Community Energy Planning From the Ground Up:

Developing an Integrated Energy Plan

By

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Abstract:

Community Energy Planning and Green Urbanism initiatives have been embraced by governing bodies to reduce their carbon footprint and achieve energy security. Although authorities have embraced ideal visions of sustainability, they have largely been unable to achieve their goals. In this paper, I begin by examining the different aspects of Green Urbanism and how it can be implemented at different scales. Next, I examine the process known as Community Energy Planning and how it can be used as a tool to achieve energy democracy. This requires a comprehensive analysis of existing legislation with respect to energy management and sustainable development in Ontario. My analysis reveals that existing sustainable guidelines and energy conservation initiatives are most often voluntary programs, vaguely outlined, and often subject to misinterpretation. This results in a gap between planning and implementation that hinders the development of low-carbon communities. In seeking to identify the underlying issues, I analyze how the influences of neoliberalism pose considerable barriers for the effective implementation of CEP. Next, I examine six case studies where community power projects have successfully been implemented in Europe, Central America, and Canada in order to identify alternative models. I identify several challenges in Ontario in terms of replicating these models and using CEP as a way forward to achieve green urbanism. Common issues include high upfront capital costs, high risk, lack of technical knowledge and experience, and legal and regulatory barriers. Lastly, as a way of addressing these issues, I present key considerations towards integrating energy management and land use planning processes in order to formulate more holistic approaches, from a bottom-up and community-driven approach, towards achieving energy democracy and green urbanism ideals in Ontario.

Keywords: Community Energy Planning, Green Urbanism, Energy Democracy, Community Power, Ontario

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Foreword

Upon starting my MES academic career, my Plan of Study (POS) initially focused on green urbanism and explored the different approaches to sustainable development and environmental planning, including green building design and net-zero building. This entailed an examination of the concepts and terms rooted in green urbanism principles such as 'sustainability' and 'biophilic' design. Following my 2-3 MES exam, I delved further into research on green urbanism and the practice of net-zero building. In examining cases involving net-zero developments across Ontario, I found that most are new, low density, greenfield projects that often require high upfront costs. Upon analyzing key planning policy frameworks, I concluded that focusing on building medium-density, better utilizing existing infrastructure, preserving green spaces, and retrofitting existing buildings are more aligned with Ontario's long-term climate change targets.

With this new understanding and a change in interests with respect to urban energy planning and renewable energy technologies, my research focus shifted to community energy planning, while examining how it is connected to, and a key part of green urbanism. Planning for 'energy' is rarely (and vaguely) used in the language of current planning documents (Provincial Policy Statement and Planning Act). This highlights a gap between energy planning and land use planning in Ontario. Urban planning and policy could be used to better manage energy production and consumption in urban developments. As such, my major paper aims to identify the challenges of integrating climate change considerations into the current planning system – using policy instruments such as Community Energy Plans (CEP).

Through my learning objectives, I thus sought to attain a more thorough understanding of Ontario's policy frameworks that have shaped the province's approach towards sustainable development and energy management, investigate how urban governance, politics, and neoliberalism have influenced the implementation of sustainable initiatives in Ontario, research innovative approaches to sustainable energy projects implemented around the world, and explore alternative models through which governing authorities can build capacity, leverage resources, and develop technical knowledge in order to better implement climate change initiatives and mitigate carbon emissions within communities. Moving forward from my initial POS research focus on green building design and net zero building, the principal objectives of my paper

therefore changed in order to explore how urban planning, climate change policy, and sustainable energy management could be integrated to develop practical approaches towards reducing GHG emissions and help Ontario create more sustainable communities.

To fulfill my learning objectives, I began by conducting a literature review of the key concepts associated with green urbanism and community energy planning and examined how CEP can be a viable tool for achieving green urbanism and energy democracy ideals. Next, I analyzed key policy frameworks with regards to energy management and sustainable planning in Ontario in order to attain a more comprehensive understanding of the underlying issues associated with implementation. As part of my field placement at Toronto Renewable Energy Co-operative (TREC), I gained valuable experience and in-depth perspective with respect to understanding the challenges with developing sustainable energy initiatives. While there, I analyzed 22 CEPs published by municipalities across Ontario, conducted background research on case studies on renewable energy projects across various jurisdictions, and interviewed key practitioners and renewable energy experts. The position therefore directly coincided with my learning objectives that aimed to better understand community energy planning, investigate its underlying issues, as well as explore alternate strategies. I also attended workshops, webinars, and conferences on sustainable energy, urban planning, and energy conservation in order to learn about current trends in clean energy, and understand the underlying issues that have hindered the growth of the renewable sector in Ontario.

