while the County.

Oxford County was also selected as the study area because the 100% RE Plan is being
developed at the County level. It is a logical area to study, because reaching 100% RE in a City,
such as Woodstock will not be possible without additional energy outputs that could be
produced in the rural townships surrounding the City – likely in the form of solar or wind power.

1.3.1 The World Future Council and Oxford County

The World Future Council (WFC) developed a set of guiding principles to reach 100% RE.
These have been foundational to Oxford County’s 100% RE Plan (Boselli & Leidreiter, 2017). The
WFC is a non-governmental organization (NGO) that works closely with civil society,
parliamentarians, governments, and businesses while conducting in-depth research to identify
policies that are in the interest of future generations around the world (Agar, Buschmann, &
Leidreiter, 2015). Table 2 lists the 10 Building Blocks - the most current approach taken by the
WFC and its partnering organizations to develop a coherent and universal approach to reaching
100% RE that can be embraced by governments all over the world. Each of the 10 Building
Blocks has multiple actionable criteria that elaborate approaches to achieving the 10 Building
Blocks (Boselli & Leidreiter, 2017).

1.4 Methods

The case study approach was used because the topic of reaching 100% RE at the municipal
level is an area with limited study and case studies allow for an in-depth exploration of the topic
(Yin, 2014). More specifically, case studies are recognized as having 4 advantageous applications
### Table 2: Building Blocks

The 10 Building Blocks represent the most current approach taken by the World Future Council and its partnering NGOs and municipal governments. Accompanying the 10 Building Blocks are criteria that detail specific approaches to achieving 100% RE (Boselli & Leidreiter, 2017).

<table>
<thead>
<tr>
<th>BUILDING BLOCKS</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Activate local resource potential</td>
<td>Perform preliminary assessments</td>
</tr>
<tr>
<td></td>
<td>Mobilize local resources</td>
</tr>
<tr>
<td></td>
<td>Identify programs for support and assistance</td>
</tr>
<tr>
<td>2. Develop the 100% RE blueprint</td>
<td>Define the 100% RE target</td>
</tr>
<tr>
<td></td>
<td>Model a 100% renewable energy scenario</td>
</tr>
<tr>
<td></td>
<td>Estimate the potential economic, environmental and social benefits</td>
</tr>
<tr>
<td>3. Formalize aims and functions</td>
<td>Fix binding targets</td>
</tr>
<tr>
<td></td>
<td>Define comprehensive legal and regulatory frameworks</td>
</tr>
<tr>
<td></td>
<td>Establish relevant institutionalized bodies</td>
</tr>
<tr>
<td>4. Promote energy conservation and efficiency</td>
<td>Change human behaviour</td>
</tr>
<tr>
<td></td>
<td>Retrofit existing built-environments</td>
</tr>
<tr>
<td></td>
<td>Upgrade infrastructures and support efficient technologies</td>
</tr>
<tr>
<td>5. Increase and integrate RE across sectors</td>
<td>Increase renewable electricity generation</td>
</tr>
<tr>
<td></td>
<td>Tackle the built environment challenge</td>
</tr>
<tr>
<td></td>
<td>Modernize the grid and other infrastructure</td>
</tr>
<tr>
<td></td>
<td>Tackle mobility and transportation challenges</td>
</tr>
<tr>
<td>6. Identify financial resources</td>
<td>Introduce innovative and alternative financing mechanisms</td>
</tr>
<tr>
<td></td>
<td>Implement new mechanisms to internalize externalities</td>
</tr>
<tr>
<td></td>
<td>Establish stable, long-term support schemes</td>
</tr>
<tr>
<td>7. Support decentralization and inclusion</td>
<td>Ensure accountability and transparency</td>
</tr>
<tr>
<td></td>
<td>Promote inclusive communication and outreach</td>
</tr>
<tr>
<td></td>
<td>Empower a decentralized and diversified energy transition</td>
</tr>
<tr>
<td></td>
<td>Safeguard a socially just transition</td>
</tr>
<tr>
<td>8. Nurture vertical and horizontal cooperation and integration</td>
<td>Further vertical cooperation</td>
</tr>
<tr>
<td></td>
<td>Cultivate horizontal cooperation</td>
</tr>
<tr>
<td>9. Promote knowledge generation and capacity building</td>
<td>Generate and disseminate specific knowledge</td>
</tr>
<tr>
<td></td>
<td>Make knowledge and data accessible</td>
</tr>
<tr>
<td></td>
<td>Promote capacity building and training</td>
</tr>
<tr>
<td>10. Engage in Networks</td>
<td>Form and engage in local and regional networks</td>
</tr>
<tr>
<td></td>
<td>Participate in international networks</td>
</tr>
</tbody>
</table>

including:

i. "...to explain the presumed causal links in real-world interventions that are too complex for survey or experimental methods."
“...to describe an intervention and the real-world context in which it occurred.”

“...illustrate certain topics within an evaluation...”

“...to enlighten those situations in which the intervention being evaluated has no clear, single set of outcomes” (Yin, 2014, p. 19)

The methodological approach taken herein consists of a triangulation of (a) an in-depth analysis of relevant literature within the domains of renewable energy, land use planning, environmental planning as well as specific municipal-level accounts of renewable energy installation and implementation (b) a review of current federal, provincial and municipal policies and documents that inform and impact municipal efforts regarding green energy and (c) findings from a series of semi-structured interviews with professionals both inside and outside of Oxford County working on RE projects.

1.4.1 Literature Review

The literature review includes peer reviewed articles and books on topics that contribute to the broader foundation of knowledge regarding 100% RE. It includes (a) practical sources including books and journal articles analyzing municipal land use plans, community energy projects, solar and wind energy, and sustainable building initiatives as well as (b) sources to support the theoretical development of this paper on the topics of environmental planning, collaborative planning and the role of the planner.

1.4.2 Document Analysis

The document analysis that supports this thesis includes analysis of relevant government acts, plans and policies from jurisdictions across Canada at both the provincial and municipal level, as well as documents from industry associations, non-governmental organization, and the United Nations. The breadth of this document analysis serves to reveal best practices for reducing GHG
emission and an understanding of how partners in industry, government and the non-profit sectors view the challenges and opportunities associated with developing renewable energy.

Document analysis is a highly valued piece of case study exploration as it enables a researcher to corroborate comments received in interviews (Yin, 2014).

1.4.3 Interviews

Semi-structured interviews were carried out with professionals working within the Oxford County RE domain along with others working in the RE field both in Canada and abroad. Semi-structured interviews are valuable, because they make “...an intentional departure from collecting data in a naturalistic field setting, replacing it with focused, purposive data collection efforts that are framed and guided by a more formal research question” (Silverman & Patterson, 2015, p. 60). These interviews added current and practical data to the analysis that was especially useful for understanding the strengths, weaknesses, opportunities and challenges that planners and policy makers experience in the evolving renewable energy policies and application (Silverman & Patterson, 2015).

1.5. Format and Structure

Following this introduction, Chapter 2 presents the methodological framework for the thesis as well as specific procedures that were followed on how both the document analysis and semi-structured interviews were carried out. Chapter 3 provides a review of scholarly literature pertaining to both theoretical planning concepts as well as practical findings from applied research. Chapters 4 and 5 present results and discussion focusing on renewable energy and land use planning. Chapter 6 presents recommendations for future research along with concluding thoughts on the road ahead.
Chapter 2
Methodology

This chapter presents the methods utilized in the development of this thesis, centered around the case study of Oxford County (see Chapter 1 for a brief description of the case). The case study method used in this analysis is described, followed by a description of the three data collection methods. Finally, a description of the data analysis and scoping are explored.

2.1 The Case Study Method

The use of case studies as a form of scholastic inquiry are common in political science and community planning. This method often finds application in these fields because it can help “…to explain the presumed causal links in real-world interventions that are too complex for survey or experimental methods (Yin, 2014). Given that Oxford County’s goal to reach 100% RE is grounded so strongly within a municipal government context, focusing on both land use planning and renewable energy initiatives that are ever-evolving, the heavily detailed, place-specific foundation of the case study method was chosen.

The analysis herein follows a hybrid approach. Though the entire analysis is centered around the execution of Oxford County’s Draft 100% RE Plan and the efforts that have accompanied it, the interviews that were completed as part of this research also shed light on nine other jurisdictions from around the world. Though these jurisdictions have not been scrutinized at the same level as the Oxford County case, information from these jurisdictions highlight the central achievements of other jurisdictions and are used to help evaluate the progress of Oxford County.

Ensuring validity is a key part of case study development (Yin, 2014). The four tests for case study validity are discussed in various sections throughout this chapter: external validity (current
External validity concerns whether a study’s findings are generalizable (Yin, 2014). In this case, the results are generalizable within Canada, because municipalities in Canada are all granted their powers by the provincial and federal governments in a way that is similar to one another. It should be noted, however, that (a) some interprovincial differences exist that may impact replicability across provincial boundaries (such as the upcoming BC Step code, discussed in Chapter 4), and that (b) the Vancouver Charter gives that city certain governing powers that are unique to other Canadian jurisdictions.

2.2 Data Collection

In a case study, it is important to develop construct validity to ensure that the researcher is using the “correct operational measures for the concepts being studied” (Yin, 2014, p. 46). These operational measures show how data was collected from the three triangulated sources: interviews, documents and academic literature. These sources were operationalized in the following logical process to ensure construct validity:

1. Notes were taken on each source, mostly in point form, with some quoted passages.
   The 17 interviews were transcribed, and were then reduced to point form notes;
2. Each individual note taken from all sources was carefully labeled by theme (see table);
3. All notes were carefully sorted from being grouped by source to being grouped by theme;
4. With all notes tidily organized by theme, each thematic grouping was then broken down into more specific discussion items;
5. These discussion items revealed points of convergence and divergence within the collected data. This operationalizes data points, revealing areas where multiple source do or do not support a given conclusion;
This shows how construct validity has been ensured within this study; by utilizing multiple sources of evidence that deliver convergent lines of inquiry. To further increase validity, a chain of evidence has been maintained, to allow future researchers to trace the evidence collected (Yin, 2014). However, because the informants have been anonymized, and because the international shift towards renewable energy will evolve in the coming years, it will not be possible to replicate certain parts of this study. Reliability within data collection has been addressed by the development of a case study database. The database consists of a separate and orderly document that includes notes taken from various sources, as well as interview data that served to inform the findings of the research (Yin, 2014).

The data collection conducted in this analysis follows the triangulation method; an approach with recognized strength, allowing a subject/issue/topic to be seen from different perspectives (Shipley, 2002). This triangulation includes:

(a) an in-depth analysis of relevant literature within the domains of renewable energy, land use planning, environmental planning as well as specific municipal-level accounts of renewable energy installation and implementation;

(b) a review of current federal, provincial and municipal policies that impact Oxford County’s efforts regarding green energy;

(c) a series of interviews with professionals from Oxford County, other parts of Canada and abroad.

Triangulation is a valuable approach to conducting research because it often leads to converging lines of inquiry. “The multiple sources of evidence essentially provide multiple measures of the same phenomenon” (Yin, 2014, p. 121).

The collection of pertinent information has taken an iterative approach. Initial data collection began with a search through the Queen’s University Library Databases and Google Scholar using
combinations of search terms including: renewable energy, system(s), 100%, municipal, government, district heat, and planning. When these queries failed to deliver articles that discussed the sharp decline in the cost of renewable energy seen over the past couple of years (see chapter 1), it became increasingly evident that these market changes had occurred in too recent a timeframe for the peer-reviewed literature to contain detailed accounts of the phenomenon. This lack of coverage in the academic literature was reaffirmed by Informant 7 (2017).

After this discovery, documents were reviewed 17 interviews were carried out with leading professionals in the field from around the globe (See Table 2.3). Informants helped to fill the gaps that the peer-reviewed literature missed, while substantially expanding on the conceptual framework of this analysis. These interviews also led to the development of the two different, yet synergistic approaches, discussed at length within this thesis. The two approaches are:

1. Examining municipal government approaches to increasing the relative share of RE within a community;

2. Examining municipal government approaches to reduce aggregate energy consumption.

Theoretically, it is possible that adding new sources of renewable energy to a grid can eventually alleviate the need for fossil fuel-based energy sources. However, if the system is inherently wasteful of energy, with each consumer using many times more energy than is necessary, one can expect that any plan to reach 100% RE would need to be far more grand in terms of both technological requirements and cost when compared to a system where per-capita energy consumption is purposely smaller. This is why chapter 4 focusses on tactics to expand RE content, while chapter 5 discusses reducing the total amount of energy required by communities.
Following the interviews, the literature was revisited to research the second stream of analysis: municipal approaches to reduce aggregate energy consumption through land use planning, energy conservation and energy efficiency. Retrieving literature for this stream of analysis delivered a far greater quantity of sources than did the initial literature search for this thesis. This is largely because theories on the development of sustainable urban land use planning, energy efficiency and energy conservation are common concepts in urban and regional planning theory and practice.

2.2.1 Literature Review

As has been previously explained, the literature review composed herein provides little support for concepts supporting the recent increase in competitiveness of renewable energy. This is problematic because the narrative present in much of this literature regarding renewable energy expansion suggests that, since renewables have not gained substantial market share, only predictions are available regarding the expansion of technologies such as wind turbines and solar PV. However, literature focusing on the second stream of analysis – reducing energy consumption through energy efficiency, energy conservation and land use planning – has delivered substantial results, showing land use planning to be instrumental in municipal efforts to achieving goals relating to 100% RE.

The literature review in Chapter 3 includes (a) practical sources on municipal land use planning, community energy projects, renewable energy and sustainable building initiatives as well as (b) sources to support the theoretical development of this paper on the topics of environmental planning, collaborative planning (Healey, 2006) and the role of the planner (Alexander, 1986).
2.2.2 Document Analysis

Documents including policy, legislation, reports and background papers, are one of the three sources of data that was used to triangulate this research. As Bowen explains “qualitative research requires robust data collection techniques and the documentation of the research procedure” (Bowen, 2009). Documents can be used to:

- Provide context to data, such as helping the researcher understand the history of a phenomenon;
- Suggest vital questions that should be asked to guide the research;
- Provide supplementary research data;
- Track changes in a phenomenon through time, and;
- Verify findings from other sources (Bowen, 2009).

Document analysis entails skimming, reading and interpreting documents, while sorting information from each document into categories or themes derived from the central questions of the research. When triangulated with the literature review and interviews, document analysis serves as a very efficient and useful method for data collect (Bowen, 2009). The documents utilized in this analysis detail a variety of relevant concepts including practical approaches to increase dwelling unit density within a community, legislation relevant to the Oxford County context that will impact its transition to a 100% RE future, examples of best practices from select municipalities across Canada, as well as policy documents developed in Oxford County (see Table 3). Analyses in Chapter 4 and 5 show how documents have been instrumental for corroborating evidence (Yin, 2014).

2.2.3 Interviews

Interviews are especially insightful because they provide information as well as personal views (Yin, 2014). The interviews referenced within this document took place in the summer of 2017.
They were recorded, transcribed, then categorized and analyzed to find both patterns within the data as well as exceptional occurrences (Yin, 2014). Thematic analysis was then used to identify patterns of meaning across the data collected from interviews, documents and literature, to provide answers to this thesis’ central research questions. These patterns were identified through a rigorous process of data familiarization, data coding and the development of themes (Braun & Clarke, 2019). This process is iterative in nature, and in practice, it resulted in several revisions as some themes became more prominent, while others became less so.

The 17 informants (listed in Table 4) that were interviewed included individuals from seven countries holding positions including engineer, planner, mayor, deputy mayor, energy planner, and consultant. Part of the recruitment took place at two conferences that I attended in Vancouver, British Columbia in the spring of 2017. The conferences were the National Symposium for the National Executive Forum on Public Property, as well as the Renewable Cities Global Forum. Some informants were recruited in person at these two events, while others were recruited via telephone or e-mail.

The informants who provided information for this analysis do not comprise a representative sample of planners and municipal employees. Rather, each informant was invited to participate based on their involvement working for a municipal government, contractor, consultant or firm with demonstrated knowledge and/or experience developing or implementing best practices in relation to advancing 100% RE in each of their respective locations. Since the informants that were selected from outside of Oxford County generally have more experience working with renewable energy plans, their testimonies substantially added to this analysis. By asking questions in each interview about the strengths, weaknesses, opportunities and challenges experienced while pursuing renewable energy goals, the resulting recommendations developed
Table 3: Documents analyzed. Documents analyzed in the development of this thesis, including local government planning documents, provincial policies, and documents from non-government organizations that support a transition to 100% renewable energy (Bowen, 2009).

<table>
<thead>
<tr>
<th>AUTHOR, YEAR</th>
<th>TITLE</th>
<th>GENERAL FINDINGS</th>
<th>DATA ANALYZED</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Saskatoon, 2017</td>
<td>Zoning Bylaw No. 8770 of the City of Saskatoon (S. 5.43)</td>
<td>Important regulations dictating acceptable development of garden and garage suites</td>
<td>Replicability of this bylaw to support increased density in other jurisdictions</td>
</tr>
<tr>
<td>Government of Ontario, 1998</td>
<td>Ontario Energy Board Act</td>
<td>3 of the 5 main objectives of this Act focus on reducing energy consumption and renewable energy</td>
<td>Direction of the Ontario Energy Board in relation to climate change planning</td>
</tr>
<tr>
<td>Government of Ontario, 2012</td>
<td>Provincial Policy Statement</td>
<td>Strong provincial approach to intensifying and mixing land use</td>
<td>Direction of Province of Ontario’s planning as it relates to land use and climate change</td>
</tr>
<tr>
<td>Government of Ontario, 2016</td>
<td>Ontario Five Year Climate Action Plan</td>
<td>An impressive selection of amendments to the Planning Act, making climate change planning a provincial interest and placing climate change planning in Official Plans</td>
<td>Sections relevant to land use planning, energy efficiency and energy conservation</td>
</tr>
<tr>
<td>Oxford County, ND, 2016</td>
<td>County of Oxford Official Plan</td>
<td>Targets for residential growth and intensification of central case study</td>
<td>Approach to increasing density and mixed use development</td>
</tr>
<tr>
<td>Oxford County, 2016</td>
<td>Draft 100% Renewable Energy Plan</td>
<td>An ever-evolving plan to reach 100% RE</td>
<td>Approaches to energy conservation, efficiency and RE expansion</td>
</tr>
<tr>
<td>City of Victoria, 2017</td>
<td>Official Community Plan</td>
<td>Valuable example of a well-developed plan to reduce GHG emissions through land use planning</td>
<td>Regional growth strategy, energy conservation and efficiency, building performance</td>
</tr>
<tr>
<td>World Future Council, 2017</td>
<td>100% RE Building Blocks</td>
<td>Recommended approach to achieving 100% RE at municipal level</td>
<td>Recommendations for municipalities working towards various renewable energy goals</td>
</tr>
<tr>
<td>ICLEI – Local Governments for Sustainability, 2014</td>
<td>Finding the Nexus: Exploring Climate Change Adaptation and Planning</td>
<td>Approaches to Climate Change Adaptation through Planning</td>
<td>Specific policy approaches to climate change adaptation that can be adapted to a mitigation focus</td>
</tr>
<tr>
<td>City of Prince George, 2017</td>
<td>Official Community Plan</td>
<td>Climate Change planning included in OP</td>
<td>Strategies for green energy and reduced carbon emissions</td>
</tr>
<tr>
<td>Town of Ajax, 2016</td>
<td>Official Plan</td>
<td>Climate Change planning included in OP</td>
<td>Strategies for energy conservation and renewable energy</td>
</tr>
<tr>
<td>City of Woodstock, 2016</td>
<td>City of Woodstock Community Energy Plan</td>
<td>Approaches to understanding energy consumption throughout the city</td>
<td>Energy consumption by housing type and section of city</td>
</tr>
</tbody>
</table>
within this thesis detail not only ideal approaches Oxford County and other municipalities might consider for 100% RE plans, but also pitfalls to avoid on the path to 100% RE (Appendix 03). In support of the search for new and inventive best practices, the interview guide followed a semi-structured format, where the interview more resembles a guided conversation than a highly structured process. Some questions were included to help find patterns within the findings across the multitude of jurisdictions that the interviewees represent (Yin, 2014). The guide also featured open-ended questions to allow each informant to illustrate events and concepts unique to each of their contexts. While allowing for flexibility, the guide also ensured a certain degree of continuity across interviews (Silverman & Patterson, 2015) (See Appendix 03 for sample interview questions).

**Table 4: List of Informants.** A list of informants that participated in this study, sorted by order of date interviewed.

<table>
<thead>
<tr>
<th>INFORMANT</th>
<th>JURISDICTION</th>
<th>POSITION</th>
<th>DATE (LOCATION)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Freiburg, Germany</td>
<td>Consultant</td>
<td>June 1, 2017 (Skype)</td>
</tr>
<tr>
<td>2</td>
<td>Toronto, ON</td>
<td>Conservation Authority Staff</td>
<td>June 2, 2017 (Skype)</td>
</tr>
<tr>
<td>3</td>
<td>Oxford County, ON</td>
<td>Elected Official</td>
<td>June 5, 2017 (Skype)</td>
</tr>
<tr>
<td>4</td>
<td>Oxford County, ON</td>
<td>Staff</td>
<td>June 7, 2017 (Skype)</td>
</tr>
<tr>
<td>5</td>
<td>San Francisco, CA</td>
<td>City Staff</td>
<td>June 9, 2017 (Skype)</td>
</tr>
<tr>
<td>6</td>
<td>Vancouver, BC</td>
<td>Engineering Consultant</td>
<td>June 13, 2017 (Skype)</td>
</tr>
<tr>
<td>7</td>
<td>Australia</td>
<td>Professor</td>
<td>June 13, 2017 (Skype)</td>
</tr>
<tr>
<td>8</td>
<td>Vancouver, BC</td>
<td>City Staff</td>
<td>June 14, 2017 (Phone)</td>
</tr>
<tr>
<td>9</td>
<td>Surrey, BC</td>
<td>City Staff</td>
<td>June 14, 2017 (Skype)</td>
</tr>
<tr>
<td>10</td>
<td>Vancouver, BC</td>
<td>Planning Consultant</td>
<td>June 15, 2017 (Skype)</td>
</tr>
<tr>
<td>11</td>
<td>Brussels, Belgium</td>
<td>Staff, World Future Council (NGO)</td>
<td>June 16, 2017 (Skype)</td>
</tr>
<tr>
<td>12</td>
<td>Växjö, Sweden</td>
<td>Elected Official</td>
<td>June 16, 2017 (Skype)</td>
</tr>
<tr>
<td>13</td>
<td>Vancouver, BC</td>
<td>Elected Official</td>
<td>June 22, 2017 (Skype)</td>
</tr>
<tr>
<td>14</td>
<td>Toronto, ON</td>
<td>University Professor</td>
<td>June 27, 2017 (Skype)</td>
</tr>
<tr>
<td>15</td>
<td>Victoria, BC</td>
<td>City Staff</td>
<td>June 29, 2017 (Skype)</td>
</tr>
<tr>
<td>16</td>
<td>Nelson, BC</td>
<td>City Staff</td>
<td>July 6, 2017 (Skype)</td>
</tr>
<tr>
<td>17</td>
<td>Sønderborg, Denmark</td>
<td>Elected Official</td>
<td>July 7, 2017 (Skype)</td>
</tr>
</tbody>
</table>
A critical downside to interviews is that they are prone to “problems of bias, poor recall, and poor or inaccurate articulation” (Yin, 2014, p. 13). For this reason, data collected from informants has been confirmed with sources from the documents and literature (Yin, 2014).

2.3 Data Analysis

Using an inductive approach, concepts that support best practices on the path to 100% RE at the municipal level emerged. The inductive approach includes a design that is both flexible and emergent, enabling the researcher to be responsive to the changing conditions of the study as it progresses.

To establish strong *internal validity* a researcher’s ability to make valid inferences must be able to stand up to scrutiny within their analysis. In this case, the analysis is made more robust by utilizing explanation building and the use of logic models (Yin, 2014). In this study, explanation building followed this general process: (1) creating initial objectives to research, (2) reviewing literature, (3) reviewing documents, (4) finding discrepancies between the two, (5) conducting interviews, (6) refining the approach that was taken before the interviews were conducted (due to findings that arose during the interviews) and finally, (7) revisiting the literature to explore the second stream of analysis.

This explanation-building approach lead to the development of lines of inquiry, that converged and produced themes (Table 5), discussed in Chapters 4 and 5. When data is collected, coded and analyzed in this way, it is known as the constant comparative method (Glasser & Strauss, 1967, as cited in Merriam 2009).
TABLE 5: Thesis Themes. Themes that emerged from the data analysis stage of research.

<table>
<thead>
<tr>
<th>#</th>
<th>THEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Achieving 100% RE requires carefully thought out land use planning</td>
</tr>
<tr>
<td>2</td>
<td>Integrating municipal staff is more important than having an innovative plan</td>
</tr>
<tr>
<td>3</td>
<td>Sincere and well thought-out engagement is critical to a successful plan</td>
</tr>
<tr>
<td>4</td>
<td>Tiering: consistent and high levels of financial and policy support from provincial and federal governments are essential for accelerating progress towards 100% RE goals</td>
</tr>
<tr>
<td>5</td>
<td>The local level is the most important places for action to occur</td>
</tr>
<tr>
<td>6</td>
<td>Community-owned and -supported renewable energy projects are much more successful than those dominated by major industrial players</td>
</tr>
<tr>
<td>7</td>
<td>100% renewable energy plans should not be a financial burden on the public</td>
</tr>
<tr>
<td>8</td>
<td>Building energy needs should be reduced in both new and existing buildings</td>
</tr>
<tr>
<td>9</td>
<td>Increasing energy conservation and energy efficiency are key concepts to support demand side management</td>
</tr>
</tbody>
</table>

2.4 Scoping

The most important characteristic of conducting research in the form of a case study is found in clearly defining the boundaries of the case (Merriam, 2009). Within the WFC’s inventory of municipalities pursuing renewable energy targets, some strive to reach 100% RE in heating, cooling, electricity, and transportation or a more limited combination of these. Oxford County has chosen the ambitious goal to achieve all of these targets by the year 2050, however this analysis will primarily focus on heating, cooling, and electricity. Transportation will be addressed in some circumstances, as gains in population density and the like often lead to reduced reliance on automobiles, however transportation will not serve as a central focus in this analysis. Furthermore, analyses concerning electric or high efficiency vehicles, busses and trains will not be included in this study. Oxford County has also developed a Draft Zero Waste Plan. Despite certain points of overlap between this plan and the County’s Draft 100% RE Plan (such as the value of embodied carbon in construction materials that can be reused rather than sent to landfill) the scope of this thesis does not reflect on the Draft Zero Waste Plan.
Chapter 3

Literature Review

The following literature review continues the two-pronged approach of focusing on (a) renewable energy and (b) land use planning as highly related, yet separate topics. Sections 3.1 to 3.3 deliver the theoretical underpinnings of this thesis, including environmental planning, conceptual ideations of the role of planners and the rational comprehensive versus institutionalist approaches to planning. Section 3.4 details findings within the literature on renewable energy. The remaining sections of this chapter review the literature as it pertains to land use planning, and related topics including engagement, energy and buildings, density and mixed-use development. The chapter concludes with a conceptualization of the relationship between renewable energy and land use planning based on the literature. This conceptualization section helps identify how the literature review informed the thesis by aiding in the development of interview questions, themes and the two-pronged approach that was taken throughout this analysis (Figure 4).

3.1 Planning Theory

The evaluation of planning demands a standard of reference, an explanation, or model of the planning process and its subjects, participants, and context. In short, evaluation needs the underpinning of theory (Horowitz, 1978, as cited in Alexander 1984, p. 4).

3.1.1 A History of Environmental Planning

This section begins with a brief history, outlining environmental planning theory that supports the analysis within this thesis. The tragedy of the commons concept is then described and linked
to guiding definitions of sustainable development.

The following quote from Mannheim’s Ideology and Utopia describes the struggles of planning for an unknown future.

The only form in which the future presents itself to us is that of possibility, while the imperative, the “should,” tells us which of these possibilities we should choose. As regards knowledge, the future - insofar as we are not concerned with the purely rationalized part of it - presents itself as an impenetrable medium, an unyielding wall. And when our attempts to see through it are repulsed, we first become aware of the necessity of willfully choosing our course and, in close connection with it, the need for an imperative (a utopia) to drive us onward. Only when we know what are the interests and the imperatives involved are we in a position to inquire into the possibilities of the present situation, and thus to gain our first insight into history (Friedmann, 1987, p. 343)

For Mannheim, utopia was a vision of the future that could inspire people to act for the benefit of that vision in both their personal and collective lives. Throughout history, environmental planning theory has evolved in step with the gradual modernization of society. In the 19th and early 20th century, those involved in planning were largely focused on engineering and architecture, with emphasis on public access to green spaces free of pollution. This was exemplified by Ebenezer Howard’s focus on Garden Cities, where urban nodes were connected across sparsely populated landscapes, as well as le Corbusier’s modernist concept of towers in the park, where the personal automobile played an essential role in transportation (Healey, 2006).

In England, in the mid 20th century, the planning field saw the environment as a ‘store of resources’ that needed to be protected to support urban life with food, building materials, and
energy. The post-war period then saw the moral dimensions of environment sidelined for a focus on thresholds of degradation. This permitted a stronger fixation on economic growth. Thresholds were regarded as problems that constrained economic growth (Healey, 2006); a sentiment that has seemingly prevailed.

As time progressed, a shift from revering the aesthetic of green space (Howard and Le Corbusier) to recognizing that human society is built upon a vulnerable natural environment, slowly emerged. By the mid-1960s environmental degradation was beginning to command public attention with much recognition given to Rachel Carson’s iconic book *Silent Spring* (Carson, 1960) which depicted impacts on climate and hydrology from societal growth. In 1987, the concept of sustainable development was famously described within the Brundtland Report, *Our Common Future*, which stated: “Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present, without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987, p. 8; Healey, 2006, p. 176).

The Brundtland Report is thus recognized for explicitly linking social and economic practices with degrading environmental conditions; for recognizing the benefits of increased levels of affluence in developed nations resulting in costs to those in developing nations (Healey, 2006).

In Britain, an attitude that had strong influence on planners in the early 20th century regarded the British countryside as “an inheritance, to be shaped and tended in its distinctive social relations and landscapes, and handed on to future generations” (Newby, 1979, as cited in Healey, 2006, p. 165). Consequently, a concept of contemporary environmentalism, stressing “limits to material development and the moral dimensions of the way we live” (Beatley, 1994; Healey, 2006, p. 165) has been a part of western culture since at least the time of pre-industrial Britain (Healey, 2006).
By the late twentieth-century, environmentalism in western societies had a major impact on environmental politics and policy and has been supported by scientifically objective concepts which recognize that actions taken in one part of the world have consequences in other places. Further, people now recognize that these impacts “…undermine the conditions for life on this planet as a whole” and that consequently, there are both “moral limits to our rights to despoil our environment” as well as “material limits to our capacity to exploit our environment” (Healey, 2006, pp. 167-168). This aggregate self-interest, which can be both unwittingly and systematically destructive is well embodied by the concept Garrett Hardin described as the tragedy of the commons (Alexander, 1986). This term describes common grazing areas in medieval England whereby each household makes the rational decision to have more livestock grazing on finite land that is freely provided. This is done without regard to what their neighbours are doing on the same, shared land. With more cattle grazing on the land than it can support, overgrazing decreases the ability of this common grazing land to produce grass. With a degraded land area, the commons supports fewer cattle than it would if a basic rationing system were provided to prevent overgrazing (Hardin, 1968, as cited in Hardin, 1968).

The tragedy that plagues the finite, overgrazed land is brought on by the “…spillover effects of one individual’s or unit’s actions on others” (Alexander, 1986, p. 96). In modern economic terms, these spillover effects are referred to as externalities, of which, environmental pollution such as the emission of greenhouse gasses is considered a classic example (Alexander, 1986).

As these emissions continue to cause to global warming, the result is a degradation of the biosphere – a commons of sorts – due to excessive masses of GHG emissions. Thus, the biosphere is a commons with a specific carrying capacity for GHGs, that – when exceeded – decreases the level of biotic productivity. This illustrates the importance of reducing humanity’s GHG emissions, by shifting to 100% renewable energy. Moreover, any actions that result in the
reduction of GHG emissions, reduces the future impact on the global commons, that is our
biosphere.

3.1.2 Definitions of Sustainable Development

Williams and Millington (2004) navigate the diverse meanings of sustainable development. The ‘environmental paradox’ is the starting point of much of the literature regarding sustainable development. It recognizes that “…there is a mismatch between what is demanded of the Earth and what the Earth is capable of supplying (Cahill M. , 2001; Cahill & Fitzpatrick; Fitzpatrick & Cahill, 2002; Goodin, 1992; Williams & Millington, 2004, p. 100). Similarly, GHG emissions cause climate change and place undue pressure on the Earth’s systems that support life.

Williams and Millington further define the core tenets of both weak and strong approaches to sustainable development. A weak approach to sustainability includes a human-centred worldview, with an emphasis on growth-oriented approaches to economic development, little recognition of the need for a radical reduction in people’s demands on the Earth, and a “perpetuation of the view that nature is merely a collection of natural resources that can be subdued by the human race” (Williams & Millington, 2004, p. 101). Conversely, the view that link together theorists with a strong sustainability approach is the view of “the Earth as finite and their conceding that no habitable future is possible unless the demand-side of the equation radically alters by rethinking our attitude towards nature as well as our view of economic progress and ‘development’ ” (Williams & Millington, 2004, p. 102; Ekins & Max-Neef, 1992; Fodor, 1999; Henderson, 1999; Mander & Goldsmith, 1996; Robertson, 1998; Warburton, 1998).

Given these approaches to sustainable development, this paper takes an approach similar to the strong approach, with a particular focus on development that contributes to reducing GHG emissions of society by aiding in the transition to communities gradually being supplied with 100% renewable energy.
3.1.3 The Role of the Planner

Planning arises “with some sense of dissatisfaction with the status quo; if there were no problem, there would be no need for action” (Alexander, 1986, p. 44). Planning has both political and technical aspects (Friedmann, 1987, p. 34) that are often at odds with one another. However, since political practice on the part of planning professionals is more apt to deliver structural innovation, suppressing political practice makes a governing organization less resilient and adaptive to changes that occur external to the system itself (Friedmann, 1987, p. 35).

Further, beyond the binary of (a) political and (b) technical aspects of planning, Alexander (1986) defines a broader set of roles that planners can utilize (Table 6). When grappling with the challenge of drastically reducing GHG emissions, each of these roles can play an important part in aiding in the transition to 100% RE.

Table 6: The six roles of the planner, as described by Alexander (1986).

<table>
<thead>
<tr>
<th>PLANNER ROLES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical-Administrator</td>
<td>Traditional government planner: technical expert serving elected officials.</td>
</tr>
<tr>
<td>Mobilizer</td>
<td>Often needs to develop support for the implementation of plans. Planners in this role may need to recruit government agencies and the public for support.</td>
</tr>
<tr>
<td>Mediator</td>
<td>Planners in the mediator role merge technical expertise with political instincts and soft skills to find a path forwards among parties with conflicting interests. A key item to identify could be finding common concern to unify disparate parties to move in the same direction.</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>Planners in the entrepreneur role garner support for plans by bringing together the elements that are needed to make the plan work. This include admin approval, funding, political support, public support, etc.</td>
</tr>
<tr>
<td>Advocate and Guerrilla</td>
<td>This role includes lending support to special interest groups including neighbourhood residents, the poor, organizations, corporations.</td>
</tr>
</tbody>
</table>

Alexander (1986) describes planning as “an integral part of any deliberate societal activity; therefore, the rationale for planning is linked to social action. “Why plan?” is transformed into a
question about the times and conditions when society should undertake deliberate action” (p. 95). Climate change is a major societal problem that requires a drastic reduction in GHG emissions. As this becomes a larger issue, some planners have been recognizing this problem as one that they are able to have an impact on, by working to ensure that their communities develop in ways that require less energy. These roles are reviewed more thoroughly below.

Within the technical-administrative role, knowledge of various governmental processes is necessary, including urban design principles, as was highlighted by the work of Condon (2010), as well as land use planning processes relating to development. When updating by-laws and official plans, planners working for local governments are able to make informed decisions to adjust by-laws pertaining to land use in a way that reduces community-level GHG emissions.

It will also be important for planners working on GHG mitigation strategies to work as mobilizers, gaining support from members of the local community and government for the new and often unfamiliar approaches to achieving these goals (Alexander, 1986).

Planners may also find themselves in the role of the mediator, navigating a path forwards while considering the impact on those opposed (Alexander, 1986). An example of a successful engagement process in Strathcona County, Alberta where substantial opposition from County staff was mitigated was described in Chapter 3 (von Hausen, 2013).

In many ways, the role of the entrepreneur must also be utilized to bring together elements of a plan that will ensure its success (Alexander, 1986). This can include support from municipal administration, elected officials, and the public; the examining of funding opportunities that may be available from the upper tiers of government at the provincial or federal level; and perhaps most importantly, an understanding and ability to find ways to utilize many of the current and emerging strategies of reducing GHG emissions by utilizing energy efficiency, energy conservation and the deployment of renewable energy.
The role of the advocate may also be required for planners interested in moving forwards with plans to reduce GHG emissions through energy efficiency, energy conservation and the utilization of renewable energy (Alexander, 1986).

To overcome engrained thought patterns such as this, a planner would need to be a strong advocate for exceeding the status quo of planning practice, by choosing to give thorough consideration to the energy requirements of new developments. Thus, a significant barrier at the municipal level is an ability to make local decisions about energy, given that most municipalities have centralized energy systems imposed on them.

The discourse on planning theory within Chapter 3 extrapolated the tragedy of the commons concept to describe how the global biosphere’s health and ability to function is being compromised by human activities that release GHG emissions into the atmosphere and cause climate change. In order to avoid the calamities of climate change, a reduction in GHG emissions is necessary. By increasing the share of renewable energy within human systems, reductions are made possible. This is covered in Chapter 4.2. Further, by reducing the aggregate energy demand of society, less new renewable energy installations will be required, making the transition to 100% RE easier.

### 3.1.4 Rational Comprehensive and Institutionalist Models of Planning

#### 3.1.4.1 Rational Comprehensive Model

The rational model requires people to consider what should be accomplished while simultaneously reflecting on what they would like to accomplish. The steps of the rational comprehensive planning model are described in Table 7.
It requires careful consideration of differing approaches to reaching a specified goal or set of goals (Alexander, 1986). Healey (2006) emphasized 6 innovations of the rational model, as described in Table 8.

In discussing the rational method, Herbert Simon claimed that no process can be truly rational, including complete information while considering all possible options. He argued that instead, people tend to “satisfice: that is, they discover and consider options one at a time, using as an evaluation standard a flexible “aspiration level” rather than rigid, predetermined goals”

### Table 7: Steps of the Rational Comprehensive Planning Model. (Friedmann, 1987; Whitelaw, 2005)

<table>
<thead>
<tr>
<th>STEPS</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>Problem identification and articulation of objectives and goals.</td>
</tr>
<tr>
<td>2</td>
<td>Analysis of the environment and identification of relevant resources and constraints.</td>
</tr>
<tr>
<td>3</td>
<td>Alternative solutions, strategies, plans, programs, projects, courses of action.</td>
</tr>
<tr>
<td>4</td>
<td>Prediction of likely outcomes of these alternatives.</td>
</tr>
<tr>
<td>5</td>
<td>Evaluation of each based on the goal oriented criteria identified in step 1.</td>
</tr>
<tr>
<td>6</td>
<td>Selection of the preferred alternative based on the evaluation.</td>
</tr>
<tr>
<td>7</td>
<td>Implementation of the decision.</td>
</tr>
<tr>
<td>8</td>
<td>Monitoring and evaluation.</td>
</tr>
</tbody>
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### Table 8: Innovations of the Rational Method. (Healey, 2006, p. 252)

<table>
<thead>
<tr>
<th>INNOVATIONS OF THE RATIONAL METHOD</th>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Emphasizes the complex web of connections among the activities it seeks to influence</td>
</tr>
<tr>
<td>2</td>
<td>Specifies the form of the process for selecting strategic proposals</td>
</tr>
<tr>
<td>3</td>
<td>Emphasizes the effectiveness of the policy rather than efficiency of process (Webber, 1978)</td>
</tr>
<tr>
<td>4</td>
<td>A focus on the “value dimension” of defining a given problem and the careful choice of strategy, rather than letting the value remain hidden by assumptions</td>
</tr>
<tr>
<td>5</td>
<td>The systematic utilization of knowledge about situations, instead of “relying on unreflective anecdote, implicit intuitions and unstructured judgement</td>
</tr>
<tr>
<td>6</td>
<td>A clear and systematic method to assessing policy ideas</td>
</tr>
</tbody>
</table>

(Simon, 1957, as cited in Alexander, 1986, p. 20). He further suggests that this is logical and essentially practical, as it is not possible to sort through an endless set of all possible options. This flexibility that allows for a narrower subset of options is also beneficial, as a planner who realizes that the subset of possible options is too restrictive may pursue further research to
broaden the scope of options, to find a more optimal approach (Simon, 1957, as cited in Alexander, 1986).

In Alexander’s 1986 book, *Approaches to Planning*, it is suggested that the rational model, despite its inherent flaws has not yet been supplanted. The rational model of decision making is not perfect, but it also does not define the method by which decisions are made in practice, since “it cannot be applied operationally without materially relaxing the assumptions that give it its validity” (Alexander, 1986, p. 31). Thus, it’s value as the best course of action can easily be called into question (Alexander, 1986). Further, Healey explains, “[t]he rationalist planning process sought to develop a scientific technology for strategy-making in complex, interconnected, public policy contexts. It assumed that strategies could be derived from social goals by analytical routines based on empirical inquiry and deductive logic” (Healey, 2006, p. 249). This method, however, is not without flaws. Black (1990) uses the example of the transportation system in Chicago in the 1960s to illustrate the rational method’s inadequacy to anticipate future change:

The staff often talked about the future, but it was a future that extrapolated the past and maintained the status quo... [Although air pollution was causing trouble in Los Angeles], no one expected air pollution ever to be a problem in Chicago. No one anticipated such developments as the environmental movement or the energy crisis. Little attention was given to the transportation problems of the poor, minorities, the elderly, and the handicapped. (Black, 1990, p. 36).

Healey suggests that this failure of vision, as argued by Black (1990), was due to a method utilized by analysts that uses past trends to extrapolate predictive futures (Healey, 2006, p. 251; Black, 1990).
In critiquing the rational method, Webber (1978) argued that it represents a technocratic view, where knowledge is seen as a scientifically objective entity that can be discovered, without accounting for the reality that some knowledge can only be found within the conscious minds. This, he argued is why a method that integrates people into the planning process was needed (Healey, 2006).

In summation, the rational planning process includes technical teams working for elected politicians, who perform analytical and performative analyses which lead to conceptual tools to manage land. This process however, dismisses the knowledge from experience gained during team members’ day to day lives as irrelevant (Healey, 2006, p. 253).

3.1.4.2 Institutionalist Model

In breaking from the rational comprehensive model, the institutionalist model maintains a backbone of support for the notably more communicative process. Further, studies on municipal climate and energy policy show that a certain amount of government involvement can have a positive effect on local action, through providing funding and clear guidelines (Fenton P., Gustafsson, Ivner, & Palm, 2015; Baker & Eckerberg, 2007; Fleming & Webber, 2004; Neves & Leal, 2010; Nilsson & Mårtensson, 2003; St. Denis & Parker, 2009).

The institutionalist model builds on the rational comprehensive model, recognizing that people bring their own professional and socio-cultural concepts to certain tasks (Healey, 2006, p. 253). It is an approach to strategy making through inclusionary argument based on five propositions.

First, collaboration is a form of power-sharing in a multicultural society, where consensus-building is a task of building trust across populations with vastly different ideals (Healey, 2006, p. 263). Second, this approach emphasizes remaining cognizant of local knowledge as well as the scientific and technical knowledge of experts. Third, consensus regarding problems and policy
development requires more than collaborative dialogue; “...it has to be actively created across the fractures of the social relations of relevant stakeholders” (Healey, 2006, p. 264). This requires a thoughtful use of language, as the language embedded within power dynamics can easily serve to exclude or discriminate against stakeholders. Fourth, this approach builds institutional capacity, as this type of consensus-building requires reflective interaction between the local knowledge of participants and the development of knowledge via consensus-building. Fifth, this approach includes substantial struggle, as it aims to level the playing field, evening out the power of stakeholders who may take control of the process and those who generally would not (Healey, 2006, p. 265). This borrows heavily from Habermas (1984), who focused on the conditions required for a ‘conversation between equals’ while recognizing that this situation could not exist. This is partially because people are capable of understanding one another, however they interpret each other differently depending on how they perceive an issue of discussion. While listening, people continuously judge speakers based on whether the points that they present make sense (Healey, 2006, p. 266). Habermas suggests that speakers and listeners “…routinely use such criteria to judge their exchanges and to learn from them.

Therefore, they can be used to critique public dialogues, as a way of identifying and challenging the one-sided conversation and the power embodied in ‘thought’ systems” (Healey, 2006, p. 266; Habermas, 1984)

The rational comprehensive model depicts a plan that is both developed and carried out in clear parts. This is contrasted in more communicative models, which can have steps of the process occurring simultaneously or seemingly out of order which can give such models the appearance of being unstructured (Fenton P., Gustafsson, Ivner, & Palm, 2015; Innes & Booher, 2004).

Healey (1998) defines five strategies for achieving collaborative planning. These include (i)
integrative place making that removes barriers between policy fields, (ii) a collaborative approach to policy making that is inclusive of environmental, business, community and activist groups, (iii) an integrative approach to stakeholder engagement that leads to shared learning and consensus building, (iv) the utilization of local knowledge, and (v) building trust and appreciation among stakeholders to actively and respectfully engage with traditionally disparate partners.