I believe this multifaceted approach in the form of academic courses, internship placements, in-depth interviews with major actors in the energy sector, attending workshops and conferences, and undertaking a field workshop course abroad enabled me to develop a holistic perspective when it came to achieving my learning objectives, while also helping me to suggest improved methods for integrated urban and energy planning.

Introduction:

As the global shift towards cleaner energy sources gains traction, there has been gradual build up of interest in local communities in Canada who are considering more environmentally-friendly technologies in order to reduce their overall greenhouse gas emissions and reduce dependence on fossil fuels. Given that buildings and transportation collectively account for approximately 35% of Canada's total greenhouse gas emissions, the need for climate change strategies to target these major sources becomes imperative, along with implementing more comprehensive sustainable planning practices and adopting better energy management strategies (Environment and Climate Change Canada, 2015). Advances in renewable energy generation and green design technologies are clearing new pathways for sustainable development.

There are several caveats and underlying issues that must be addressed however. Factors such as weak policy frameworks, lack of coordinated efforts between governing bodies, inconsistencies with respect to implementing sustainable strategies, and the politics of urban environmentalism present major challenges for sustainable development. The upfront costs associated with developing energy projects and adopting green infrastructure in communities also creates barriers for implementation. These issues can be linked to neoliberalism, which creates significant challenges for environmental planning and often deters public and private sectors from investing in sustainable features. Furthermore, the planning/implementation gap between governing bodies and local communities leads to additional constraints. It has thus been claimed that the major obstacles are not technical issues, but are rather embedded within the political processes of decision-making and allocating resources (Connelly et al., 2009). Planning for energy has also sparsely (and vaguely) been used in the language of existing planning documents in jurisdictions across Ontario (such as the Provincial Policy Statement and Planning Act). More integrated urban and energy planning policy frameworks could be used to better manage energy consumption and help communities in Ontario meet their emissions targets.

The principle objectives of this paper are to better inform the process of community energy planning and green infrastructure planning in Ontario. It will also explore how urban planning, climate change policy, and sustainable energy management could be integrated to develop feasible approaches towards reducing greenhouse gas emissions and building more resilient Canadian communities. To facilitate a better understanding of the sustainability

movement, it becomes necessary to trace the development of the practice of 'green urbanism' and the history of energy management, as well as examine the policy frameworks associated with energy conservation and sustainable development. This also requires a comprehensive analysis of the underlying challenges and critiques associated with their implementation. These include the ambiguous definition of sustainability, the politics of urban governance, and neoliberalism. In seeking solutions, the research paper will look at how Community Energy Plans (CEPs) can be used as an integrated tool for governing bodies to build more sustainable and inclusive communities. This entails a cross-examination of six case studies that focus on community power projects that were successfully implemented in Canada, Central America, and Europe in order to identify alternative models towards achieving energy democracy and attaining sustainable goals.

Ultimately, I hope to present key considerations for formulating a community-driven approach towards energy management, examine potential pathways for stimulating political and community support, and explore ways by which energy management could be more inclusive and better integrated into the regulatory frameworks and planning processes of jurisdictions in Ontario.

In Chapter 1, I conduct a literature review of the main concepts associated with green urbanism and community energy planning. In Chapter 2, I begin by looking at the history of energy management and development in Ontario. This is followed by an analysis of key policy frameworks and regulatory guidelines with respect to urban planning and energy management in in the province. Chapter 3 delves into the underlying issues and challenges associated with achieving green urbanism and energy democracy, with an emphasis on investigating how neoliberalism and urban governance greatly influence energy planning in Ontario. In the subsequent Chapter 4, I explore six case studies that were chosen to represent comprehensive approaches towards implementing community-focused, sustainable energy projects. I conclude this chapter by highlighting the major barriers and underlying issues with regards to replicating similar models in Ontario. Lastly in Chapter 5, I explore alternative models and key considerations for developing an integrated system of community energy planning.

Research Design and Methodology:

In this paper I critically explore the concept of "green urbanism", with a focus on community energy planning. To address the complex issues and challenges pertaining to community energy planning, my research methods were mixed and included theoretical analysis, gathering of empirical data, attending meetings and workshops, and in-depth qualitative interviews. The first component of my research comprised of a literature review of green urbanism, sustainability, community energy planning, community power, and energy democracy in order to develop an holistic understanding of the entrenched issues associated with energy planning and sustainable development in Ontario. Next, I conducted a comprehensive analysis of community energy plans and Ontario's legislation that have shaped its approach towards energy management, green infrastructure development, and land use planning, while simultaneously evaluating their performance (Green Energy Act, Community Energy Plans, Toronto Green Standard, Ontario's Long Term Energy Plan, Growth Plan for the Greater Golden Horseshoe).