The transition to 100% RE has the potential to result in changes to how residents and businesses use energy in Oxford County. Without carefully considering all of the issues that could arise from this transition, real challenges could arise for local citizens and businesses. For this reason, engaging with citizens and stakeholders from a broad cross-section of business and other interest groups will need to be undertaken to ensure that it is a just transition that doesn’t leave any community members behind.

### 3.2 Renewable Energy

This section begins with a short review of literature written on the topic of renewable energy from the perspectives of modelling and utilities. This is followed by a brief review of literature on topics of Community Energy Plans (CEP), communicative versus institutionalist approaches to renewable energy development, ending on approaches to renewable energy engagement.

#### 3.2.1 Modelling and Utility Planning

Literature on the topic of renewable energy proliferation exists in a relatively abundant volume, however, literature focusing on renewable energy expansion at the municipal level in Canada is rather limited. This subsection briefly reviews papers written on the topic of renewable energy, from technical reports on utility-level logistical planning, to modelling increases in renewable energy up to 100% of energy consumed. Though useful in helping
achieve 100% renewable energy goals, these papers are not included in this analysis because they either focus on a level of government intervention that is above that of the municipality, or they focus on interventions that should be made by utilities, and not municipal governments. A synopsis of these papers has been included to show that valuable research has been completed in this field, and to provide the reader with background into areas that have significant overlap with municipal-level energy. The following are examples of these papers.

In 1988, there were about 300 utilities operating in Ontario’s 444 municipalities. Through consolidation, there are about 70 electric utilities in Ontario (Informant 4, 2017). Since the vast majority of municipal governments in Ontario no longer have jurisdictional authority over the operation of utilities, this will not be a primary focus of this thesis.

Richardson and Harvey’s (2015) paper discusses load balancing at the utility level to achieve a lowest cost mix of renewable energy sources while maintaining load reliability at the grid level for the Province of Ontario. This study projects modelling for the retirement of an existing nuclear reactor, the electrification of all passenger vehicles, and the displacement of fossil fuel generation. Results suggest that system reliability is technically feasible and can be maintained without requiring excessive cost increases (Richardson & Harvey, 2015).

The paper Towards 100% renewable energy systems: Uncapping power system flexibility by Papaefthymiou and Dragoon (2016) provides near-, mid-, and long-term recommendations for utility sector interventions in support of a transition towards 100% renewable energy, utilizing variable renewable energy sources including wind and solar (Figure 1). This paper presents key elements and challenges that will be present in the transition to 100% renewable energy, and “…provides an overview of the policies, technical changes, and institutional systems necessary to enable this transition…” (Papaefthymiou & Dragoon, 2016). Since this paper provides a
utility-focused analysis, at the regional and national level, it lends little to the discussion of what municipal government actors can do to support these goals (Papaefthymiou & Dragoon, 2016).

Mathiesen, Lund and Karlsson (2011) developed a hypothetical renewable energy system for Denmark, with a 90% reduction in GHG emissions by 2050, and hour-by-hour energy system analysis. Findings showed that implementing plans for energy savings, renewable energy and more efficient energy conversion technology can result in positive socio-economic impacts, job creation and increased earnings on exports (Mathiesen, Lund, & Karlsson, 2011).

Lund and Mathiesen (2009) produced a paper based on a series of more than 40 seminars held by the Danish Association of Engineers to discuss the future energy system design for Denmark. This paper focuses on system design from a technical engineering perspective, for a national energy system composed of 50% renewable energy by 2030, and 100% renewable

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**Figure 1: Policies and institutional changes.** Overview of the needed policies and institutional changes along the path of the three development regimes: near-, mid- and long-term (Papaefthymiou & Dragoon, 2016).
energy by 2050. The 100% RE system is described as needing three changes: demand side management, increased energy efficiency and increased energy production (Lund & Mathiesen, 2009).

Steinke, Wolfrum and Hoffmann’s paper, Grid vs. Storage in a 100% renewable Europe (2013), provides modelling, quantifying how a 100%RE Europe would remain stable via excess supply of renewable energy generation, or ensuring sufficient energy storage is in place. It is noted that a system with an average of 100% renewable energy supply would require sufficient storage or dispatchable backup power for periods when demand exceeds supply (Steinke, Wolfrum, & Hoffmann, 2013).

Rahman et. al.’s (2016) paper assesses seven scenarios for establishing a 100% renewable energy system in a remote off-grid community in Canada, replacing a system that currently relies exclusively on diesel fuel. The scenarios considered include: (1) 100% renewable, (2) 80% renewable, (3) 65% renewable, (4) 50% renewable, (5) 35% renewable, (6) 21% renewable, and (7) 0% renewable. These options had respective energy costs of $1.48/kWh, $0.61/kWh, $0.53/kWh, $0.42/kWh, $0.39/kWh, $0.37/kWh and $0.36/kWh. The least expensive energy cost remained diesel only (Rahman, Khan, Ullah, Zhang, & Kumar, 2016).

Elliston, MacGill and Diesendorf’s (2014) paper compares 4 future scenarios for energy supplied to the Australian National Electricity Market. This includes (1) 100% renewable electricity in 2030, (2) using only gas-fired turbines, (3) using coal with carbon capture and storage, and (4) using gas with carbon capture and storage for only a portion of energy derived from gas. The modelling for this analysis revealed that “…only under a few, and seemingly unlikely, combinations of costs can any of the fossil fuel scenarios compete economically with 100% renewable electricity in a carbon constrained world” (Elliston, MacGill, & Diesendorf, 2014, p. 196).
These papers serve as strong references for utility-level logistical planning, and modelling for renewable energy increases towards 100%. However, since the findings of these papers cannot likely be utilized by most municipal governments, given that most municipal governments do not own and operate their own utilities, they have mostly been excluded from this analysis.

3.2.2 Community Energy Plans

Community Energy Plans (CEPs) are defined as documents that a community uses to define a community energy system. St. Denis and Parker (2009) specify that Community Energy Plans (CEP), Community Energy Management (CEM) and Local Action Plan for climate change (LAP) are essentially synonymous. Though CEPs have proven to be relevant municipal documents to aid in the reduction of GHG emissions and in some cases the increase of renewable energy development, they do not make up a large component of this thesis’ analysis.

Walker and Devine-Wright (2008) studied the policies and practices of community projects in the United Kingdom between 2004 and 2006. They started by developing a database of community projects and then proceeded to interview the policy makers and programme managers who set them up. From this database, six projects involving wind, solar, biomass and heat pumps were selected as case studies for further examination. This methodology lead Walker and Devine-Wright to recognize a recurring theme of discussion and analysis: that defining what community renewables does and should mean was a persistently difficult task (Walker & Devine-Wright, 2008). A focus within their line of enquiry was placed on both process and outcome, as they relate to the views of policy makers, administrators, activists, project participants and local residents. This is illustrated in Figure 2, below (Walker & Devine-Wright, 2008). The ‘process’ dimension, is “concerned with who a project is developed and run by, who is involved and has influence” (Walker & Devine-Wright, 2008, p. 498). The ‘outcome’ dimension
concerns “who the project is for; who it is that benefits particularly in economic or social terms” (Walker & Devine-Wright, 2008, p. 498).

As Figure 2 shows, a utility wind farm would be in the bottom, left quadrant, where a project is developed with little involvement from local community members, which produces electricity for the grid rather than the local community and delivers benefits to shareholders rather than community members near the wind farm. They suggest that an ideal scenario would be in the top, right corner of this chart (Walker & Devine-Wright, 2008).

Based on interviews with a variety of actors who voiced opinions as to how ‘community renewables’ ought to be defined, Walker and Devine-Wright (2008) developed the following three interpretations. Viewpoint (A) includes a focus on process, and is highly inclusive of community members throughout the planning and development processes as well as running the project. Interviewees with backgrounds in alternative technology and community development endorsed this viewpoint (Walker & Devine-Wright, 2008). Viewpoint (B) places

Figure 2: Community renewable energy project process and outcome dimensions. (Walker & Devine-Wright, 2008)
emphasis on beneficial outcomes of the project, such as local jobs, local regeneration or providing local educational opportunities. The primary concern for people holding this viewpoint is that the local community benefits from the project (Walker & Devine-Wright, 2008).

Viewpoint (C) more broadly represents community projects. People who held viewpoint (C) allowed for a broader interpretation of community. “Here people tended to be less concerned with whether or not a proposed project ticked the right ‘community’ boxes, but that it was actually going ahead and would lead to something productive and useful happening. Many different possible combinations of process and outcome are therefore deemed acceptable” (Walker & Devine-Wright, 2008). As Walker and Devine-Wright (2008) explain “[t]he diversity of meanings...explains why the meaning of community renewables has become, at times, an object of contestation.”

Jaccard, Failing and Berry (1997) describe community energy management (CEM) as including (i) land use planning, (ii) transportation management, (iii) site design, (iv) local energy supply and delivery planning. They explain that “…traditional energy management focuses on energy using equipment and buildings, [while] CEM also considers the urban land use and infrastructure level” (Jaccard, Failing, & Berry, 1997, p. 1065). This is an especially relevant difference considering the level of efficiency of the design of infrastructure and land use patterns “…can significantly affect the energy throughput - and associated wastes - of our economic system, both by influencing the demand for energy services and by supporting new technologies for delivering those services” (Owens, 1986, as cited in Jaccard, Failing and Berry, 1997, p. 1065).

This concept is supported by the following three trends. First, energy analysts are recognizing the important role of infrastructure and land use patterns as determinants of energy consumption, including density and mixed use development, among others. Second, energy use in settled areas is gaining recognition for impacts on the environment, including climate change.
Third, there is an increasing cost-effectiveness of small-scale decentralized co-generation of heat and electricity, especially where heat requirements are concentrated. As such, CEM supports “neo-traditional urban design and the concept of complete communities” (Jaccard, Failing, & Berry, 1997, p. 1066).

In this context, Jaccard, Failing and Berry (1997) recommend implementation at the municipal or regional level to include certain requirements. One recommendation is to “[e]stablish regional standards for new development (e.g. site, building, street and lot design, efficiency standards, etc.) and development cost charges (e.g. sliding charges levied against developers at the time of construction) to encourage preferred densities, use mixes, energy efficient construction, on-site generation, etc.” They further recommend “…developing special zoning standards in consideration of energy objectives (eg. District heating/cogeneration zones with special standards for density, diversity, growth rate, infrastructure connections, etc.)” (p. 1071). Finally, they recommend including energy utility representatives as stakeholders within negotiations with developers as well as including them as strategic partners in planning processes (Jaccard, Failing, & Berry, 1997).

3.2.3 Municipal Energy Strategies: The Rational Comprehensive Model versus Institutionalist Model

Fenton et al.’s article Sustainable Energy and Climate Strategies: lessons from planning processes in five municipalities (2015) examines the ways in which 5 Swedish municipalities have approached the development of climate and energy strategies between rational or communicative approaches and investigates the impacts that these approaches had on the resulting processes. Municipalities in Sweden have been required to develop energy plans since 1977 (Fenton, Gustafsson, Ivner, & Palm, 2015; Palm, 2006). Traditionally, Swedish
municipalities have taken a rational approach but have shifted to more communicative models (Fenton P., Gustafsson, Ivner, & Palm, 2015; Albrechts, 2004; Frederiksson, 2011; Healey, 2009).

Studies on municipal climate and energy policy show that some action on the part of local government can have a positive effect on local action, such as providing funding and clear guidelines (Fenton P., Gustafsson, Ivner, & Palm, 2015; Baker & Eckerberg, 2007; Fleming & Webber, 2004; Neves & Leal, 2010; Nilsson & Mårtensson, 2003; St. Denis & Parker, 2009). Fenton et al. (2015) reveal key items that seem to impact how municipalities implement sustainable energy policy. They include:

A clear, shared vision and engaged politicians; the size and organizational structure of the municipality and its willingness and capability to act; the organization of the process and extent to which stakeholders have been involved; the need for clarity about financial aspects, such as planned financing and implementation; and the need for greater clarity concerning selection of targets and their relevance to global climate and energy trends (Fenton P., Gustafsson, Ivner, & Palm, 2015, p. 213).

Fenton et al. (2015) also found that rational comprehensive and communicative approaches may be affected by various and often different contextual factors such as budget constraints or a process that is imposed by external actors. The following quote illustrates this.

...[The] study showed that the choice of a rational approach to strategic planning may be influenced by contextual factors (limited or uncertain budget, process imposed by external actors, etc) but is likely to result in establishment of a smaller project organization, limited involvement of other stakeholders, and deliver outputs with a narrow scope. This in turn may impact on the ambition level of strategies, in terms of scope, targets and
also the likelihood of their implementation. There is a risk that such processes neglect or fail to take advantage of potential synergies, burden-sharing or other potentials. In contrast, the choice of a communicative approach may be influenced by other contextual factors, e.g. tradition or political commitment. Choice of communicative approaches is likely to result in a process characterized by early involvement of stakeholders (notably politicians, managers/executives and citizens), without preconditions; from this emerges a process and a larger project organization, with continuing high levels of stakeholder participation and a wide scope and remit. Municipalities adopting communicative approaches suggested that the approach brings significant added value in terms of engagement, legitimacy, partnerships, etc; however, in certain contexts, the approach may also emphasize problems or undermine these benefits, if for example conflicts between stakeholders are left unresolved (Fenton, Gustafsson, Ivner, & Palm, 2015, p. 220).

Fenton et al.’s article, *Stakeholder participation in municipal energy and climate planning – experiences from Sweden* (2016) provides a balanced view of engagement, and is also based on a review of experiences in 5 Swedish municipalities. There is a “...perceived overemphasis on consensus-building [that has] led to criticism of the participation norm” (p. 273). It has also been observed that increased levels of participation are often endorsed in theory, but unwelcome in practice due to potential disagreements over conflicts of interest, power struggles, or divisions by elected officials or staff (Fenton et al. 2016; Pacione, 2014). However, they also recognize that stakeholder participation can serve multiple goals: to define a diversity of opinions, or to work towards building consensus. Further, increased engagement can serve to increase knowledge transfer and cooperation between actors, and increasing commitment from the populous in the long term (Fenton P. , Gustafsson, Ivner, & Palm, 2016; Cuthill & Fien, 2005).
This article brings to light the conflicts that may arise between municipalities and stakeholders; notably, stakeholders from municipally-owned utilities. The experience of some seems to be of a siloing between municipal and utility employees, the former of whom face the challenge of being unable to effectively communicate in terms that are practically applicable to workers at the utility. In one instance, an interviewee from the municipally-owned utility called the facilitators ‘nerds’ and gave a scathing review stating that he received “no help to understand the strategy or its consequences for the company” (Fenton P., Gustafsson, Ivner, & Palm, 2016, p. 281). Staff from this municipally owned utility resented the interference by the municipality in what it considered to be “its” operations (Fenton P., Gustafsson, Ivner, & Palm, 2016, p. 281).

In another municipality that was examined, “the interviewee from the privately-owned energy company said that they had little dialogue with the municipality on most issues and that the municipality’s organizational structure was flawed, with no obvious groups or experts to discuss energy issues with” (Fenton P., Gustafsson, Ivner, & Palm, 2016, p. 281).

The 2009 paper *Community energy planning in Canada: The role of renewable energy* by St. Denis and Parker provides a detailed overview of 10 of Canada’s first communities to undertake community energy plans (2009). At this time, community energy plans were an emerging phenomenon in Canada. This analysis revealed that out of the three ways that a community can improve its energy system to reduce GHG emissions: energy efficiency, energy conservation and increasing renewable energy; the two most commonly focused on were energy efficiency and energy conservation (St. Denis & Parker, 2009). Renewable energy was being integrated into these plans in two principle ways. First, education and awareness for public acceptance were practiced. Second, municipal governments lead by example, by reducing GHG emissions in their vehicle fleets, by adding renewable energy into the energy mix for government-owned
buildings, and by purchasing renewable energy for their community with bulk purchases (St. Denis & Parker, 2009).

A common practice taken by communities that undertake CEPs is hiring outside consultants to aid in the development of CEPs. This served to bridge gaps in internal capacity and added the expertise and foundational technical knowledge needed to develop a starting point (St. Denis & Parker, 2009).

### 3.2.4 Renewable Energy Engagement

Within this paper, there is a focus on engagement rather than consultation. This is because engagement implies a higher level of involvement, where participant’s statements and values have the potential of being integrated into a given framework. Conversely, consultation is often considered a practice that does not imply accommodation to requests or integration of participant’s values. Often, it also represents the minimum requirements of involving stakeholders or community members into a framework and is associated with tokenism.

Engagement is also critical for grid-level renewable energy implementation. The 2016 article by Fast et al., *Lessons learned from Ontario wind energy disputes* provides a detailed history and analysis of the rapid rise of wind energy development dating back to 2009 and the conflicts that arose over the seven years that followed. Like those in other places, communities in Ontario have voiced intense concern over industrial wind development (Fast, et al., 2016).

In 2009, the Feed-In Tariff (FIT) scheme was started in Ontario. In order to reduce barriers to development, the province introduced a consolidated approach, that standardized noise regulations, setbacks for turbines, and consultation requirements. Further, “[t]he Planning Act, which guides municipal land-use planning in the province, was amended so that municipalities no longer had direct control over land-use decisions” (Fast, et al., 2016, p. 1). This effectively
removed municipal governments and their employees from being involved in the process, including community engagement.

Disputes regarding wind development were intense, with many communities protesting wind energy development. After the 2011 provincial election, the governing Liberal party maintained its position as ruling party, but lost most of its seats in rural ridings. Shortly thereafter, a new policy was introduced, which gave priority to wind energy proposals from companies that could demonstrate that they had support from municipal councils. This tactic backfired, with approximately one quarter of the province’s municipalities passing resolutions as unwilling host of wind energy. This resulted in the planned changes never being implemented. Then in 2013, with continued criticism, the FIT programme for wind was cancelled. Two years later, the provincial government offered contracts in a competitive bidding system, awarding companies contracts that could garner both support from local governments and signed support from 75% of landowners abutting turbine sites (Fast, et al., 2016).

The pay structure in Ontario for wind energy saw direct compensation paid only to those who owned land hosting wind turbines, despite the visual impacts that neighbouring properties endured. Academic literature recommends equitable distribution of financial benefits to increase acceptance and address justice issues (Fast, et al., 2016). In polarized communities in Ontario, this funding can be seen as a bribe if offered before construction, or as an admission of wrongdoing if paid after construction is completed (Fast & Mabee, 2015; Cass, Walker, & Devine-Wright, 2010).

Fast et al. (2016) explain:

Policy tools such as restricting ownership of wind projects to local citizens, as was done historically in Denmark, or mandates to procure wind-generated electricity with a 50% municipal
government ownership stake (Quebec), have a better chance of incentivizing stronger forms of community based energy development than the price premium and priority grid access mechanisms pursued by Ontario (p. 3).

To improve the strained procurement process in Ontario, Fast et al (2016) suggest four changes to improve the distribution of financial benefits. First, increase transparency for current compensation agreements by publishing average payments to land owners for wind projects, thus reducing gossip. Second, offer compensation to owners of neighbouring properties early-on in the process. Third, early discussions should be held to decide how much funding will go to (a) neighbours and (b) other community interests. Finally, the province should experiment with a wide range of community ownership models beyond cooperatives, involving first nations, municipal governments and/or non-profits.

Further, setting minimum engagement requirements of two local public meetings has often been treated as a maximum requirement by developers. A better approach would be requiring that the outcomes of the plan change depending on comments received during the community consultation (Fast, et al., 2016, p. 3).

Issues of impacts to health have also been of concern for residents living near wind turbines. Many have claimed to develop negative health impacts due to the wind turbines, the validity of which has been discussed at length by Fast et al. (2016). This paper does not take a stance on the validity of these claims, however “It has been speculated that the top-down process used to develop wind turbines in Ontario can lead to annoyances and a number of health outcomes by making residents feel as though they are being manipulated or ignored” (Fast, et al., 2016, p. 3; Bowdler, 2012; Chistidis & Law, 2012). The research team further argue that rather than dismissing claims of ill health, policy makers should take care to address the factors that frustrate host communities.
Many communities are opposed to wind energy development, with residents feeling that they have been ignored by the province. However, some support for wind energy remains. Fast et al. (2015) interviewed residents in areas of Ontario impacted by wind energy development, and several participants felt that the benefits of wind energy outweigh any concerns over the appearance of the turbines. One wind turbine lease-holder stated:

If a distant neighbour doesn't like the look of turbines too bad. They didn’t buy the vista, they didn’t buy the view. They don’t own the view.... We have to leave a heritage for our grandkids and our heritage can’t be to stick a finger in the eye of renewable energies just because you don't like the looks of turbines (Fast, Mabee, & Blair, 2015, p. 186).

Fast et al. (2015) continues:

This opinion both invokes and ignores a complex mixture of public interest arguments. An imperative to transition away from fossil fuels for a greater public good overrides any argument that the landscape is a commonly held asset that requires public decision making. This participant and others also demonstrate a mechanism observed by Soini et al. (2014), that perceptions of turbines and other new technology are governed by what the perceiver sees as being offered or afforded by the new landscape element. For the SP04 individual, turbines afford a legacy of support for renewable energy that has multi-generational benefits (Fast, Mabee, & Blair, 2015, p. 186).

In the article, *From private lives to collective action: Recruitment and participation incentives for a community energy program*, Hoffman and High-Pippert (2010) describe a number of case studies of community energy initiatives focused on reducing GHG emissions, based on bottom-up approaches seeking to maximize the capacity of active and engaged citizens. They found that
“better in the long term would be policies that discriminate in favor of local ownership and maximize development that benefits communities” (Hoffman & High-Pippert, 2010, p. 7568; Farrell & Morris, 2008). They further argue that “If participation in community energy initiatives is to involve something more than “citizen as economic actor”, a reasonable and realistic notion of engagement must be secured” (Hoffman & High-Pippert, 2010, p. 7572).

3.3 Land Use Planning

The following subsections within Chapter 3.3 discuss key land use planning-related categories that can be adjusted to reduce GHG emissions from settlements. They are density (Chapter 3.3.1), mixed-use (Chapter 3.3.2) and engagement (Chapter 3.3.3).

3.3.1 Density

Density is the most important factor influencing the people in a neighbourhood’s propensity to drive or use transit (Condon, 2010, p. 74). In a typical suburban subdivision, there are 4 dwellings per acre. However, 10 dwellings per acre is considered the density where it is economically feasible to utilize buses at short headways, while enabling trams and streetcars to be economically feasible requires 20 dwellings per acre (Condon, 2010). This has substantial ramifications, as Condon explains:

Low-density sprawl costs much more per dwelling unit to service than does higher density development. A subdivision of single-family and duplex units on 2,800- to 3,300-square-foot lots can be serviced for 75% less per dwelling unit than can single-family homes on larger lots of 8,000 to 9,000 square feet. ... At lower densities, the cost of providing required streets and services can be over $100,000 per dwelling unit (Condon, 2010, p. 4).
Vancouver has been recognized for successfully increasing housing density by building higher density low rises that fit well within lower density neighbourhoods and by converting existing single dwelling parcels into multiple dwelling parcels (Condon, 2010, p. 102). Further, it is possible to effectively double the population density of single-family neighbourhoods by permitting auxiliary dwelling units on lots with single detached dwellings. This further results in reduced energy consumption per capita by preserving the energy embodied in the material of the original structure because the population density increases without replacing existing structures (Hurd & Hurd, 2012). The benefits of increasing population density via auxiliary suites increases the mix of age and income demographics, neighbourhood permanence and social cohesion. Hurd further explains, “[a]ll of these things in turn have been correlated with increased investment in the neighbourhood, decreased violence and petty crime, increases in social capital, and decreases in the incidence of depression among residents (Jacobs, 1961; Hurd & Hurd, 2012). Thus, beyond reducing aggregate GHG emissions within a settlement, increasing population density comes with many co-benefits.

Low density suburbs are regarded as good and affordable places to raise a family. However, these neighbourhoods can only be sustained by ever increasing government financing for highways, personal financing paid at the gas tank and increasing mass of GHG emissions (Condon, 2010). Low density development patterns are also challenging to fix, as the unsustainable development patterns that created them tend to create reinforcing loops. Figure 3 shows how unsustainable patterns can become engrained. Dispersed settlements lead to
Figure 3: Reinforcing Loops. Example of two reinforcing system loops for dispersed settlement patterns (Hurd & Hurd, 2012, p. 5).

reduced transit quality and an increased need for private vehicle ownership and road construction, which all reinforce dispersed settlements (Hurd & Hurd, 2012).

Single family homes can be a part of sustainable community design if they are located on small lots, as were very common in traditional streetcar cities. The secret, Condon purports, is the 3,000 to 4,000-square-foot lot. With a lot frontage of 33 feet and a depth of 110 feet, there would be about 32 lots per block, making the gross density about 6-7 parcels per acre. This lot size allows the single-family home to be viable in a sustainable design scheme, especially if secondary suites and duplexes are common, as is the case in Vancouver, BC (Condon, 2010, p. 51). With sewers, roads, water and electricity already in place, suburbs are an excellent place to redevelop for higher density (von Hausen, 2013).

3.3.2 Mixed Use

Population density can be effectively increased by enabling infill development. In neighbourhoods dominated by single detached dwellings, infill development provides many of
the same benefits as permitting auxiliary suites, by reducing the need for new roads and the requirement for expanded utilities. Cities can permit infill development without demolishing buildings or negatively impacting the character of an area (Hurd & Hurd, 2012). Moreover, strip commercial areas along arterial corridors in suburban areas are one of the easiest places to promote infill development. These areas are often reaching the end of their useful life, making them ideal locations to infill and create complete communities (Condon, 2010). Condon explains:

> Infilling presently underutilized arterials for mixed-use transit streets and housing for [the elderly] seems the only possible way to capitalize on our previous investments, meet our housing needs, and retrofit our suburbs for low GHG production. By adding density to these formerly commercial locations, the level of land use activity can as much as double, adding customers to local services, workers for new jobs, and riders for transit (Condon, 2010, p. 63).

The market for homes in walkable areas with good transit access have been substantially stronger from 2000 to 2010 than at any point since the 1940s (Condon, 2010, p. 64; Leinberger, 2008; Dunham-Jones & Williamson, 2008).

Though there are many people who support the theory of compact cities, some argue that compactness will have little impact on commute times if people have to travel from one city to another (Healey, 2006, p. 91). Employment is one reason why the mix of land uses is such a critical part a neighbourhood’s makeup. In the post-war era, uses were segregated to protect residents from the noise, smoke and smell of industrial areas (Healey, 2006, p. 189). However, people visit multiple land use areas each day and mixing land uses within buildings and neighbourhoods enables people to meet their daily needs in smaller geographical areas. One
approach to increasing the mix of uses has been to require mixed-use zoning with retail at street level for all buildings in neighbourhoods over a certain density. Though, a potentially better approach is to allow for residential, commercial or office use on most blocks with none being specifically prescribed, enabling a more efficient market response to development (Hurd & Hurd, 2012, p. 89).

### 3.3.3 Land Use Planning Engagement

Engagement has become an integral part of the planning process. Further, processes involving multi-stakeholder participation have become a key part of sustainably solving issues within communities (Bunting, Filion, & Walker, 2010, p. 252). Thomas Kvan explains that “…urban strategies are not simply choices about technical and physical alternatives - cars versus pedestrians; urban agriculture versus paved surfaces. The choices are about the values of the citizens and systems to support those values” (Kvan, 2014, p. 84). Further, many approaches to engagement exist: meetings, hearings, citizen boards, advisory councils, task forces, charrettes, games, simulations, etc. (Kweit & Kweit, 1981 as cited in Alexander, 1986, p. 105; Fagence, 1977).

Alexander (1986) defines public participation as:

...the involvement in the planning process of all the individuals, groups, interests, organizations, and communities who might be affected by its outcomes. This is more than indirect participation through representative elected officials, or appointed administrators who are assigned to a liaison role to find out and communicate the relevant parties’ needs and goals. It means direct interaction, in the context of developing, reviewing, and adopting plans and proposals, between the planners and responsible officials, and the affected parties themselves (p. 105).
A noted benefit of increasing public participation is that it can increase a community’s trust in government. However, opposition to this view exists, where people see engagement as tokenism when communities want a real voice in decision making (Alexander, 1986, p. 105; Arnstein, 1969; Glass, 1979). Further, increased public participation has shown little impact on changing the attitudes of citizens, and at times leads to inefficient policymaking and more conflict (Kweit and Kweit, 1981; Checkoway & Van Til, 1978, as cited in Alexander, 1986, p. 106).

Engagement is critical for land use planning when developing both sustainable communities, as well as establishing renewable energy. With regards to the requirements for a city to transform from its current states to a sustainable, resilient future, Rochecouste and Pearson (2014) explain that: “[t]he core ingredients are people and place. If you start with technology, all you get is technology; if you start with design, all you get is design; but if you start with people and place and with where we are now, then you can deliver real change to real people in their lives” (Rochecouste & Pearson, 2014, p. 44).

Von Hausen (2013) described how a successful design charrette in Strathcona County, Alberta, illustrates the potential value of engagement for developing sustainable communities. Initially, there were vocal opponents to the proposal. Those leading the engagement then worked with those engaged in the process to define the potential benefits and conflicts with the proposed development concept. The community voiced concerns regarding increased traffic and noise, decreased property values, and minimum lot sizes. The resultant plan proposed to reestablish woodlots and natural landscapes, provide nine varieties of houses to address local needs to age in place and other units to accommodate young, single people. Careful design features allowed for sufficient privacy as well as 50% of the site to remain as open space that served the dual purpose of flood retention. This plan resulted in 181 dwellings on 100 acres, a density that would easily support public transit in the form of busses (Condon, 2010). The final plan found
support from Strathcona County Staff, and residents that were previously opposed to the plan (von Hausen, 2013).

3.4 Energy and Buildings

In North America, 40% of material consumption and one third of energy use is attributed to buildings and infrastructure (Bunting, Filion, & Walker, 2010). By contrast, Germany has thousands of buildings constructed to the passive house standard including homes, commercial and public buildings, which only require 5 to 10% of the energy for heating and cooling as conventional construction (Heinberg & Fridley, 2016, p. 105). In fact, in Solarsiedlung, Vauban, Germany, the district features highly efficient buildings with enough rooftop solar to produce a surplus of energy that is sold back to the grid (Heinberg & Fridley, 2016, p. 152).

One approach to reducing GHGs in settlements is to build smaller. Hurd and Hurd (2012) explain:

Smaller spaces have less embodied carbon because they use fewer materials; they also have lower operational costs. Compact neighbourhoods create access with fewer mobility challenges: you can get where you need to go without supplementing your human power with other forms of energy (p. 53).

Between 1970 and 2004, the average size of a single family detached dwelling in the USA increased from 1500 square feet to 2300 square feet. Residential energy use per capita remained stable in this time frame, as gains in efficiency were offset by larger homes with more space to heat and more room for appliances such as second refrigerators (Hurd & Hurd, 2012, p. 53).

Toronto’s Better Building Partnership is an example of a municipal government funded program that was designed to decrease GHG emissions and improve urban air quality at a time
when smog was becoming a problem. “The program, launched in 1996, provides comprehensive energy retrofits to private and public buildings through lending schemes that allow building owners to pay back retrofit costs through efficiency gains” (Bunting, Filion, & Walker, 2010, p. 255). These retrofits include upgrades to lighting, heating, cooling, and adding renewable energy. In the first 11 years, municipal financing has allowed 600 buildings to be retrofitted, reducing 200,500 tonnes of CO2/year, and 19 million dollars in savings for business owners (Bunting, Filion, & Walker, 2010).

Operating buildings wastes a lot of energy and emits significant quantities of GHGs. Even many of the buildings that have been certified as eco-friendly can waste large amounts of energy due to trade-offs that are allowed within the certification schemes (Birkeland, 2014, p. 147; Safamanesh & Byrd, 2012). However, approaches that have a narrower focus on energy use may rectify this stated issue with certification schemes.

A Net Zero Energy (NZE) house drastically reduces energy consumption by using highly efficient lights, appliances, and water heaters. They also employ highly efficient building envelopes, with excellent insulation, to reduce the energy requirements for space heating and cooling, while on-site solar or geothermal energy are used for electricity and heat. As such, a NZE building produces as much heat and electricity as it requires. A Net Zero Ready (NZR) building features the aforementioned building envelope and infrastructure that would enable the building to be NZE after a renewable energy system is added (Brostrom & Howell, 2008).

A noted downside to developing energy efficiency in buildings is that only around 2% of the building stock is new each year. However, this is a poor reason to ignore building efficiency, as renovations for energy efficiency alone can be cheaper than not acting, while reducing pollution, waste and carbon emissions (Miller & Birkeland, 2009; Birkeland J. L., 2000 as cited in Birkeland J. , 2014, p. 149).
This is further explained by Girardet (2015):

Being conscious about energy consumption when buildings are erected or renovated is a good investment - for the climate and also for the economy. No less important is the improved quality of life that results from energy efficient buildings. There is huge money to be made in optimization of buildings, recovering investments relatively quickly (Girardet, 2015, p. 142).

These concepts will be explored in the chapters that follow. Mohareb and Kennedy (2014) examined emissions from light duty passenger vehicles, residential buildings and commercial/institutional buildings in the Greater Toronto Area. They analyzed a high, low and business-as-usual case for estimating future adoption of low GHG-emitting technologies, and found “...that even aggressive scenarios are not sufficient to achieve an 80% reduction in GHG emissions by 2050” (Mohareb & Kennedy, 2014, p. 685). With regards to reducing emissions from buildings, it was found that reducing GHG emissions would require moving forwards on two principle strategies: retrofitting existing buildings, and improvements to the building energy code towards net zero and/or passive house standards (Mohareb & Kennedy, 2014).

In the opening paragraph of this chapter, three methods were explained as being instrumental in improving the energy system of a community including switching to renewable energy sources, increasing energy efficiency and increasing energy conservation. With regards to achieving 100% Renewable Energy, all three of these tactics are critical. Further, each of the subsections within this chapter list approaches that integrate at least one of these methods.

The merits of these three approaches as well as illustrations as to how they have been implemented in a real-world context will be explained in Chapters 4 and 5.
3.5 Renewable Energy and Land Use Planning Conceptual Framework

Much of the literature cited herein aided in the development of interview questions, themes and the two-pronged approach that was taken throughout the analysis. The initial development of this thesis was entirely focused on renewable energy expansion. However, the iterative approach that embodies the constant comparative method enabled the scope to be broadened as each informant explained their experiences working on a wide variety of GHG-reduction initiatives. It was through this process of interviewing and returning to the literature, that land use planning, as a means to reducing energy use, became a defining part of the analysis.

The literature review was instrumental in the development of the conceptual framework for this thesis. Silverman & Patterson (2015), was the most informative reference used in the general development of the semi-structured interview questions (Appendix 03). Jaccard, Failing and Berry (1997) included land use planning as a component of community energy management, while Condon (2010) gave insight into approaches to planning sustainable communities. These two publications helped establish a ‘land use’ lens within the list of questions. The value placed on community and stakeholder engagement was most influenced by Von Hausen (2013), Healey (2006), Fast et al. (2016), and Walker & Devine-Wright (2008).

One of the most essential articles used was by St. Denis & Parker (2009), who provided a detailed overview of 10 of Canada’s first communities to undertake community energy plans. They argue that there are three main approaches that can be taken by communities to improve their energy systems including switching to renewable energy systems, increasing energy efficiency and increasing energy conservation (p. 2089). Energy efficiency “…refers to how well the supply side performs in ensuring little waste of energy in generation and delivery, as well as, the demand side of energy management’s ability to perform desired services with less energy input” (St. Denis & Parker, 2009, p. 2089). Further, energy conservation is defined as “any
measure made to reduce the amount of high quality energy that is demanded to provide goods and services (St. Denis & Parker, 2009, p. 2089; Aubrecht, 1995). This thesis also focuses on these approaches. However, a notable difference that has emerged in the ten years since St. Denis and Parker published, is a slow recognition, that land use planning plays a key role in reaching these goals, simply because settlements that are designed to have lower energy requirements will require less energy overall, making the transition to 100% RE require fewer new renewable energy inputs (Boston, Barrs, Pol, & Hendrickson, 2017).

The work of St. Denis & Parker (2009) helped clarify how community energy plans were undertaken in the recent past, and helped define the two-pronged approach (as was explained at the start of Chapter 3). Figure 4 depicts the value of including land use in 100% RE Plans.
Figure 4: Conceptual framework model. A conceptual framework model showing two paths towards reaching 100% RE at the municipal level. The goal will be achieved sooner if land use planning tools are integrated into the plan. Time location “A” represents a current date, when a hypothetical 100% RE Plan is initially being developed. Time location “B” represents a future date, aligned with achieving 100% RE while using land use planning tools as part of the plan. Time location “C” represents a future date, aligned with achieving 100% RE while using the same plan as was used for time location “B” but without utilizing land use planning tools.
Chapter 4

Results and Discussion – Renewable Energy

This section provides results and a discussion of research, on topics impacting renewable energy development. Section 4.1 discusses relevant policy. Section 4.2 examines energy mapping, while taking a closer look at the City of Woodstock’s Community Energy Plan and the projections for energy consumption laid out in Oxford County’s 100% RE Plan. Section 4.3 discusses challenges faced working with utilities. Finally, Section 4.4 covers engagement as it relates to expanding renewable energy.

The themes that emerged during the data analysis phase of research are discussed throughout this Chapter, and are listed in Table 9 (below).

Table 9: Emergent research themes, by Section within Chapter 4. Themes that emerged from the data analysis stage of research.

<table>
<thead>
<tr>
<th>#</th>
<th>THEME</th>
<th>SECTION</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Achieving 100% RE requires carefully thought out land use planning</td>
<td>4.2</td>
</tr>
<tr>
<td>2</td>
<td>Integrating municipal staff is more important having an innovative plan</td>
<td>4.3</td>
</tr>
<tr>
<td>3</td>
<td>Sincere and well thought-out engagement is critical to a successful plan</td>
<td>4.4</td>
</tr>
<tr>
<td>4</td>
<td>Tiering: consistent and high levels of financial and policy support from provincial and federal governments are essential for accelerating progress towards 100% RE goals</td>
<td>4.2, 4.3</td>
</tr>
<tr>
<td>5</td>
<td>The local level is the most important places for action to occur</td>
<td>4.1</td>
</tr>
<tr>
<td>6</td>
<td>Community-owned and -supported renewable energy projects are much more successful than those dominated by major industrial players</td>
<td>4.4</td>
</tr>
<tr>
<td>7</td>
<td>100% renewable energy plans should not be a financial burden on the public</td>
<td>4.4</td>
</tr>
<tr>
<td>8</td>
<td>Building energy needs should be reduced in both new and existing buildings</td>
<td></td>
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<tr>
<td>9</td>
<td>Increasing energy conservation and energy efficiency are key concepts to support demand side management</td>
<td>4.2</td>
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4.1 Renewable Energy Policy

Within Oxford County’s Official Plan, Section 2.1.4 Economic Competitiveness - states:
Opportunities for increased energy supply to accommodate current and projected needs will be provided, including the use of alternative and/or renewable energy systems, where feasible and appropriate. The potential negative impacts from a changing climate on the built and natural environment and the local economy, and the potential measures to mitigate such impacts, will be considered, where feasible. (Oxford County, 2017)

It is beneficial that Oxford’s OP mentions climate change and the importance of mitigating its impacts by utilizing renewable energy, however beyond stating that “opportunities...will be provided...” the content of this passage is vague, and could be strengthened considerably. Examples of improved policy language from the Town of Ajax OP and the City of Victoria’s OCP follow.

The Official Plan for the Town of Ajax (2016) includes provisions for renewable energy. Under Section 2.1.9. It states:

The Town supports the principle of renewable energy to address climate change and help improve air quality. Accordingly, the Town shall:

- Support the inclusion of solar-ready infrastructure in the design of new buildings and the retrofitting of existing buildings, subject to the requirements of the Ontario Building Code;

- Consider shadow impacts on solar energy systems from new development through the review of subdivision and site plan designs;

- Request all proponents pursuing a Renewable Energy Approval from the Province to provide the following at the required pre-consultation with the municipality:

  i) a site plan that:
identifies the location of the building or structure on the lot in relation to adjacent land uses, existing natural heritage and/or hydrologic features; and,

addresses site access, parking, site circulation, pedestrian access, and landscaping;

ii) building and/or structure elevations;

iii) total electricity generation capacity of renewable energy facility;

iv) minutes of all public consultation meetings; and,

v) draft copies of all studies that will be submitted to the Province in support of the application;

d) Permit a district energy facility adjacent to the Downtown Regional Centre to serve local industries and businesses, as well as Downtown development, and supply electricity to the grid, in accordance with Section 6.12 (Town of Ajax, 2016, pp. 20-21).

The Official Plan for the Town of Ajax, Ontario includes policy for climate change mitigation under Section 2.1.9, such as including renewable energy, developing both new buildings and retrofitting older buildings to be solar-ready, and avoiding unnecessary shading of solar panels with new construction. However, the phrasing used for these policies is generally weak, stating that the Town of Ajax shall “support.” It is beneficial to address these items, however if a change in practice is desired, this phrasing leaves room for improvement. For example, part 2.1.9(a) states that the Town shall “Support the inclusion of solar-ready infrastructure in the design of new buildings and the retrofitting of existing buildings, subject to the requirements of the Ontario Building Code” (Town of Ajax, 2016, p. 20). This policy does not require nor incent builders to make changes to their practices at all. A stronger approach that could be taken by
Ajax and Oxford County, would be to state that the town shall require property owners be consulted about the potential inclusion of solar-ready infrastructure in the design of new buildings and the retrofitting of existing buildings. This would go beyond the basic requirements of the building code, without requiring contractors to take on a prohibitive level of extra work.

Section 2.1.9(c) (2016) also lists a number of items that the Town requests proponents bring with them when pursuing renewable energy. When a contractor proposes a residential renewable energy development to a building official or planner at the Town of Ajax, it will be helpful to know in advance which documents will be required, thus streamlining the approval process. Though Ajax’ policy is not ideal, it is an improvement over that of Oxford County’s existing policy, as described in Section 4.2.1, above.

The City of Victoria, British Columbia has an Official Community Plan that features several policies supporting more renewable energy generation, as well as restricting its development in sensitive land use areas (City of Victoria, 2017). The policies from the City of Victoria are comparatively stronger.

Section 12 – Climate Change and Energy, of the Official Community Plan includes the following policies:

12.11 Work with community and business partners to explore opportunities for on-site technologies that re-use waste heat and to generate energy from waste recovery.

12.12 Support and enable the feasibility of renewable energy on a distributed basis or at district scale through objectives and policies for land management and development in this plan, that:

12.12.1. Encourage large-scale mixed use development with adequate density to support district energy systems, and where energy demand is diverse; and,
12.12.2. Consider all available tools and incentives that could enable and support on-site renewable technology and district energy systems.

12.13 Seek opportunities for district energy systems and identify effective and appropriate locations for facilities.

12.14 Work with the Capital Regional District, utility providers, businesses and private developers to explore the feasibility of renewable energy as a utility on a district scale through: 12.14.1 Partnership for utility provision and ownership of district energy system facilities;... (City of Victoria, 2017).

The wording in these policies are demonstrably more robust than those of the Ajax OP. Rather than stating that their administration should support the principle of renewable energy, support the inclusion of solar-ready infrastructure, or permit a district energy facility – as Ajax’s OP does – Victoria’s OCP states that they should work with proponents to explore opportunities, support and enable the feasibility of renewable energy, encourage developments that support district energy, consider all available tools and incentives to support renewable and district energy, seek opportunities for district energy systems, and work with other stakeholders to explore the feasibility of renewable energy (City of Victoria, 2017). This provides clear and specific direction to staff through policy within the City’s OCP.

It stands to reason that the policies within Victoria’s OCP will result in a larger uptake of renewable energy than that of Ajax. However, Oxford County could stand to benefit from both of these examples. Victoria’s OCP features strong language around renewable energy development. However, Section 2.1.9 (c) of the Town of Ajax’s OCP serves to clarify which documents will need to be supplied to move the process along, from pre-consultation to approval. Since navigating the processes of local governments can be challenging for contractors
whose work spans numerous municipalities, explicitly stating which documents are required in advance makes navigating the policy framework much easier.\(^1\)

Oxford County’s Official Plan is the central guiding document for land use development and should therefore include clear language stating that all development activities shall be reviewed to ensure compliance with the County’s 100% Renewable Energy Plan.

With regard to technological advances, local policies exist that can increase the amount of renewable energy produced in a municipality. However, it must also be recognized that in some cases the supply chain for a given renewable technology such as a heat pump, or a fuel, such as renewable natural gas, does not have a robust enough supply chain to allow for mass uptake in the near term (Informant 8, 2017).

### 4.2 Energy Mapping and Energy Use Projections

Many communities are investing a lot of time and energy into combatting climate change while delivering little to no tangible impact, even ten years after the implementation of the plans (Informant 10, 2017). This is a common occurrence:

Thousands of cities are undertaking climate action plans, but their aggregate impact on urban emissions is uncertain (robust evidence, high agreement). There has been little systematic assessment on their implementation, the extent to which emission reduction targets are being achieved, or emissions reduced. Current climate action plans focus largely on energy efficiency. Fewer climate action plans consider land-use planning strategies and cross-sectoral measures to reduce sprawl and promote transit-oriented development... (IPCC, 2014).

\(^1\) This is an example of Theme 5: The local level is the most important place for action to occur.
This confirms Theme 1: Achieving 100% RE requires carefully thought-out land use planning. It is also an example of Theme 5, showing that local-level plans are very important, despite often being insufficient. In this research, cities and municipalities are regarded as the places most capable of leading 100% renewable energy strategies (Informant 1, 2017; Informant 5, 2017; Informant 11, 2017; Informant 12, 2017). Like businesses that start small before investing in warehouses, and office buildings, cities are places where you can test out what does and doesn’t work before higher orders of government adopt the approach (Informant 5, 2017). Växjö is half way to meeting its GHG-free goal, without significant sacrifice in lifestyle or comfort. Their model has now been replicated by a network of municipalities across Sweden that have taken up the same goal (Pearson, Newton, & Roberts, 2014, p. 35). Further, 80% of emissions globally are emitted by cities (Condon, 2010). Thus, if GHG emissions are to be substantially reduced globally, there is plenty of reason to support cities and municipalities as critically important places to focus efforts.

Strategic energy and emissions mapping is a strong approach to reducing GHG emissions because it enables municipal staff and council to readily identify where inefficient as well as highly polluting land uses exist (Informant 10, 2017). Similarly, the 100% RE Building Blocks recommends strategies designed to help monitor and benchmark progress towards achieving 100% Renewable Energy (Boselli & Leidreiter, 2017). One of the strategies is to perform preliminary assessments, which aid in establishing community energy consumption baselines. These are valuable because they reveal the current state of energy use, enabling any reductions to be tracked through time.

Beyond showing how much energy is being used, energy mapping can depict the geographical location where energy is being consumed, what type of energy is being consumed, and can be enhanced by computer modelling to project future energy use by area.
With financial support from the Ontario Ministry of Energy, Woodstock, the largest city in Oxford County, developed a Community Energy Plan (CEP). This is another example of tiering, where support from a higher level of government enabled a municipal government to accomplish what would otherwise be outside of their normal operations and/or budget. The importance of support that municipal governments receive through tiering is a major finding of this research that will be referenced again in Section 4.3 and 5.5 (Theme 4).

The Woodstock Community Energy Plan contains energy maps showing the distribution of energy intensity across the City (See figure 5). It further divides the City into 11 Energy Planning Districts (EPD), and includes a series of maps showing city-wide energy consumption data for the year 2013, for:

- Total energy use (GJ)
- Non-residential energy consumption (GJ)
- Residential energy consumption (GJ)
- Residential energy intensity (GJ/m^2)
- Total natural gas consumption (GJ)
- Total electricity consumption (GJ)
- Total GHG emissions (t CO2e)

Figure 6 shows data for greenhouse gas emissions, in tons of CO2 within the city, by energy source.

Figure 6 shows where energy is used, how much of each type of energy is being used, as well as the quantity of GHG emissions being released in each area. Moving forwards, this will provide
Figure 5: Woodstock energy planning districts (City of Woodstock, 2016).

Figure 6: Woodstock greenhouse gas emissions by source (t CO$_2$e) (2013) (City of Woodstock, 2016).
a clear understanding to City staff, of where GHGs are being emitted, helping them decide which interventions will be most effective in reducing emissions. The third goal of Woodstock’s Community Energy Plan (2016), is: “Sustainable Planning and Policy: We will be a green and sustainable community, and will consider our energy future in our land use and growth planning” (City of Woodstock, 2016, p. i). Given that many land use planning techniques can be used to reduce emissions, this analysis will help define areas to use these tools.  

Section 3.2 of Woodstock’s CEP states that single detached homes have the highest average household energy use in Ontario. It also states that single detached homes make up about 65% of residential buildings in Woodstock, with semi-detached and row houses making up a combined 10%, and multi-unit residential buildings making up 24% (City of Woodstock, 2016) (Figure 7). Thus, it would be advisable that Oxford County’s OP be updated to drastically reduce the amount of low density housing to well below the current 55% required for newly developed areas.

![Figure 7: Woodstock residential building profile](City of Woodstock, 2016)

The various maps in the Woodstock CEP depict high levels of energy use in the downtown area. With this knowledge, achieving gains by increasing energy efficiency is made much easier, as the areas where energy is being wasted can be identified.
core and surrounding areas, and show the outlying, low density residential areas as having comparatively less total energy consumption. This is good, though it would be better if data could be collected for each EPD to define: (a) the ratio of people to living space area, (b) emissions per capita, (c) the density of dwelling units in each area, and (d) a walkability rating. One might assume that the outlying, low density residential areas of Woodstock would have the fewest people per area of living space, the highest emissions per capita, the lowest density of dwelling units and the worst walkability scores. However, the CEP does not focus on these items. If it did, it’s recommendations might shift to a reduction in the 55% allocation for low density residential areas, especially in any outlying greenfields, as this development type can result in 4- to 5-times higher GHG-emissions (Informant 10, 2017). Further, understanding which areas have the most floor space per resident may reveal preferable locations to encourage secondary suites within existing residences, and where transit use and walkability are lowest (likely the low density areas).

Moreover, it may also result in new developments following a gridiron, rather than dendritic (i.e. crescents and cul-de-sacs) street layout, with lots ranging in size from 3,000 to 4,000 square feet. These tactics have both been shown to result in more sustainable communities (Condon, 2010).³

The CEP (p. 45) advocates for the “…continued implementation and extension of existing policies.” This ‘extension’ is not elaborated upon, however, a list of existing policies is provided (p. 45). But, what do these policies really mean? They aim to “encourage alternative modes of transportation”, “encourage the safe use of bicycles for commuting…shopping…[and for] leisure and recreation” and “maximize the efficiency and accessibility to transit services by providing

³ Figure 5, above depicts a gridiron street layout on the west (left) side of EPD 7, while all of the street layout within EPD 3 would be considered dendritic.
compact forms of development”. The word ‘encourage’ does not represent binding policy language, and a requirement to provide compact forms of development means little when the parameters of this development form are not detailed in the Official Plan’s Definitions Section. In essence, these policies are suggestions.

Unfortunately, this aspirational policy for developing undefined compact urban form carries comparatively little authority, when compared to Section 7.2, which requires a minimum density of only 22 units per hectare (9 units per acre) for low density areas (Oxford County, 2017). Planning for densities this low sets these areas up to have low levels of transit ridership (Condon, 2010). This should be regarded as concerning, given the majority of future housing in the City is allocated for low density development (Oxford County, 2017).

The CEP refers to Woodstock as having a “relatively dense, urban character…including a connected-street grid” (p. 47). This is true in part, given the older parts of Woodstock, in and around EPDs 4 and 7, have about half of their areas laid out in a dense grid pattern. However, the outlying residential areas of Woodstock, including nearly all of the residential areas in EPDs 1, 2, 3, 5, 8, 9 and 10 have been laid out in a dendritic, not grid formation (City of Woodstock, 2016). Dendritic street systems should be regarded as fundamentally unsustainable because they:

- Force residents to drive up to 40% more than they would in older, dense, neighbourhoods with gridiron street layout (Define units/ha) and thus increase transportation GHGs to a similar level;
- Force all trips to lead to major arterial roads, which inevitably causes congestion;
- Reduce transit ridership, because people must walk further to reach bus stops;

4 The Woodstock CEP also states that single detached homes make up about 65% of the residential buildings in Woodstock (City of Woodstock, 2016).
• Lead to major intersections being much wider to accommodate the traffic that is funneled to main thoroughfares. This makes them both less desirable, and more dangerous places for pedestrians to be (especially infirm pedestrians);
• Favour big box development over more neighbourhood-level development, with location of stores based on the income levels of surrounding residents, and the number of car trips that pass through the area (Condon, 2010).

As Condon (2010) explains: “given that interconnected street systems are walking and transit friendly, reduce vehicle miles traveled, and are compatible with community-scale “streetcar city” corridors, they are the more sustainable approach.” Moreover, residents living in cul-de-sacs can reach approximately 25% of the population of a given area, however those who live between the cul-de-sacs and arterials have much higher car traffic on their streets than those in an interconnected grid system (Condon, 2010). It is also much, much easier to navigate a city or town on foot or by bicycle when the city is laid out in a grid system, or a variant there-of.\(^5\)

In an interconnected system (like one based on a simple grid layout) there are several benefits, such as:

• Making all trips the shortest possible;
• Allowing cyclists and pedestrians to move conveniently;
• Relieving congestion due to multiple possible routes to each destination;
• A five-minute walk easily covers twice as much ground as in a dendritic system;

The main disadvantage of gridiron street layouts, is that no homes are cut off from through-traffic completely, however this is not really a bad thing (Condon, 2010).

\(^5\) This example illustrates Theme 1: Achieving 100% Renewable Energy requires carefully thought-out land use planning. This land use discussion has been included in Chapter 4 rather than Chapter 5 because it illustrates energy mapping well.
And so, when we look back to the aspirational policies that have been praised within the Woodstock CEP, it is clear that these very policies need updating, to show a clear intention to reinvigorate the City’s layout by extending the interconnected gridiron street layout that exists downtown, to make all future residential developments more sustainable. This, is one of many potential pieces that will help enable Woodstock to more easily achieve increased active transportation and use of public transit. Unfortunately, a continuous grid will not be possible across the entire city, since there is already substantial area dedicated to the dendritic system that would be cost-prohibitive to redevelop – though every bit helps.

Moving forward with this policy would help achieve the third goal of Woodstock’s Community Energy Plan, to become a green and sustainable community, that considers their energy future in their land use and growth planning (City of Woodstock, 2016, p. i).

**ENERGY USE PROJECTIONS**

Within section 2.1.3 of the 100% RE Plan, baseline data collection of electricity, transportation fuel, and natural gas consumption have been defined by sector to enable measuring energy consumption through time. Projections have also been made for future energy consumption out to 2050, based on a business as usual case (Table 10), as well as a 100% RE case (Table 11). Preliminary assessments of wind and solar energy production have been defined, while prospects for other RE sources including biomass, RNG, synthetic natural gas, solar thermal and hydro power have been considered (Oxford County, 2018).

In 2015, the total amount of renewable energy consumed within the County was 94% non-renewable, with the 6% renewable content coming from wind and hydro within the electric grid. To achieve 100% renewable energy, the 100% RE Plan states that space heating will need to switch from natural gas to electric; vehicle fuels will need to change from gas and diesel to electric and compressed natural gas, and a transition to 100% renewable energy in the electric
grid will need to occur. The goal will be reached when the amount of renewable energy either
generated within the County, or imported equals or exceeds the annual energy consumed.

**Table 10: Oxford County Current and Predicted Consumption Patterns.** Business as Usual case. All data is measured in thousands of Gigajoules (Oxford County, 2018, p. 19).

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-RE consumption</td>
<td>21161</td>
<td>20673</td>
<td>20185</td>
<td>19697</td>
<td>19209</td>
<td>18721</td>
<td>18234</td>
<td>17746</td>
</tr>
<tr>
<td>RE purchased from Grid</td>
<td>1243</td>
<td>1345</td>
<td>1447</td>
<td>1548</td>
<td>1650</td>
<td>1751</td>
<td>1855</td>
<td>1955</td>
</tr>
<tr>
<td>RE Generation</td>
<td>315</td>
<td>631</td>
<td>946</td>
<td>1261</td>
<td>1577</td>
<td>1892</td>
<td>2208</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>22404</td>
<td>22018</td>
<td>21632</td>
<td>21245</td>
<td>20859</td>
<td>20472</td>
<td>20087</td>
<td>19701</td>
</tr>
</tbody>
</table>

**Table 11: Oxford County Energy Consumption and Generation targets for 100% RE by 2050.** All data is measured in thousands of Gigajoules (Oxford County, 2018, p. 20).

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-RE Consumption</td>
<td>21161</td>
<td>20673</td>
<td>16248</td>
<td>12997</td>
<td>9748</td>
<td>6494</td>
<td>3243</td>
<td>-</td>
</tr>
<tr>
<td>RE purchased from grid</td>
<td>1,243</td>
<td>1,344</td>
<td>1,456</td>
<td>1,569</td>
<td>1,681</td>
<td>1,793</td>
<td>1,906</td>
<td>2,018</td>
</tr>
<tr>
<td>RE Generation</td>
<td>-</td>
<td>1,173</td>
<td>2,346</td>
<td>3,519</td>
<td>4,692</td>
<td>5,865</td>
<td>7,038</td>
<td>8,211</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>22404</td>
<td>22017</td>
<td>20,050</td>
<td>18,085</td>
<td>16,118</td>
<td>14,152</td>
<td>12,186</td>
<td>10,221</td>
</tr>
</tbody>
</table>

Oxford County’s plan to reach 100% renewable energy recognizes changes that can be made in the future to increase the renewable energy content including increasing the quantity of solar and wind energy (Section 5.1), adding small hydroelectric generation (Section 4.3.8), and waste heat recovery (Section 4.3.10) (Oxford County, 2018). Section 5.1.3 of the 100% RE Plan states “In 2018, Oxford County will connect an additional 620 KW of Net metered solar PV technology. Expansion of solar PV is expected to increase in coming years, largely led by net metering and virtual net metering installations” (Oxford County, 2018, p. 54). Further, Section 5.1.7 explains that the rapid reduction in cost for solar power and battery storage have made and will continue to make off-grid energy production, storage and use more common (Oxford County, 2018;
Informant 7, 2017). Indeed, in 2018, several large off-grid solar projects were established (Oxford County, 2018).

The plan also includes future plans to develop energy from agriculture and food waste. Renewable Natural Gas (RNG) is one of these resources, which collects the methane released from beef feedlots. This RNG can then be added to the piped natural gas grid in the County, reducing the demand for natural gas (Oxford County, 2018).

4.3 Utilities

Utility operation is generally beyond the control of municipal councils in Ontario, with some exceptions. For this reason, the design of utility systems is also beyond the scope of this paper. However, due to the inherent need to engage with utility operators as stakeholders in the development of 100% RE Plans, it is clearly beneficial to discuss their strongest points of overlap with and contribution to 100% RE Plans.

Section 5.1.1 of the 100% RE Plan (2018) states that Oxford County relies on gas and electric utilities to manage the electricity distribution system and that they will necessarily be important contributors to any 100% RE Plan. The Plan further states “A largely untapped opportunity exists for gas and electric utilities by identifying use of renewable energy to provide much of the electricity required for their customers and simultaneously avoiding unnecessary investment in infrastructure by leveraging renewable energy resources locally” (Oxford County, 2018).

The authors of Oxford County’s 100% RE Plan are not alone in this regard. The Ontario Energy Board Act (2017) includes 5 objectives with regards to electricity. They are:

1. To protect the interests of consumers with respect to prices and the adequacy, reliability and quality of electricity service.
   
   1.1 To promote the education of consumers.
2. To promote economic efficiency and cost effectiveness in the generation, transmission, distribution, sale and demand management of electricity and to facilitate the maintenance of a financially viable electricity industry.

3. To promote electricity conservation and demand management in a manner consistent with the policies of the Government of Ontario, including having regard to the consumer’s economic circumstances.

4. To facilitate the implementation of a smart grid in Ontario.

5. To promote the use and generation of electricity from renewable energy sources in a manner consistent with the policies of the Government of Ontario, including the timely expansion or reinforcement of transmission systems and distribution systems to accommodate the connection of renewable energy generation facilities (Province of Ontario, 2017).

Informant 4 spent many years working for a utility in Ontario, and explained that the provincial legislation governing energy were largely in support of a renewable energy transition. They explained the direction that objectives 3, 4 and 5 on this list provide to utilities, as well as the conflicts that arise due to apathy from staff at utilities:

3 of the 5 mandates are essentially all circulated around renewable energy and the enabling technologies, yet when you talk to a lot of utilities...there’s apathy, right? They don’t really see what’s coming or what’s required of them. So that was what I really hooked onto when I was working at the utility - I said “look, we’re being told to get on with this, I’m not sure why you’re

---

6 This provincial policy directive is an example of Theme 4: Tiering: consistent and high levels of financial and policy support from Provincial and Federal governments is essential for accelerating progress towards 100% RE goals.
challenging me on the promotion of renewable energy and smart grids (Informant 4, 2017).

Informant 4 (2017) elaborated on this, explaining that any foot dragging, stubbornness, or fighting against these directives, slows progress towards making the changes needed to transition toward increased renewable energy in the grid. Further, they said that (a) the apathy that they faced working with these utilities, (b) the lack of local champions to push this work forwards, combined with (c) a lack of awareness of what was needed to be done in order to fulfill the requirements of these last three objectives in the Energy Board Act, all served to work against progressing on these objectives.⁷ Thus, targets and mandates are important, however people need to be willing and able to implement them (Informant 1, 2017).

Objective 3 of the Energy Board Act, encourages a reduction in electricity consumption through demand management, and conservation. Both of these approaches have been recommended as part of Oxford County’s 100% RE Plan (Oxford County, 2018). The fourth objective is to implement a smart grid. “Smart grid essentially refers to an intelligent grid that possesses the ability to harness renewable energy, energy storage and other sources of electrical energy and efficiently supply consumer load at the best time and when energy sources are at their optimum capacity” (Oxford County, 2018, p. 53; Natural Resources Canada, 2016). This is a recognized strategy within the 100% RE Plan, that is intended to be utilized in the mid-to long-term (Oxford County, 2018). Objective 5 speaks to increasing renewable energy generation, as is clearly in line with the goals of any 100% renewable energy plan.

⁷ This example relates to theme 2: integrating municipal staff is more important than having and innovative plan. Though this is example is not of local government staff and a local-level plan, but rather utility staff and a provincial directive, having engaged staff is critical.
By increasing renewable energy content and modifying the design of electrical utility grids to support increased renewable energy content, GHGs can be reduced in the long term, which serves to reduce the impacts of climate change.

4.4 Engagement

In order to develop a strong 100% renewable energy plan, the public, as well as stakeholders, municipal staff and municipal decision makers should be engaged early and often (Informant 5, 2017; Informant 10, 2017; Informant 13, 2017; Informant 14, 2017). Further, within this analysis, 14 of 17 informants spoke to the importance of doing proper engagement (Informant 1, 2017; Informant 2, 2017; Informant 5, 2017; Informant 7, 2017; Informant 8, 2017; Informant 9, 2017; Informant 10, 2017; Informant 11; 2017; Informant 12, 2017; Informant 13, 2017; Informant 14, 2017; Informant 15, 2017; Informant 16, 2017; Informant 17, 2017). Section 4.4 largely falls under Theme 3: Sincere and well thought-out engagement is critical to a successful plan.

Community funded photovoltaic solar projects have been successfully completed in Freiberg, Germany and Nelson, BC (Informant 1, 2017; Informant 16, 2017). The City of Freiberg, Germany made it easy for citizens to get involved in their renewable energy programs. When they decided to locate photovoltaic solar panels on the roof of the soccer stadium, the season ticket holders were given the first opportunity to fund the development by purchasing shares as investors – which completely sold out in 14 days. A similar plan to locate solar panels on the roof of a local school, saw the parents of the students given the first opportunity to buy shares, which quickly sold out. Further, after the solar cells were installed, the students were shown how they work, and then studied the financial payoffs associated with them in their math classes (Informant 1, 2017). This echoes sentiments from Informant 17, who emphasized the importance of having environmentally responsible topics such as renewable energy as part of lesson plans (Informant 17, 2017). Similarly, Informant 16 used a solar community model where
Nelson Hydro customers buy into a solar power generation facility and receive credit back on their account for the electricity that the solar panels generate. Initially, Informant 16 spoke with Nelson residents and compiled a list of 120 names and later held an information session. A survey was then sent out to this list of community members, to learn preferences for price point, level of profitability, and solar garden location. The data from the survey was then used as the foundation for developing the solar garden, which was fully subscribed. Inspired by the Nelson Solar Garden, Kelowna and New Westminster, BC are now developing their own community-owned Solar Gardens (Informant 16, 2017). These actions serve as exemplary approaches for Oxford County to follow with regards to implementing their 100% RE Plan.  

In the case of Nelson, a dedicated staffer was hired to work on special projects such as this (Informant 16, 2017). Similarly, Oxford County hired a consulting firm to help them develop the Woodstock Community Energy Plan, as well as an engineering firm to help them develop the metrics behind the County-level 100% Renewable Energy Plan (City of Woodstock, 2016; Oxford County, 2018). Hiring firms to help where additional expertise or capacity is needed is a common practice (St. Denis & Parker, 2009; Informant 10, 2017). It may be of benefit for Oxford County to hire a consulting firm or full time staff person to lead community engagement, which would support the engagement-related policies from the County’s 100% Renewable Energy Plan, such as:

- Chapter 1.1.3 “[t]he active engagement of Oxford’s residents and businesses will play an important role in the implementation of our 100% Renewable Energy Plan” (p. 5), and;

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8 The success of these locally-initiated solar energy projects, and the eagerness of other communities to replicate the work of Nelson Hydro are examples that confirm Theme 6: community-owned and –supported renewable energy projects are much more successful than those dominated by major industrial players.
Chapter 2 overview “[t]he 100% RE blueprint will be based on local potential and will be as inclusive as possible to ensure that all parts of society are involved and engaged” (p. 16).

The approaches taken to increasing community-supported photovoltaic solar installations in Nelson and Freiberg, would find support with policy from Oxford’s 100% RE Plan that states “… the real change will begin only when individual people, groups and business owners engage and lead on their own terms” (Oxford County, 2018, p. 25). However, the second listed policy above speaks to a more inclusive approach, where personal wealth aught not be required for community members to benefit.

The City of San Francisco has worked hard to include populations across all income-brackets in their renewable energy planning, while also requiring the local economy benefit from the creation of local jobs:

If you track the course of the evolution of solar, it used to be an ideological conversation of ‘well, if you’re green and an environmentalist and you’re wealthy, you’re going to have solar and if you’re not, then too bad’ and that was the mentality back then. That’s never how you should be approaching any sort of climate solution around equity. So, I’ll give the example, when we launched our solar program, it wasn’t just an incentive for people with money to do these installations. We structured the program that had a component for workforce job training, and we added a component for locally owned solar installer businesses, so we basically offered greater incentives if you utilized certified installers that were utilizing a local work force, so partnering with unions, figuring out that training program – because again, these are important opportunities…It’s not just about the planet, it’s about helping people, and how do we use these as vehicles to
help people; help get them out of poverty and provide resources to them that will help them transition with us to this new economy and be ready for this new economy (Informant 5, 2017).

By leading with this equitable approach, making the program easily accessible to people of all walks of life, the attitudes of ratepayers soon changed from antagonistically asking why their money was going to programs for increasing solar energy to citizens asking how they can help move this initiative forward (Informant 5, 2017).  

Keeping costs affordable, was a strategic focal point that they engrained in utility scale renewable energy as well. In March of 2017, the City of San Francisco established the municipally-owned Community Choice Aggregation (CCA). In comparison to the existing investor-owned utility, which receives 30% of its energy from renewable sources, the CCA has a renewable supply of 35% to 40% and costs customers slightly less than the investor-owned utility. The city also hopes to move the level of renewable energy in the mix up to 50% by 2020. About 98% of the renewable energy supplying the CCA is from wind farms located about 64 kilometers outside of the City limits (Informant 5, 2017).

This plan has been hailed as a tremendous success, however the Mayor of San Francisco was not always a strong advocate for the program. Despite criticism from the environmental community, he decided not to launch the plan during its first iteration because it had the potential to leave people with higher energy bills and higher rates. So, he had the committee revise the plan to (a) ensure energy would cost the same or less than what people were paying on their energy bills, and (b) ensure that it was an enterprise owned by the municipality, rather than one of the plan’s early partners, the oil company Shell. With these objectives met, the plan

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9 This is an example of Theme 7: 100% RE should not be a financial burden on the public. This equitable approach ensures this development serves to benefit the community.
has seen great success, with a 3% opt-out rate among the first 75,000 customers (Informant 5, 2017). This is a great example of a highly successful renewable energy project that is community-owned and –supported, rather dominated by major industrial players (Theme 6).

The success of this plan required strong leadership that recognized the importance of minimizing the impacts on everyday citizens and keeping profits within the community. Informant 5 has explained that, a key lesson from their experience was avoiding looking at renewable energy plans through a lens that is restricted to an environmental perspective, but rather to look at them from the perspective of the people who are going to be impacted by the change in policy.

Ontario’s Green Energy and Green Economy Act was responsible for 90% of the solar power installed in Ontario (Informant 4, 2017). However, it is also clear that permitting a major corporation to serve as the dominant actor, extracting profit that could otherwise remain in the community, removing land use planners from the process of community consultation, and widely ignoring the concerns of impacted communities, resulted in strong opposition to wind energy development in Ontario, with communities declaring themselves unwilling hosts. Informant 4 elaborates:

There continues to be concern over large scale wind. In the County, our focus is really going to be more solar to begin with. Wind is just too long of an installation and learning and acceptance curve, whereas solar can be installed today and it really doesn’t have any impact of visuals for the most part (2017).

One cannot be certain that developing a community-based process that integrated planners, and excluded large multinational corporations from dominating the process would have resulted in a high level of community support for wind development as it did for solar power in Nelson and San Francisco given solar is much less visible and is more accepted by communities.
However, wind energy is now a very controversial topic across rural Ontario, and any increase in support for large scale wind energy development will be hard-earned and likely require an abundance of community engagement (Fast, et al., 2016).10

Research from Hoffman and High-Pippert (2010) suggest that bottom-up initiatives play an important role in shaping how people engage with these initiatives and potentially alter the energy system. Their research suggests that when you bring community members into the discussion and a possibility exists for the input and actions of community members to give back to their community, people can find it easy to support new renewable energy projects. However, if the community is shut out of the discussion and the benefits of the new development will clearly not be shared in the community, people quickly line up in opposition (Hoffman & High-Pippert, 2010; Fast et al., 2016). This is further supported by Walker and Devine-Wright (2008), who concluded that best practices for establishing renewable energy include a focus on process, are highly inclusive of community members throughout the planning and development process, and emphasize beneficial outcomes of the project including local educational and employment opportunities.

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10 This exemplifies Theme 6: Community-owned and –supported renewable energy projects are much more successful than those dominated by major industrial players.
Chapter 5

Results and Discussion – Land Use Planning

This section provides results and a discussion of this research, on topics relating to land use planning, as it pertains to reducing energy consumption, and thus, making the goal of 100% RE more rapidly achievable. When planning communities, certain land use policies lead to lower energy requirements and emit less GHGs, if they are utilized carefully. These policies include: mixing uses, increasing transit use, and developing complete and compact neighbourhoods with easily navigable street layouts (Pearson, Newton, & Roberts, 2014, p. 190; Condon, 2010). Section 5.1 and 5.2 discuss the land use planning concepts of density and mixed use respectively.

Section 5.3 examines engagement for both citizens and stakeholders, while contrasting a wide variety of views, to define best practices. Section 5.4 discusses findings as they relate to energy use in buildings. Within this section, a variety of building types, and energy saving strategies are examined, with a focus on retrofits and energy efficient new builds. Finally, Section 5.5 – Tiering, discusses the critical role that provincial and federal levels of government play, in supporting municipal transitions towards 100% renewable energy.

Energy conservation was previously defined as “any measure made to reduce the amount of high quality energy that is demanded to provide goods and services (St. Denis & Parker, 2009, p. 2089; Aubrecht, 1995). The following sections explain how a reduction in aggregate energy demand can be achieved by utilizing land use tools.11

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11 Chapter 5 falls under Theme 1: Achieving 100% RE requires carefully thought-out land use planning. Theme 9: Increasing energy conservation and energy efficiency are key concepts to support demand-side management – also applies to much of this chapter. This is because implementing land use plans that lead to efficient energy use will, in most cases, also result in fewer emitted GHGs.
Jaccard, Failing and Berry (1997) previously explained that land use patterns have a determining impact on the energy consumption of human settlements, with density and mixed use development as two important factors. They also recognized that energy use in settlements result in environmental impacts, including climate change (Jaccard, Failing, & Berry, 1997). This Chapter delves deeper into how changes in land use development can result in reduced energy consumption, while reducing GHG emissions. Thus, efforts that effectively reduce GHG emissions through conserving energy will, in effect, reduce the projected impacts of climate change (Jaccard, Failing, & Berry, 1997).

Table 12, below, shows where each theme emerges within Chapter 5. In each section of this chapter where these themes are relevant, the theme is referenced within the text.

Table 12: Emergent research themes, by Section within Chapter 5.

<table>
<thead>
<tr>
<th>#</th>
<th>THEME</th>
<th>SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Achieving 100% RE requires carefully thought out land use planning</td>
<td>5.1, 5.2</td>
</tr>
<tr>
<td>2</td>
<td>Integrating municipal staff is more important having an innovative plan</td>
<td>5.2, 5.3, 5.4</td>
</tr>
<tr>
<td>3</td>
<td>Sincere and well thought-out engagement is critical to a successful plan</td>
<td>5.3</td>
</tr>
<tr>
<td>4</td>
<td>Tiering: consistent and high levels of financial and policy support from provincial and federal governments are essential for accelerating progress towards 100% RE goals</td>
<td>5.5</td>
</tr>
<tr>
<td>5</td>
<td>The local level is the most important places for action to occur</td>
<td>5.3</td>
</tr>
<tr>
<td>6</td>
<td>Community-owned and -supported renewable energy projects are much more successful than those dominated by major industrial players</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>100% renewable energy plans should not be a financial burden on the public</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Building energy needs should be reduced in both new and existing buildings</td>
<td>5.4</td>
</tr>
<tr>
<td>9</td>
<td>Increasing energy conservation and energy efficiency are key concepts to support demand side management</td>
<td>5.4</td>
</tr>
</tbody>
</table>

5.1 Density

Section 7 of Oxford County’s Official Plan includes policies for its largest settlement, Woodstock. Cities are often the most effective places to find sustainable land use policies, due to a higher propensity for policies that support increased density of dwelling units, a greater mix
of land uses, and dense enough populations to support public transit. For this reason, the policies pertaining to Woodstock are the focal point of the analysis for Oxford County’s Official Plan (Oxford County, 2017). The recommendations made herein apply to Woodstock, but should be adopted where applicable, in the County’s second and third largest settlements: Tillsonburg and Ingersoll.

**SERVICING COST**

Low density development requires prohibitively expensive servicing (Condon, 2010), reduces public transit viability, and increases the need for private vehicle use (Hurd & Hurd, 2012). Permitting secondary suites in existing residential areas serves as a more cost-efficient way of adding dwelling units than permitting additional greenfield development. The initial cost to develop greenfields is substantially less than that of adding dwellings to an existing developed area. However, development decisions are often made on upfront costs, which has led to a distributed pattern of development. This strain is further compounded because developers tend not to be invested beyond the sale of each dwelling, and thus have little concern for the lifecycle costs associated with operating the home and maintaining the necessary servicing infrastructure (Informant 10, 2017).

The high cost of low density development is exemplified in Ambleside, within the City of West Vancouver, British Columbia. Homes in Ambleside require about five to six linear meters of civic infrastructure per household, while other areas of West Vancouver require 50 to 60 linear meters per household, yet taxes are not 10 times higher in these parts of the City. So, the taxes paid by mid- to high-density residences essentially subsidizes the higher per-unit infrastructure cost of low density areas, where wealthier people live (Informant 10, 2017). This is a fundamental injustice in the current paradigm of urbanism in Canada.
To remedy this, low density areas can be retrofitted to permit additional dwelling units by stratifying existing single detached dwellings, or permitting them in accessory buildings on the same lot. Planners often focus on developing nodes and corridors within settlements, while their time may be better spent focusing on the 75-90% of residential areas dominated by single detached dwellings (Informant 10, 2017). Indeed, suburbs are an excellent place to redevelop for higher density, given that sewers, roads, water and electricity are already in place (von Hausen, 2013). Moreover, from a 100% RE perspective, “…[e]nabling secondary suites and laneway homes through diverse regulatory and financial policy tools is potentially the most cost-effective way to double per capita GHG [reductions in] homes and create new affordable housing units” (Boston, Barrs, Pol, & Hendrickson, 2017, p. 17).

Garage and garden suites are an emerging trend in Canada. They are becoming a common feature in Vancouver, BC, and have been the focus of Official Plan amendments in rural municipalities in Eastern Ontario, including the predominantly rural County of Peterborough. Section 7.2.4.1.2 of Oxford County’s Official Plan permits backyard infill by way of consent, or by creating a garden suite (Oxford County, 2017). However, the creation of a garden suite is subject to Temporary Use provisions under Section 10.3.9, limiting the use of a garden suite to retired or retiring family members, on a strictly temporary basis (Oxford County, 2017). This is counterproductive. To enable increased population density, garden suites should be permitted outright.

To further these goals, Oxford County could permit garage and garden suites and set out design guidelines, as is done in Section 5.43 of Saskatoon’s Zoning Bylaw No. 8770. These regulations ensure that suites meet requirements for rear- and side-yard setbacks, maintaining privacy with neighbours, and a smaller gross floor area than the primary dwelling (City of Saskatoon, 2017). These guidelines encourage the incorporation of sustainable design to reduce
water use, encourage passive solar design and other gains in energy efficiency (City of Saskatoon Planning and Development, 2014). Introducing design guidelines such as these would serve to clarify to homeowners and developers, what options exist, making it easier to add dwelling units to their property.

LOCAL AUTHORITY

Local governments often emphasize conventional conservation strategies to reduce GHG emissions, such as switching fuels from coal or natural gas to renewable sources. However, they often fail to recognize their primary authority is over land use (Informant 10, 2017). This is exemplified in Ontario’s Provincial Policy Statement, which authoritatively directs municipal-level land use policy in Ontario (Province of Ontario, 2014):

1.4.1 To provide for an appropriate range and mix of housing types and densities required to meet projected requirements of current and future residents of the regional market area, planning authorities shall:

a) maintain at all times the ability to accommodate residential growth for a minimum of 10 years through residential intensification and redevelopment and, if necessary, lands which are designated and available for residential development; and

b) maintain at all times where new development is to occur, land with servicing capacity sufficient to provide at least a three-year supply of residential units available through lands suitably zoned to facilitate residential intensification and redevelopment, and land in draft approved and registered plans (Provincial Policy Statement, 2014).

\[12\] It is notable that PPS S.1.4.1(a), would have far less clout if, in place of “shall” it read “shall have regard to.” In this passage, the utilization of the more flexible phrasing “shall have regard to” would permit an implementing authority at the municipal level to simply consider following a given policy (Provincial Policy Statement, 2014).
This policy has valuable implications regarding sustainable development. From a 100% RE perspective, it helps prioritize increases in density; restricting greenfield development to only occur when necessary. Moreover, an approximate 4- to 5-fold increase in GHG emissions exists when locating a new home in a greenfield rather than an urban corridor or node (Informant 10, 2017). Similarly, Section 7.2.4.3 of Oxford County’s OP permits Woodstock City Council to zone areas within Low Density Residential Districts “…to permit detached, semi-detached and townhouse dwellings to be converted into two residential units” which also helps increase density (Oxford County, 2017). This policy will likely be of use to rationalize additional dwelling units in low density areas.

The Official Plan for Oxford County contains a number of policies that encourage an increase in density; in many cases through residential intensification. For example, Section 7.2.2 includes a number of policies that ensure opportunities exist to develop a variety of dwelling types within the City by permitting residential intensification, as well as setting a 15% minimum target for new homes to be developed through residential intensification. Section 2.1.1 - Growth Management - Intensification, which refers to the County as a whole, promotes intensification in areas of the County serviced by centralized wastewater and water supply facilities. Also, Section 2.1.3 directs development of land uses that would be most appropriately developed on centralized wastewater and water supply, to occur in larger settlements, away from prime agriculture areas (Oxford County, 2017). Policies that enable intensification in serviced settlements are beneficial for two reasons. First, serviced areas can generally support intensification better than unserviced, since the area required for septic systems, and the

Conversely, by stating that “…planning authorities shall…” follow a given regulation, the legal obligation of a given planning authority to do what is stated is firm, as the stated requirement is not optional or open to interpretation. So, not only is this a policy that serves to benefit reductions in GHG emissions, but it is written with strong enough language to require adherence.
capacity of those systems are not limiting factors. Though it should be noted that sewer systems also face capacity limitations. Second, residential intensification increases density, making communities more transit-friendly and often more cyclable, walkable, and supportive of mixed-use development.

Section 1.1.3 of the PPS also requires targets for intensification and redevelopment to be achieved concurrently or prior to new development in growth areas along with requirements to ensure sufficient servicing (Provincial Policy Statement, 2014). A focus on sustainable development is taken further in Section 1.1.3.2(a)2 which requires land use patterns in “...settlements be based on...densities and a mix of land uses which...are appropriate for, and efficiently use, the infrastructure and public service facilities which are planned or available, and avoid the need for their unjustified and/or uneconomical expansion...” (Provincial Policy Statement, 2014). This implies that low-density, greenfield development would be an inefficient use of space and reinforces goals that are aligned with reducing GHG emissions via land use planning (Province of Ontario, 2014; Informant 10, 2017).

**DENSITY REQUIREMENTS IN OXFORD COUNTY**

Section 7.2.3.2.2 of the OP requires newly developing communities to follow a set of urban design criteria, which requires secondary plans approved by Council to contain a variety of dwelling types, to enable a mix of 55% low density, 30% medium density, and 15% high density, with an overall net residential density of approximately 30 units per hectare (12 units per acre). There is also a requirement that residential development within 200 metres of an arterial or collector road meet a minimum net residential density of 25 units per hectare (10 units per acre) (Oxford County, 2017).

Condon (2010) found that 10 units per acre was the point where utilizing busses became feasible at short headways. Aiming for an overall net density of 12 units per acre in newly
developing areas is better than aiming for 10 units per acre. Further to this point, 12 units per acre would better serve Woodstock as an appropriate minimum limit, rather than an aspired-to goal, since it would probably result in a more highly subscribed transit service. Reducing allocations for low density areas makes even more sense, once one considers that, in Canada, family sizes are decreasing, and new housing stock is not based on this demographic reality, where 60% of households only consist of one or two occupants. Further, by 2025, there will be more 1-person households than any other variety in Canada (Informant 10, 2017).

Policies within Section 7.2.5 - Medium Density Residential Areas, permits the development of townhouses, cluster houses, converted dwellings and apartment buildings as well as a minimum net residential density of 31 units per hectare (13 units per acre), and a maximum of 70 units per hectare (30 units per acre). Based on Condon’s assertions, Woodstock’s medium density residential areas would provide very substantial density to support higher bus ridership (Condon, 2010). Thus, a substantial increase in area for medium density housing, at the expense of the 55% of new development area currently allotted to low density dwellings would be a decisive improvement in Oxford County’s land use policy.

Chapter 7.3.2.3.1.1 - Built Form, Urban Design, Site Planning - also supports increased density in downtown Woodstock, and permits buildings ranging in height from 2 to 8 storeys. Within the Pedestrian Predominate Area, the limit to building height is 6 storeys. This is good because it means that the buildings will not appear overly imposing, making for a more comfortable, human scale experience for people walking, cycling and taking transit in this area, while maintaining a high level of dwelling unit density.

Oxford County OP, Section 4 - Growth Management Policies, requires “existing designated land supplies and infrastructure be efficiently utilized, including achievement of intensification targets, prior to designating new areas for growth” (Oxford County, 2017). Section 4 also
contains policies that pertain more specifically to the rural areas including villages and hamlets, permitting growth in areas with the Village designation, while restricting it to either infill or plans of subdivision that do not exceed a village’s existing boundary (Oxford County, 2017). This is a strong approach which permits growth, but not sprawl.

Oxford OP Section 10.3.10 – permits increases in the density or height of developments under certain circumstances, and only if the developer is willing to provide benches or climatic shelters for transit users. This is an excellent policy to include within an official plan, especially considering these required provisions make active transportation and taking public transit more appealing. Thus, providing density bonussing as a provision in Oxford County’s Official Plan can also serve as a benefit for reducing GHG emissions. Oxford County may also consider permitting density bonussing in exchange for other provisions such as increasing the energy efficiency of a new building, or requiring the integration of solar hot water heaters into new buildings.

HOLDING PROVISIONS

The Oxford County Official Plan has designated Future Urban Growth Areas within Section 4.2.2.6, permitting new low density residential development on the City’s southwestern border (Oxford County, 2017). Though this is a very common practice, it may be preferable to set part of this area aside under a holding provision, thus barring it from development for the foreseeable future. There likely is demand for more low density, single family lots in the City of Woodstock, however restricting the quantity of low density lots may enable the value of the existing homes on large lots to increase, helping reduce the disparity between the cost of servicing for low density development and that of medium and high density development (as described in Chapter 5.1 – Density). Further, given the intent of Section 7.2.1 of the OP, to reduce energy consumption in Woodstock, it would be best to continue to avoid establishing
new low density residential areas, as they emit more GHGs than higher density areas. This aligns with OP S.7.1.1 - Strategic Initiatives:

The City of Woodstock promotes the concept of a compact urban form as a means of maximizing the use of existing services, promoting energy efficiency and protecting agricultural lands and natural areas. The policies of this Plan emphasize an efficient land use pattern for both residential and employment areas by promoting higher overall densities in newly developing areas while maintaining flexibility for a variety of development forms (Oxford County, 2017).

These approaches to increasing density conserve energy by reducing the per-capita energy requirements within communities, thus making the transition to 100% RE easier to accomplish. This, in turn, will reduce the impacts of climate change on the biosphere.

**5.2 Mixed Use**

The County of Oxford Official Plan contains several items that support the mixing of uses within the City of Woodstock. For example, Section 7.2.3.3 - Neighbourhood Servicing Uses in Residential Areas requires City Council to support uses that serve the community including schools, churches, day care facilities, libraries, parks and convenience stores. This Official Plan also contains evaluative criteria used to discern the value of development proposals in terms of how they enrich the community living experience by increasing safety, a sense of community and everyday needs for local residents. It also requires developers to demonstrate how the new development will compliment adjacent uses, minimize any adverse effects of the development, and provide reason as to why this service is better located in a residential area than other areas designated in the Official Plan.
Findings within the literature suggest that the market for homes in walkable areas have been much stronger in the first ten years since 2000 than at any point since the 1940s (Condon, 2010, p. 64; Leinberger, 2008; Dunham-Jones & Williamson, 2008). Indeed, neighbourhoods where people can walk or take transit to access the amenities required for everyday life, enable a reduction in GHG emissions that would come from the use of personal vehicles.

In the overview for Chapter 5 of Oxford County’s 100% RE Plan it states that “the plan will encourage active mobility (walking and cycling), public transport, and mix-use developments. An evaluation of the community’s public transport system and [an analysis of] citizen’s mobility behaviour including connection to surrounding regions/suburbs will take place” (Oxford County, 2018, p. 52). Mix-use development is again referenced later in this Chapter of the 100% RE Plan, but is not actually discussed at any point in the document. Since this is a living document, that will be improved upon as time passes, there may be good reason to integrate staff from the County’s Community Planning Office. This would be advisable for three reasons. 13

First, planners have specialized knowledge with regards to developing policy, while integrating input from diverse sources. Since official plans and zoning by-laws serve as the two main documents that planners both write policy for and utilize to make recommendations to Council with regards to individual planning applications and developments, they are truly the experts on land use within municipal structures.

Second, in reference to Table 6, planners have the capacity to go beyond the technical-administrator role, to function as a mobilizer, entrepreneur or advocate, pushing for a more thoughtful and communicative approach to planning.

13 This is an example of Theme 2: integrating municipal staff is more important than having an innovative plan.
Third, planners typically have expertise regarding land use planning concepts such as mixed-use, increasing population density, transit planning, compact urban form and complete communities. Finally, since these qualities make planners effective communicators, and these concepts serve as best practices for reducing the energy requirements of a community, it would therefore be best if planners were integrated into the development of Oxford County’s 100% RE Plan moving forward.

Official Plans are typically updated every 5 to 10 years in Ontario. The 100% RE Plan could be improved by explicitly stating an intent to inform the development of the County’s Official Plan when scheduled updates are occurring, and by amending the County’s OP to require new development to engrain principles of energy conservation and further demonstrate how they embody low GHG-emitting development patterns. This would enable Smart Energy Oxford to advocate for keeping settlements compact, while creating walkable, complete communities, as has been done by the City of Victoria (City of Victoria, 2017). It may be argued that development plans that apply to cities like Victoria - which has twice the population of Woodstock, and several times that of Tillsonburg and Ingersoll - should not be applied to these smaller communities. However, the concepts of mixed-use, compact settlements, and complete communities apply to small towns and large cities alike. Regardless of the size of the settlement, at the neighbourhood level, these concepts are equally applicable. At the neighbourhood level, the choice to walk, bike or take transit should be easy and appealing. This is accomplished through increasing density, mixing uses and creating compact, complete communities.

Informant 10 composed meta-analyses for over 20 municipalities and found that household GHG emissions are substantially lower in mixed-use, medium- to high-density neighbourhoods. They further argue that density is an overrated metric, and that “super-high” densities are not necessary to achieve substantial reductions in GHG emissions:
If you don’t mix use, if you don’t have destinations that you can walk to, bike to or take transit to, density doesn’t matter. So, we have high-rise neighbourhoods that don’t have proximate grocery stores, or don’t have street design that makes it conducive to walk to the butcher, the baker, the cappuccino maker, [so] people drive, right? So, you have high density, ... high transportation GHGs, and moderate building GHGs. So, the mixed use, and – interesting - their proximity to major employment nodes are far more important than density... (Informant 10, 2017).

The City of Victoria, British Columbia’s Official Community Plan places much emphasis on increasing density, the development of mixed land use; and the protection of green and blue spaces. Victoria’s Regional Growth Strategy contain the following 5 areas of Strategic Direction:

1. Keep Settlements Compact
2. Protect the Integrity of Rural Communities
3. Protect Regional Green and Blue Space
4. Manage Natural Resources and the Environment Sustainably
5. Build Complete Communities (City of Victoria, 2017, p. 25).

These serve as guidelines to ensure future developments have low GHG emissions within the City of Victoria. Item 5 speaks to the concept of complete communities. This has not been a focal point of this analysis thus far, as it has considerable overlap with the concepts of (a) mixed-use and (b) increased population density. However, it is worth noting the value of complete communities within the context of Victoria’s Regional Growth Strategy. In order for a policy to be consistent with the fifth area of strategic direction, Build Complete Communities, the following is required:
Establish policies to facilitate urban development that contributes to greater community completeness, in particular by supporting: growth in and within 500 metres of the Metropolitan Core and Major Centres; the co-location of housing, employment, services and recreation; new housing within a ten-minute walk of existing business and community services and facilities; ... and, locate new growth within 400 metres of transit routes. (City of Victoria, 2017, p. 27).

This focus on reducing GHG emissions is reinforced at several places within the Official Community Plan for the City of Victoria. Section 12 - Climate and Energy, includes several subsections that promote sustainable energy principles. Section 12.4 promotes the continued reduction of GHG emissions in Victoria through (a) compact land use patterns with complete centres and villages, (b) transit oriented development, and (c) development supporting cyclists and pedestrians. Within Victoria’s OCP, it has also been demonstrated that certain development patterns at the neighbourhood-level result in lower emissions:

In Victoria in 2007, sources for total greenhouse gas emissions were: 43% from transportation, 29% from commercial buildings, 22% from residential buildings and 6% from the management of solid waste. Per capita emissions are significantly lower in compact urban neighbourhoods such as Harris Green and Downtown, where shorter trip lengths from homes to destinations enable walking and cycling, and multi-unit building forms are more energy-efficient (City of Victoria, 2017, p. 90).

Mixed-use development was previously highlighted by Condon (2010) as a key strategy to aid in greenhouse gas emission reduction, especially as it pertains to retrofitting suburbs and strip commercial areas. This was reinforced by Hurd and Hurd (2012), who suggested allowing residential and commercial uses to mix on most blocks with neither being specifically
prescribed, to enable a more efficient market response to development. Healey (2006) explained that some oppose the concept of density in cities, on the grounds that long commutes may still be required if people need to travel to other cities for employment. Though this will always be the case for a portion of any city’s population, mixing uses reduces the length of trips to places that a person may need to travel to meet many of their daily needs; often including employment. By reducing the length of car trips and enabling short enough commutes to make walking and cycling feasible, energy is conserved and GHG emissions are reduced; decreasing the impacts of climate change on the biosphere.

5.3 Engagement

Section 5.3 falls under Theme 3: Sincere and well thought-out engagement is critical to a successful plan. The following two subsections on Citizen Engagement and Stakeholder Engagement demonstrate Theme 5: the local level is the most important place for action to occur.

CITIZEN ENGAGEMENT

A focus on community engagement and behavioural change is present in Oxford County’s 100% Renewable Energy Plan (2018), as well as Woodstock’s Community Energy Plan (2016). Chapter 4 of Oxford County’s 100% RE Plan promotes energy conservation and efficiency, and explains that substantial energy savings can be achieved through educating the public and promoting a culture of sustainability within the community, based on increasing engagement with community members. They further recognize that engaging the public will take time, and that programs will be offered to help the community more easily transition to renewable energy (Oxford County, 2018).

To date, citizen engagement in Oxford County has been limited. However, the plan to reach 100% RE by 2050 still has over three decades to go, and the 2018 100% RE Plan clearly states a
strong intention to engage with the community to ensure a plan with community support is developed in the future. The following statement clearly shows that this plan has the intention of making engagement a key part of the plan moving forward: “Continuous efforts into ensuring the citizens of Oxford County are engaged in decision making process will be critical” (Oxford County, 2018, p. 40).

The remainder of this section describes a number of approaches to citizen engagement that have the potential to help Oxford County develop its engagement approach, including (a) engaging early and often, (b) engaging on core community priorities, rather than the threat of climate change, (c) connecting energy mapping to core community priorities, (d) maintaining transparency regarding how diverse strategies will be prioritized, and (e) recognizing that top-down models do not work.

It is important to engage with citizens and other stakeholders early and often (Informant 5, 2017; Informant 13, 2017). This was highlighted by Informant 14 (2017), a professor at York University, who insisted that “100% Renewable Energy is possible and it is achieved through 100% community focus” (Informant 14, 2017).

As was discussed previously (Chapter 3.3.2), engagement has become a central part of the planning process since the communicative turn, recognizing that people bring their own professional and socio-cultural concepts to certain tasks (Healey, 2006, p. 252), including solving issues relating to sustainability (Bunting, Filion, & Walker, 2010, p. 252). Von Hausen (2013) also described an example (Chapter 3.4.1) where an effective engagement process in Strathcona County, Alberta was able to deliver a plan for developing a more sustainable community, while swaying vocal opponents.

Some believe that when engaging with people on the topic of climate change, it is best to make appeals to logic, such as explaining that climate change leads to greater ecosystem
fragility, biodiversity loss, and negative future economic impacts, or the future lives of children living today (Informant 2, 2017). However, stronger arguments have been made for different approaches to getting people to support efforts to reduce GHG emissions from eight informants.

Informant 10 supports this concept, and illustrates it with an example of one of the dozens of communities they worked with: “when I go into a community...for a public consultation, I don’t start with climate. I ask people in the community “What do you cherish, and don’t want to lose? What do you feel is at risk to protect or restore?”” (Informant 10, 2017). This lead to community members describing the issues in their community including overwhelming traffic congestion and issues of affordability, such as the existence of adult children of current residents who are unable to live in the community where they were raised. From these conversations about core community priorities, the biggest opportunities for advancing an effective, local carbon management agenda can be revealed:

[The approach] I iteratively have found most successful is...[focusing on] better community and better climate. If you identify the core community priorities, and then meld the agenda and the strategies around those, they’re much more palpable and meaningful and you also tend to have players in the community and players at city hall who are working on those priorities – so there is somebody working on economic development, there is somebody working on housing affordability (Informant 10, 2017).

Land use is central to nearly all of these activities and once these priorities have been defined, people who are working on them can be integrated into the process. Therefore, if there is one person working on the climate agenda out of hundreds or thousands of employees at a municipality, they will be able to deliver a far more effective plan if they can integrate the
carbon management agenda into a plethora of existing activities at that municipality (Informant 10, 2017).

It is very important to show community members how you plan on evaluating the very diverse strategies that have been brought forward and which items will be prioritized. To ensure this involvement occurs, they suggest having the public involved in identifying the criteria that will shape the strategies (Informant 10, 2017).

Informant 5, a staff member at the City of San Francisco shares similar sentiments:

“We firmly believe that any solution has to be a ground-up solution and any top-down model just doesn’t work.” They further stated “We should be collaborating on and trying to figure out all of these issues from the beginning so that when we do announce something, everyone can be jointly locking arms and saying “we’re in this together” (Informant 5, 2017).

Engagement criteria should include cost-effectiveness, potential for GHG reduction, ease of implementation, political feasibility, as well as co-benefits and the ability to contribute to core community priorities. A key community priority for one British Columbia municipality is the thriving forest surrounding the community. However, in this municipality, 65% of homes are single family dwellings. As a form of low-density sprawl, this development pattern has simultaneously decimated the forest cover within the municipal boundary (Informant 10, 2017).

This contradiction was revealed through the process of engagement and helped residents agree to a Climate Action Plan that had the impact of removing provisions for new single family dwelling areas in the community’s OCP. This is notable, given that it has been over 40 years since multi-family development occurred in this municipality in any significant way.

The benefits of undertaking community engagement are further exemplified by the Swedish City of Växjö. In the 1980’s the oil crisis lead this community to start taking environmental issues
more seriously. Engagement has been less crucial for educating the public there, because public education on environmental issues began over three decades ago. Now, topics of environmental responsibility are included in lessons at local schools, and it has simply become a part of day to day life for the citizens of Växjö. With regards to increasing energy efficiency, one strategy that worked well for residents of Växjö was providing them with the means to measure their day to day electricity use, to see precisely how much they save when they reduce their consumption (Informant 12, 2017). This was echoed by Informant 17, who emphasized the importance of getting the citizens on side with GHG emission reduction plans (2017). They explained that it is important to give the citizens a kind of ownership, rather than allow entities from outside of the community to take control.

Informant 13 (2017), a Councilor from the City of Vancouver explained that they have employed a very broad engagement campaign in relation to the Greenest City program, spanning multiple scales and multiple sectors. In 2009, the first year of the Greenest City program, an expert team was established to guide the development of the Greenest City metrics, to ensure progress is tracked and effectively valued (Informant 13, 2017).

With regards to public engagement, there are a variety of approaches that have been advocated for. Informant 13 (2017) insists that engaging at the ground level, with everyday citizens is necessary. One event combined an information session with live music. Despite charging money for tickets, the 300-seat venue sold out in 20 minutes. Then, after upgrading to a 2800-seat theatre, there was still a 1000-person waiting list (Informant 13, 2017). Events such as this are useful for providing a platform to speak to a large numbers of citizens, however Informant 10 (2017) suggests that engaging a large number of citizens can be a waste of limited time and resources. They described an event where 1 in 5 people were engaged at a 100,000-person Canada Day event while adding very little to their plan. For this reason, broad citizen
engagement is often something that should receive less attention (Informant 10, 2017). Higher levels of participation are often endorsed in theory, but unwelcomed in practice due to disagreements, power struggles and the like (Fenton et al., 2016; Pacione, 2014). This sentiment was echoed by Informant 9 (2017) - a staff member from the City of Surrey. They explained that the City of Toronto has made admirable progress, streamlining policy to reduce barriers for builders and developers installing solar panels on roofs. They explain:

[Toronto has] … done a lot without attracting the same media attention and scrutiny that Vancouver does for a lot of what they’re trying to do, so I think that in terms of actually making change without having to go through massive amounts of engagement and scrutiny, Toronto’s done a great job. In terms of educating the public as to why they’re making that change, Vancouver is probably a little bit louder; or it’s just the nature of the media [there] that their policy changes are often scrutinized (Informant 9, 2017).

Clearly there is support for developing proper engagement strategies from experts the world over, though tactics vary.

**STAKEHOLDER ENGAGEMENT**

Engaging the broad public is important, however this group is only one in a list of four stakeholder groups that should be engaged. In descending order of importance, engagement should take place with (1) municipal staff, (2) Council, (3) key community stakeholders and finally, (4) the broad public (Informant 10, 2017). A common challenge that a municipality can face is the presence of an overzealous employee who wants an exceptional plan, but doesn’t realize how critical it is to engage Council, and opponents within the community “...to develop a

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14 This highlights theme 2: Integrating municipal staff is more important than having an innovative plan.
plan that at least gets you down the ball field”. Though this hierarchy may seem rather intuitive, staff and council are often not at the top of the list when engagement is being considered (Informant 10, 2017).

Establishing targets within official municipal documents is important, however people are needed to implement them, and for this, having municipal staff that can share their expertise, as well as some of the work load, can be very effective in advancing carbon management plans (Informant 1, 2017; Informant 4, 2017). Also, there are likely staff members working on issues such as affordable housing and economic development within the municipal structure (Informant 10, 2017).

Oxford County has successfully integrated municipal staff, as was suggested by informants 1, 4 and 10 (2017). Staff from multiple departments sit on Smart Energy Oxford and contribute to the 100% RE Plan, which is exemplary (Pearson, Newton, & Roberts, 2014, p. 49). Smart Energy Oxford serves as a multistakeholder steering committee that effectively achieves part of the eight Building Block: increase horizontal integration. They have also worked to achieve vertical integration with this plan by increasing cooperation and integration with other municipalities across Canada; 6 provincial ministries in Ontario; as well as four federal ministries (Oxford County, 2018). With regards to the Ontario government, Informant 3 explained that they have consulted all of Ontario’s provincial parties, to discuss the 100% renewable energy plan (Informant 3, 2017). Though Oxford County’s engagement may seem less extensive than that of Vancouver, BC, or San Francisco, California, these places have reputations for being true outliers with regards to sustainable developments, and community support for progressive politics. As chapter 3.2.4 which focused on the wind energy dispute in Ontario made clear, at times a more variable political landscape persists in Ontario with regards to support for renewable energy.
One of the biggest limitations in developing 100% RE plans is the unwillingness of municipal staff working on carbon management plans to engage with local Council and get their fingerprints on the plan. Gaining support from Council is important, because if a course-correction is to occur, Council will be the only group able to lead (Informant 10, 2017). Key community stakeholders are another critical party to engage (Informant 10, 2017; Informant 16, 2017. For informant 16 (2017), a staff member at Nelson Hydro, in Nelson, BC, engagement is now a part of their daily work, ensuring that leaders within the community are well informed regarding programs occurring at the City of Nelson including the EcoSave program for retrofitting buildings, as well as initiatives such as the solar garden. Informant 16 (2017) explains:

So your average homeowner or resident might look to people who work at the hardware store or their real estate agent or their banker or their local community rotarian to know something about a program once its launched. ...Once it was launched...a homeowner would say to their neighbour who was a real estate agent ‘oh, do you know about this program that they’re launching?’ and of course the real estate agent would say ‘oh yeah, it sounds really good, you should definitely do it. It’s going to be super valuable and you can get rebates...” [Without this additional engagement]...people would have gone to the contractors that they trust and they would have shook their head and said ‘well, I don’t know what the city is doing.’ And it would have not created that credibility, and that homeowner would have had to take a leap of faith or just walked away... So, it’s very important to identify who those people are in your community because they are going to be doing your marketing for you (Informant 16, 2017).
Taking this approach, the City of Nelson had over 50 people sign up for the City’s energy retrofit program and within 3 months of launching, the program successfully reached its 2-year target of registrants.

Real estate developers and builders are key community stakeholders (Informant 5, 2017; Informant 10, 2017; Informant 16, 2017). Informant 10 (2017), explained that they often go into a community with a pre-conceived understanding of the best way to manage carbon and energy, only to discover unforeseen barriers that are known to local developers.

When San Francisco City staff were drafting laws requiring all new buildings within the city to be electric vehicle-ready, engagement activities were undertaken for a year and a half to gain insights from affordable housing developers and other developers in the City (Informant 5, 2017). Informant 5 illustrates the process of engaging developers on installing EV chargers in new buildings:

We got great suggestions from [developers], such as: ‘don’t require the actual charging unit; have us put in the wiring...make sure that every space is ready, but [wait] until someone says ‘hey, I have an electric vehicle, can I charge it? Then all they have to do is mount the charging station...so we removed that barrier... That was a great suggestion because we originally thought we should require them to install a few charging stations, just to see about the market in the building. But after having a conversation with [developers], we realized that we don’t want stranded assets. What’s the point of having a charging station sitting there if there isn’t a tenant with an EV? And you might as well let that person take advantage of whichever latest tech is available (Informant 5, 2017).

In this case, developers saved on costs, while new buildings remained adaptable to new future demand for EV charging infrastructure.
Going out into the community to work with key stakeholders is a strong approach to ensure that the public is educated as to which programs are being offered by a municipality. However, an often successful, more formal, and more collaborative approach is establishing advisory committees.

Citizen advisory committees, composed of local residents are one type of stakeholder committee that can be instrumental. Citizen advisory committees tend to understand the community in a way that staff do not, since the staff that work at the municipal office often do not live in the community (Informant 10, 2017). Informant 5 (2017) agrees that having citizen advisory committees can greatly add to municipal carbon management plans:

> On the specifics of how we engage with people, the mayor has a solar energy task force, he has different citizen’s advisory committees advising him on all of these issues and we do firmly believe that any solution has to be a ground-up solution and any top-down model just doesn’t work (Informant 5, 2017).

This approach was also used in Vancouver, to establish an expert committee to guide the development of their engagement campaign for Vancouver’s Greenest City Initiative (Informant 13, 2017).

Establishing advisory committees has been an instrumental method of increasing both support for, as well as participation in municipal carbon management initiatives. However, the potential for horizontal partnerships does not end with the forming of committees. The City of Vancouver established over 180 partnerships with stakeholders in the City that take a variety of forms. One such partnership is between the City and the University of British Columbia. UBC collects driftwood that washes up on Vancouver’s beaches to burn in their biomass plant, and in return, the City of Vancouver pays for 10 graduate students to work as scholars on the Greenest City Plan at the City of Vancouver for 4 months each summer (Informant 13, 2019). This
symbiosis works to benefit both parties involved, supplying a sustainable source of energy in the form of driftwood that would otherwise pose a cost to the City during collection and disposal.

Representatives from Oxford County also contributed to the development of the Building Blocks document, as well as the Kassel International Dialogue that preceded it (Boselli & Leidreiter, 2017; Agar, Buschmann, & Leidreiter, 2015). This is supported by the first Building Block:

Activate local resources, which states that:

It is important that local actors are not left to work in isolation. From the outset, local governments must gather and engage interested parties, forming broad coalitions of concerned local actors, organize workshops and roundtables or engage with local utilities and regulators from the very start (Boselli & Leidreiter, 2017, p. 14).

This document further suggests that establishing relevant institutionalized bodies, responsible for designing, implementing and monitoring the transition towards achieving 100% renewable energy be established and formalized. This is precisely what Oxford County has done with the establishment of its multistakeholder steering committee, Smart Energy Oxford. This steering committee is composed of stakeholders from the private, municipal and utility sectors, including about a dozen community energy experts and has a mandate to carry out Oxford County’s 100% Renewable Energy Plan. It includes representatives from all three electric utilities and one of the two natural gas utilities operating in Oxford County (Oxford County, 2018). This concept was further supported by Informant 9 (2017), who suggested that substantial progress can occur through consensus, and suggested that engaging with many government, utility, and professional organizations can lead to effective changes in regulations (Informant 9, 2017).

Section 1.1 of Oxford County’s 100% RE Plan (2018) emphasizes engaging residents, businesses, the various chambers of commerce, business improvement area organizations, not-
for-profit organizations such as religious and community groups, social service organizations, educational institutions from elementary to post-secondary (including partnerships with York University, Ryerson University and Western University), builder’s associations, agricultural groups, first nations, arts and culture sector as well as distribution and natural gas companies. The plan that Oxford County has established is a plan that, by design, will evolve through time. At this early stage, commendable progress has been made, with the development of a steering committee that integrates relevant major actors including utilities, business and industry. Finally, Section 1.2.3 of Oxford’s Plan states that “community development funds” will be available to provide seed funding to businesses and organizations developing sustainable community projects. Though much of Oxford County’s 100% RE Plan has yet to be implemented, the blueprint that it provides has merit.

5.4 Energy and Buildings

Section 5.4 is aligned with Theme 8: Building energy needs should be reduced in both new and existing buildings. To date, Ontario has reduced energy use in buildings through energy conservation programs, stricter requirements in the Ontario Building Code, product efficiency regulations, reducing GHGs in electricity content, and improved access to energy information for consumers (Ontario, 2016). Similarly, Oxford County’s 100% Renewable Energy Plan (2018) advocates for and describes best practices for increasing energy efficiency, enabling it to provide support to those in the building industry. It states:

Energy efficiency and energy savings are always the first step when planning a shift to renewable energy. The amount of renewable energy required to displace non-renewable energy resources is directly proportional to the amount of energy consumed; the less we consume to create the same services, the
less we will require in capital investment for our renewable energy systems. Effective energy efficiency planning must align with renewable energy needs assessment, in order to achieve 100% RE. Energy efficiency gains will reduce the amount of renewable energy required (p. 38).

There are a variety of methods that can be taken to reduce the energy requirements within the buildings in a community (Boselli & Leidreiter, 2017, p. 39). Retrofitting buildings makes them more energy efficient, while new buildings can be constructed to a standard that requires substantially less energy. When it comes to reducing energy in buildings these two approaches are very intertwined. As Informant 9 (2017) explains, the hardest, most expensive part of a building to retrofit is its envelope. Conversely, this is the easiest and least expensive part to build to higher specs at the time of construction. The mechanical systems of buildings that heat, cool and provide air circulation are conversely much easier to install after construction – and given that these systems generally require replacing between 5-20 years, they are far easier to retrofit (Informant 9, 2017).

6 informants stated the importance of retrofitting existing buildings, with two lamenting the fact of low fossil fuel costs making it harder to incent people to opt for retrofits (Informant 1, 2017; Informant 6, 2017; Informant 8, 2017; Informant 9, 2017; Informant 10, 2017; Informant 16, 2017). The contributions of Informants 6, 9, and 16 were most prevalent.

Retrofits for existing buildings are done differently, depending on the size and type of the building. Though the systems within single detached homes, and large commercial buildings can be very similar, the processes for developing them can be quite different (Informant 6, 2017; Informant 16, 2017). Further, it should be noted that in both small and large buildings, energy savings and GHG reductions can often be misaligned, since the hydroelectricity in BC is already very low in GHG emissions, while natural gas heating is GHG-intensive (Informant 9, 2017).
The City of Nelson, BC has been regarded as likely having the best building retrofit agenda in Canada (Informant 10, 2017). Since the early 2010’s, Informant 16 has worked for Nelson Hydro - the local electrical utility - helping municipal electricity customers make their homes and businesses more energy efficient by helping them access existing rebates through the City’s EcoSave Program. They further developed a financing mechanism and helped customers to navigate the various and changing requirements for new retrofits under different incentive programs, which is likely why there have been over 550 homeowners who have registered to the program as of summer 2017 (Informant 16, 2017). This highlights the value of creating a staff position to help local citizens take advantage of rebate programs. Similarly, Section 1.2 of Oxford’s 100% RE Plan explains that several opportunities to provide consumers with access to funding for energy audits and retrofits exist, and are often supplied by natural gas and utility companies, however there is no staff position in Oxford County to help residents navigate the various funding options (Oxford County, 2018).^{15}

Once a Nelson homeowner has decided to retrofit their building, a certified energy advisor performs a blower door test, allowing the homeowner to understand the performance of each of their windows and doors. The test also details how many gigajoules of energy the house is currently using and how much less it would use, given various interventions, such as a conversion to high performance windows, doors, and insulation (Informant 16, 2017).

Similarly, Informant 6 works as an engineer in British Columbia, focusing on large building retrofits. They work with clients on existing buildings to compose energy audits as well as retrofit large buildings to help them reduce energy consumption, greenhouse gas emissions and save money on energy costs (Informant 6, 2017).

^{15} This highlights the importance of having municipal staff working towards 100% Renewable Energy goals (Theme 2).
Depending on the building, retrofits can save 50% of energy consumption with a payback period of 2-10 years. Further, along with the BC carbon tax, the decline in the cost of technology have made retrofits more affordable. One project was completed for a private sector client with a large building in downtown Vancouver where the new HVAC system was brought in overnight. Thus, this retrofit project had no impact on the routines of the workers in the building, while making the building far more efficient, and making maintenance of the building’s heating and cooling systems easier for the building manager (Informant 6, 2017). Clearly, tiering is critical (Theme 4). Without funding and incentives from the provincial government, the longer payback period for retrofits would be too onerous for many clients to accept. However, there are times when a large building retrofit can be less expensive to retrofit with an electric heat pump, than installing a conventional gas boiler (Informant 9, 2017).

Nine informants that spoke to the importance of constructing energy efficient buildings (Informant 3, 2017; Informant 4, 2017; Informant 6, 2017; Informant 8, 2017; Informant 10, 2017; Informant 12, 2017; Informant 15, 2017). At the municipal level, creating new building standards is a challenge, given that Building Codes are provincial and not municipal documents. However, this is not to say that lobbying the provincial government to develop a building code that has more stringent requirements for energy efficiency would be without merit. Indeed, as Informant 10 (2017) explained, the British Columbia Energy Step Code (BCESC) was only established due to municipal actors pushing a moral imperative for the province to develop the new Code, with the aim of rapidly achieving more ambitious targets for building efficiency. This engagement with staff from municipalities across BC has been central to the development of one of the most progressive Building Codes in North America (Informant 9, 2017; Informant 10, 2017). The result was the BC Energy Step Code – a new building code in British Columbia that establishes a set of incremental improvements in efficiency above and beyond those required in
the BC Building Code, gradually leading the development industry in BC to construct buildings to a standard of Net-Zero Ready (NZR) by 2032 (Energy Step Code Council, 2017).

The BCESC is categorized into Lower and Upper Steps, with a higher level of efficiency required as the steps increase (See figure 8). The first Step of the ESC requires that builders calculate the energy use of the building and perform a blower door test, with energy efficiency requirements needing only to meet the level required under the pre-existing BC Building Code. This serves to familiarize builders with the Step Code. Every step thereafter leads to a Net Zero-Ready building – requiring 80% less energy to run.

This legislated update to the BC Building Code, ensuring buildings reach a high standard of energy efficiency is a very strong approach, which provides a level of consistency and predictability in the province’s housing market as it shifts towards a higher standard of practice (Energy Step Code Council, 2017). It was developed in concert with substantial engagement of
stakeholders and other relevant actors, and has been developed to be delivered in a stepwise fashion that will provide a slow enough transition for the development community to achieve the targets.

Informant 9 (2017) works for the City of Surrey as a Community Energy Planner, which includes working on policy and programs that the City has in the works relating to mitigating GHG emissions including those from buildings. Developers in Surrey have communicated that younger, first-time buyers are willing to pay a small premium for a more sustainable home. They explained that there is a negligible difference in the cost of building to the specifications of the BC Building Code and building to the lower steps on the Step Code, considering a high level of airtightness can be achieved with builders who are careful and pay attention to detail (Informant 9, 2017).

With BC Hydro producing 97% renewable energy (Informant 15, 2017), adding photovoltaic solar panels to rooftops would not have a great impact on reducing GHG emissions in the near term. However, reducing the quantity of natural gas that is needed to heat buildings would result in substantial reductions in GHG emissions from buildings.

Ensuring that the solutions that are being prescribed are place based and work for individual communities is also very important. In Surrey, for example, there is a considerable turnover of building stock. So, by-laws addressing new buildings can have a large impact (Informant 9, 2017). This could include incentives for increasing density, such as converting some of the 60 to 65% of existing single family dwellings to townhouses. This reduces GHG emissions because “[m]ulti-family housing (e.g. Duplexes, row/townhouses and towers) are less energy intensive than single family homes...because they share walls that reduce heat loss and are typically smaller, which reduce[s] heating demand” (Boston, Barrs, Pol, & Hendrickson, 2017; Canada Mortgage and Housing Corporation, 2016).
A common approach to building more efficiently is following various certification programs. Though many of the buildings will receive a rating, stating that it has reached a certain level of eco-friendliness, it is still possible for buildings that achieve an admirable level of certification to waste large amounts of energy due to tradeoffs permitted within the certification scheme (Birkeland J., 2014, p. 147; Safamanesh & Byrd, 2012). Further, since residential builders in Ontario who are interested in constructing buildings to a higher level of energy efficiency will be selling in a market where (a) high efficiency building cost slightly more, and (b) new houses are already very expensive, a market-level shift towards developing high-efficiency buildings has not occurred at a large scale. To illustrate this reality, in Oxford County, there is currently only one builder building beyond the comparatively low standard set by the Ontario Building Code, and they are building to the Energy Star standard (Oxford County, 2018).

There has been a stronger focus within this analysis on the BC Step Code because it is designed to not only develop energy efficient buildings, but rapidly shift the entire market so that all new buildings developed within British Columbia will have very low emissions by 2032. This change in the market towards building high efficiency buildings is an incredible feat, that cannot be overstated. By levelling the playing field between competing builders, the potential financial disadvantage that builders face who choose to do the right thing, and build to a higher standard is removed.

In absence of a new building code that shifts the building market towards very high efficiency buildings, Oxford County has moved forward with initiatives for building demonstration projects for high efficiency buildings including one multi-residential social housing building that will be owned and operated by Indwell Community Homes and built to the Passive House standard. It is being developed in Woodstock, will include 34 dwelling units and has been awarded funding from the municipality and province. Oxford County’s Waste Management Office is also one of
the first Net Zero Certified buildings in Canada, including 120 KW of solar energy that serve to offset the majority of the operation’s energy needs.

After recognizing, advocating for, and enabling the development of lower emissions buildings in a variety of ways, the only improvement to the 100% RE Plan regarding energy efficiency in new buildings would be to lobby the Ontario government to follow BC’s lead and develop an equivalent to the BCESC.

5.5 Tiering

In Canada, 100% renewable energy plans are most successful when there is sustained support from local, provincial and federal levels of government. The City of Victoria, BC’s OCP states, “As daunting as the task may be, we will not achieve real change in emissions without a reasonably coordinated overhaul of regulations at all levels of government - from utility governance at a federal level to state environmental protection processes to zoning at the municipal level” (p. 52)

Section 5 of the 100% RE Building Blocks (2017) explains further:

Consistent financial support from national, regional and local governments is essential to develop the renewable energy market and to stimulate the necessary participation of companies and private individuals in moving this transition forward. Financial support schemes should not only target renewable energy technologies but also energy efficiency and solutions to reduce consumption (Boselli & Leidreiter, 2017, p. 54)

As provincial governments change their mandates through time, provincially-funded retrofit program offerings often change as well. It can be challenging for residential customers to keep track of program start and end dates that can change somewhat frequently (Informant 16, 2017). Informant 12 (2017), from Växjö, Sweden echoed this sentiment, explaining that it is
important to have broad political cooperation, and not just four years followed by a change in direction. With broad political support, high-level goals are now commonplace in Växjö’s planning paradigm, such as including bus and bike lanes as part of the design when new buildings are developed. It is simply part of the process now (Informant 12, 2017).

As was discussed in Chapter 4.2, the Government of Ontario provided funding to support the development of a Community Energy Plan for the City of Woodstock - work that would otherwise not be possible due to budgetary restraints at the municipal level. Further, Informant 10 explained that funding from BC Hydro’s Sustainable Communities Program provided financing for planning staff; enabling meaningful work to be done at the municipal level in BC. The Provincial Policy Statement for the Province of Ontario also provides direction to municipal governments to develop communities to have a higher density of dwelling units, as was highlighted in Chapter 5.1. Provincial support for initiatives that align with plans to reach 100% renewable energy with regards to efforts made to reduce emissions from buildings are strongest in BC. The Energy Step Code was produced at the provincial level in large part, thanks to engagement with municipalities. The redevelopment of the BC Building Act was going in the wrong direction before municipal level engagement revealed that local government actors both knew of areas where modest improvements could be made and felt a moral imperative to do something to reduce emissions from buildings (Informant 10, 2017).

Support from the provincial government has also been instrumental to the success of large building retrofits. In Chapter 5.4, Informant 6 explained how incentives from the provincial government have been instrumental to gaining customers, as it enables the payback period of the retrofits to be reduced from 6 to 4 years in some cases. Without this reduced payback period, the retrofits would be too onerous for many clients to accept.
In California, support from the State has also enabled the City of San Francisco to move quickly with initiatives to transition to 100% RE. When the State of California announced goals to reach 50% RE by 2030 and 100% RE by 2050, San Francisco’s municipal government utilized that support to galvanize new plans to get to these goals on a shorter timeline (Informant 5, 2017). By ensuring that support is in place for transitioning to a 100% renewable energy-based economy, across levels of government, the likelihood that these plans will be successful is increase
Chapter 6

Conclusion

OBJECTIVE ONE

The first stated objective of this thesis is to identify the current progress toward reaching 100% renewable energy in Oxford County and identify any strategic gaps that need to be addressed to achieve their goal of reaching 100% renewable energy by 2050 at the community level.

In 2015, Oxford County consumed about 22.4 million gigajoules of energy from electricity, natural gas, gasoline and diesel, with 94% being produced with non-renewable sources. Energy from hydro and wind make up the remaining 6%. In Woodstock – the largest settlement in Oxford County, 56% of GHG emissions come from burning natural gas and oil for heat. Regarding renewable energy generation, there is some supportive wording within the OP, however it expresses more of a sentiment to change, rather than dictating rules that will make it so. To improve upon this, the County could utilize some of the strong policy found in Victoria, BC’s OCP regarding renewable energy development.

Oxford County’s OP features some policy supporting urban and rural development that enable communities to require less energy. This includes policies supporting infill development, secondary suites, compact urban form and restricting development within unserviced hamlets. However, stronger policies from the City of Victoria could be used to improve the existing policies. Further, there remains a 65% share of residential areas in Woodstock that are low density, as well as policy that supports 55% of future residential land development as low density. A more strategic approach would be to plan for a small fraction of future development
to be low density residential, and increase the density of dwelling units in the existing low
density areas, to a level that strongly support public transit and active transportation. This
would have the added benefit of reducing the average cost of servicing; paid for by all
taxpayers. The Community Energy Plan for Woodstock should also be seen as an
accomplishment for Oxford, however a stronger analysis that provides more direction for policy
development and measures emissions at the level of the individual would provide a clearer
frame for policy development.

With regards to green building, Oxford County has worked with various private actors to
establish Passive House Certified demonstration projects, which serve as examples for the local
development community to learn from. Without more stringent policy in the form of a
revamped Ontario Building Code, an industry-wide transition to building highly efficient
buildings is unlikely; and thus drastically reducing the aforementioned 56% of GHG emissions
that come from heating buildings will remain stubbornly high. However, Oxford County could
still see some progress made if they were to hire staff to promote all of the incentives that are
available from various levels of government and utility providers, and work with residents to
take advantage of these ever-changing incentive programs.

OBJECTIVE TWO

The second objective of this thesis is to set out best practices and recommendations for future
research in regards to achieving 100% RE in Oxford County and other municipalities across
Canada. This builds upon the strategic gaps that were described within Objective 1, above. To
reach 100% renewable energy at the municipal level, two different, yet complimentary
approaches are suggested: (1) increasing the share of renewable energy within the electrical
grid, and (2) reducing energy consumption within communities, with a somewhat larger focus
on land use planning techniques.
As was discussed in Chapter 4.2.2, energy mapping is a tool that should be utilized in all 100% RE Plans. It can effectively show which parts of a community are consuming the most energy, and emitting the most GHG emissions, while providing insight to council and staff as to where future interventions should be made to reduce emissions and energy demand.

Expanding renewable electricity in the form of wind or solar requires substantial and thoughtful engagement that ensures people in the communities where the energy will be developed benefit from the development and feel like their opinions are recognized and valued (Informant 1, 2017; Informant 5, 2017; Informant 10, 2017; Informant 14, Informant 16, 2017; Informant 17, 2017; Fast & Mabee, 2015; Fast et al., 2016; Walker and Devine-Wright, 2008). Further, it is important to integrate the council and staff at municipal governments, and key community stakeholders into the process of developing 100% renewable energy plans (Informant 10, 2017; Informant 16, 2017).

Reducing the total amount of energy required by a municipality is more easily achieved when settlements within that municipality are designed to be energy efficient. This includes increasing the density of dwelling units (Condon, 2010; Province of Ontario, 2014; Informant 10, 2017; Informant 14, 2017; Hurd and Hurd, 2012; von Hausen, 2013; Pearson, Newton, & Roberts, 2014), adding secondary suites (Condon, 2010; Informant 10; Boston, Barrs, Pol, & Hendrickson, 2017, p. 17; Pearson, Newton, & Roberts, 2014), and mixed-use development (Condon, 2010; Hurd and Hurd, 2012; Leinberger, 2008; Dunham-Jones & Williamson, 2008; Pearson, Newton, & Roberts, 2014).

Burning fossil fuels to heat buildings is a major source of GHG emissions in Oxford County, with 56% of emissions in Woodstock coming from burning natural gas and oil to heat buildings. Phasing in higher standards for energy efficient construction such as the BC Energy Step Code is an important way to shift the market for new buildings towards very high levels of energy
efficiency. Further, many governments and utility providers offer incentives for people to make their buildings more energy efficient, and it is advisable that local governments hire staff to encourage citizens to take advantage of these programs (Boselli & Leidreiter, 2017; Informant 16, 2017). Further, retrofits on HVAC, lighting and systems for controlling energy flow throughout large buildings can be relatively unobtrusive, and can save 50% of energy consumption with a 2-10 year payback period (Informant 6, 2017). Finally, building more multi-family housing, such as row houses and townhomes, which are less energy intensive than single family homes reduces energy demand (Boston, Barrs, Pol, & Hendrickson, 2017; Canada Mortgage and Housing Corporation, 2016; Informant 9, 2017). Finally, in Canada, 100% RE Plans are most successful when there is sustained support from local, provincial and federal levels of government.

There are a number of problems that could benefit from further research that were exposed during the course of this research. The following are recommendations for topics of future research.

First, the funding for municipal energy managers is often supplied by major utility providers. This has the potential to be a conflict of interest if the chosen policies are directly or indirectly impacted to avoid threatening the utility-provider’s profits. Research into the strength of policies that arise from staffers based on the organization that provides funding would be interesting to read. This could examine staffers who are funded by utilities, by the Federation of Canadian Municipalities, by the municipality for whom they work, or by a combination of any of these.

The second area of recommended future research is similar to the first, as it relates to staff hired to work on GHG emissions reduction plans. Local government staff that work on various climate strategies and GHG reduction plans can be funded as permanent staff, or receive
funding for a couple of years, with the potential for renewal. It would be interesting to see if research showing if cities that have permanent versus term staff end up having plans that lead to greater reductions in GHG emissions through time. It seems obvious that having a permanent staff member would result in a stronger plan. However, if this is true, then it could have implications for the common practice of hiring consultants to develop an action plan in collaboration with a local government; where after the task is completed, there is little-to-no contact between the local government and the firm that developed the plan.

Third, when municipalities compose their annual budgets, if an item is not listed, it usually will not receive funding. Similarly, if an OP does not contain policies that reduce the energy needs and projected emissions of a community, it is unlikely that development will occur in a way that emits less GHGs than business as usual. An emerging concept is adding a climate lens to municipal budgets as well as planning documents. This essentially means that a local government would need to consider the GHG emissions of all of its activities when the budget is being created, and when writing policy for official planning documents and by-laws. Going further, if a carbon budget were added to a municipalities budget, it could be a piece of policy that restricts activities from occurring if they are expected to emit more GHG emissions than are permitted in the budget. These tools seem to still be in early development, however if binding, they could substantially reduce GHG emissions. Any research into this emerging topic would be fascinating to read.

OBJECTIVE THREE

The third and final objective of this thesis is to extend thinking on conceptual and theoretical approaches to achieving 100% RE in particular relation to land use planning. The theoretical underpinnings of this thesis center around an understanding that human society’s current methods of acquiring energy are unsustainable in the long term, and that a near term, large
scale overhaul of humanity’s energy system away from one that emits GHGs is indeed, critical to sustaining human society in the long term. Converting human society’s energy systems to use 100% renewable energy will substantially reduce the GHG emissions that cause climate change. This would drastically reduce the negative impact that increased levels of atmospheric greenhouse gases have had on our common biosphere.

A major contribution of this work to planning theory, is linking renewable energy with land use planning, to achieve 100% renewable energy goals. Increasing energy efficiency is often seen as an important strategy for reducing GHG emissions, however utilizing land use planning tools, to create settlements that purposely consume less energy, is rarely a main focus, despite the value of this approach in community energy management being highlighted over 20 years ago by Jaccard, Failing & Berry (1997).

Municipal governments have the option to implement carefully considered planning practices, building practices, retrofit programs and engagement programs, to achieve substantial reductions in GHG emissions at the community level. Though reducing greenhouse gas emissions includes reducing emissions for things like ocean-going ships, transport trucks and forest fires, these are sources of emissions that are generally beyond the scope of influence for a municipal government. Thus, the approaches explained within this analysis that fulfill objective 2 have pinpointed areas were local governments can make meaningful reductions. Moreover, the various roles of the planner will need to be exercised to move this work forward, as the new and creative approach will require professional skill sets that go far beyond the classic role of the technical bureaucrat.

Replicating the methods of this paper may be challenging given that it was (a) researched using a case study method, and (b) utilized interviews from professionals across a subset of Western, developed nations. Another limit to replicability is that this paper took a County-level
focus, with one small city as the case’ policy focus. Given most other jurisdictions that are referenced in this paper are for medium to large cities, some parts of the analysis may apply less effectively. However, some parts of this analysis will remain quite generalizable.

The lessons learned regarding density and mixed-use apply at the neighbourhood level in settlements the world over. Further, energy efficient building techniques may mean different things in tropical and high latitude locations, but constructing buildings to require less energy will reduce energy demands regardless of which climate zone a building is constructed. Finally, the applicability of tiering will remain a generalizable finding in most jurisdictions. Support from upper levels of government will remain important for any local government looking to develop a 100% RE Plan. This is true for examples such as provincial policies that dictate how land use plans are to be implemented in municipal-level official plans, as well financial support for municipalities to hire staff to develop 100% RE Plans.

Over the two or more years since the research for this paper began, the number of jurisdictions in Canada that have started working toward 100% RE goals has grown from 2 to well over a dozen. As the need for GHG reductions becomes a more and more pressing issue, concepts from this research will likely become routine parts of the planning process, ensuring urban and rural developments follow a path in line with a low GHG-emission future.
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Appendix 1: Letter of Information and Consent

Letter of Information and Consent Form

May 9, 2017

“Examining the role of municipal-level government in accelerating renewable energy adoption and application: a case study of Oxford County, Ontario”

Principle Investigator: Matt W. Murray
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Supervisor: Dr. Graham Whitelaw, Professor
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In reading this letter, you will be provided with a complete overview of the master’s research study being conducted by Matt Murray under the supervision of Dr. Graham Whitelaw of the School of Urban and Regional Planning at Queen’s University in Kingston, Ontario, Canada. The information provided will assist you in deciding whether or not you wish to participate in the research project.

This master’s thesis is a case study of Oxford County, Canada’s Draft 100% Renewable Energy Plan. The main objectives of this thesis include: (a) extend thinking on conceptual and theoretical approaches to achieving 100% RE found within the literature, (b) identify the current state of renewable energy in Oxford County, (c) identify the gaps in knowledge that need to be addressed to achieve the goal of 100% RE by 2050 in Oxford County and (d) set out best practices and future research for renewables in Oxford County and achieving 100% RE by 2050. I am conducting 15 to 20 interviews with professional planners, government employees, professors and employees of NGOs to help provide me with a better understanding of how professionals in jurisdictions in Canada and abroad have developed renewable energy from a policy and/or planning perspective.

You are invited to take part in this study through a semi-structured interview. If you agree to take part, I will interview you for approximately 45 minutes via telephone or Skype. The interview will be audio-recorded.

Approximately 3-5 business days before our scheduled interview, I will email you an interview guide. This interview guide will contain a list of discussion topics and questions that will be asked during the interview. I will also provide you with a copy of the Consent Form and review this Letter of Information with you, prior to the interview occurring.

Following the formal introductions and answering any questions you may have about the study, we will begin the semi-structured interview. The interview will be recorded using an audio recorder in order to allow myself the ability to refer to recordings and confirm handwritten notes.
at a later date. After the interview questions, there will be time for you to ask questions of me that are related to this study, and wrap up our interview.

There are no known risks for taking part in this study and while there are no direct benefits to you as a participant, the study results will help contribute to a growing body of literature on the development of renewable energy from a land use planning and public policy perspective.

Your participation in this study is voluntary. If you do not want to answer some of the interview questions, that is fine and we can still continue the interview process. You can stop participating at any time. After the interview, you may withdraw from the study until July 28, 2017 by contacting me at m.murray@queensu.ca.

I will keep your data securely for five years, after which time I will destroy it. Your confidentiality will be protected to the extent possible by replacing your name with a pseudonym for all data and in all publications. The code list linking real names with pseudonyms will be stored separately and securely from the data. I will be the sole individual with access to this data. This will prevent the identification of individuals based on their name or position.

I hope to publish the results of this thesis in academic journals. However, I will never include any personal information, such as your name, with quotes, and I will do my best to make sure quotes do not include information that could indirectly identify participants. During the interview, please let me know if you say anything you want attributed to you or to be quoted.

Any questions about the research or study participation may be directed to Matt Murray at m.murray@queensu.ca or Dr. Graham Whitelaw at whitelaw@queensu.ca.

If you have any ethical concerns, please contact the General Research Ethics Board (GREB) at 1-844-535-2988 (toll-free in North America) or 613-533-2988, or email chair.GREB@queensu.ca.

This Letter of Information provides you with the details to help you make an informed choice. All your questions should be answered to your satisfaction before you decide whether or not to participate in this research study.

Keep one copy of the Letter of Information for your records and return one copy to the researcher, Matt Murray. By signing below, I am verifying that I have read the Letter of Information and all of my questions have been answered.

Name of Participant: __________________________________________

Signature: ____________________________________________________

Date: _________________________________________________________
Appendix 2: Interview Questions

As was described in Chapter 2 – Methodology, the development of this thesis took an iterative approach, known as the constant comparative method (Glasser & Strauss, 1967, as cited in Merriam 2009). As new information was gained, the interview questions evolved to include a stronger focus on energy efficiency, energy conservation and urban planning.

This is the first iteration of interview questions:

1. Please describe your professional role as it relates to renewable energy and/or urban planning.

2. What barriers or challenges have been present while developing renewable energy?

3. In your experience working with community members, have you seen any change or evolution in how they see renewable energy development?

4. What public engagement techniques have you used in the context of renewable energy? If you have found that some approaches work better than others, why do you suspect this difference exists?

5. In what ways has urban planning influenced the evolution of renewable energy development? Has it been a help or a hindrance?

6. In your opinion, which are the leading jurisdictions that have established renewable energy?

7. What do you think are the most important lessons from your experiences with renewable energy that should be shared with other communities?

8. Based on your experience, what significant policy changes have occurred and need to occur in order to increase the proportion of renewable energy?

9. Are there any publications or literature that has influenced your thinking regarding the value of renewable energy development?

10. How have you seen the price of renewables impact the pace of implementation?

11. What successes or opportunities have arisen from your efforts to implement renewable energy?
This is the final iteration of interview questions:

1. Please describe your professional role as it relates to renewable energy, energy conservation, energy efficiency and/or urban planning.

2. What barriers or challenges have been present while developing plans for renewable energy and energy conservation/efficiency?

3. In your experience working with community members, have you seen any change or evolution in how they see renewable energy development and/or sustainable land use development?

4. What public engagement techniques have you used in the context of renewable energy and reduction of GHG emissions? If you have found that some approaches work better than others, why do you suspect this difference exists?

5. In what ways has urban planning influenced the evolution of renewable energy development and energy conservation/efficiency? Has it been a help or a hindrance?

6. In your opinion, which are the leading cities, states, provinces, regions or nations that have established renewable energy and energy conservation/efficiency?

7. What do you think are the most important lessons from your experiences with renewable energy and energy conservation/efficiency that should be shared with other communities?

8. Based on your experience, what significant policy changes have occurred and need to occur in order to reduce GHG emissions?

9. Are there any publications or literature that has influenced your thinking regarding the value of renewable energy development and energy conservation/efficiency?

10. How have you seen the price of renewables impact the pace of implementation?

11. What successes or opportunities have arisen from your efforts to implement renewable energy and/or energy conservation/efficiency?