Due to the inherently complex nature of the topic, it also became necessary to conduct an in-depth review of the key issues and challenges often associated with green urbanism and community energy planning. External factors such as neoliberalism, the politics of urban governance, public perception, and industry lobbying all play an instrumental part in affecting the process of planning and developing energy projects across the province.

The paper subsequently examined case studies involving community power projects across Canada, Central America, and Europe. These case studies facilitate an understanding of the underlying challenges pertaining to community energy planning across the world. In examining these case studies, I investigated different approaches towards achieving green urbanism and sustainable energy management. It also became necessary to examine green urbanism from the ground up. This required an examination of community level engagement in decision-making and in formulating community energy plans. My hope is that these findings could better inform and facilitate decision making processes when it comes to adopting sustainable initiatives and implementing community power projects.

My research methods also included conducting four in-depth semi-structured interviews with key informants chosen by non-random sampling: one community power practitioner, one representative of a network of renewable energy cooperatives, one expert in the field of energy management, and one state representative at the corporate level with experience in administering

and formulating a municipal community energy plan and implementing sustainable initiatives. This process served to gauge the underlying challenges associated with energy management and the implementation of community power projects. All my interviews were conducted in person and by phone from October 2017 to June 2018 and lasted an average of approximately one-hour. Prior to conducting interviews, I formulated a list of primarily open-ended questions for respondents (see Appendix A). These questions were designed to allow flexibility and were tailored to address specific individuals in order to facilitate a seamless conversation. This process was conducted in accordance with a research ethics protocol approved by the Faculty of Environmental Studies at York University. All my interviewees were provided with written Informed Consent forms that officially declared my research objectives (see Appendix B). In addition, I also attended workshops, conferences, and webinars pertaining to renewable energy, energy storage, and green infrastructure development as an independent observer/researcher (see Appendix C for a list of these events). These experiences provided invaluable insight with respect to the major problems of implementing green urbanism and community energy planning.

It is important to note that my seven month internship experience at Toronto Renewable Energy Co-operative (TREC) during the course of my graduate studies yielded tremendous insight with respect to understanding the complex issues associated with implementing community power projects. My role as a Research Assistant at TREC involved conducting background research on community power/ community energy planning, looking at case studies in Ontario and other jurisdictions, and interviewing key practitioners and renewable energy experts. Key assignments also included analyzing relevant policy environments and performing economic modelling in order to evaluate potential business opportunities. Because the eventual goal of the placement was to assist in the development of toolkits targeted at renewable energy co-operatives and municipalities to broaden the acceptance for community power projects, the position directly overlapped with my Major Paper objectives that sought to better understand community energy planning. The data I collected at TREC and in undertaking this paper were both qualitative and quantitative in nature and my study comprised of primary and secondary sources.

The final component of my research paper involves exploring alternative models to existing community energy planning systems. Here, I present key considerations for developing integrated urban energy plans in Ontario in order to bridge the planning-implementation gap.

This includes developing comprehensive community energy planning processes, finding synergies between municipalities and co-ops, taking advantage of emerging trends towards energy democracy, exploring financial mechanisms, and making legislative amendments to improve community energy planning processes. This section also reflects upon my research findings and looks into the possibilities and constraints of implementing these solutions in order to better coordinate top-down and bottom-up approaches for the future of community energy planning.

Chapter 1: Theoretical Framework and Literature Review

What is Green Urbanism?

Green urbanism suggests a radically different way of urban living in different urban spaces and processes. It has been defined as the practice of designing sustainable urban spaces that are supported by accessible transit, open green spaces, and community services (Lehmann, 2010). This is why green urbanism, by its definition, is inherently interdisciplinary. This concept requires the collaboration of landscape architects, engineers, urban planners, ecologists, designers, energy analysts, sociologists, economists, and other specialists (Lehmann, 2010).

The foundations of green design are based on concepts that stem from landscape ecology, where the common goal is to optimize the functioning and resilience of ecosystems (Marcucci and Jordan, 2013). One definition of resilience is "the ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change" (Dale and Newman, 2006). In the context of the built environment, community resilience can be used to describe how the features and design elements of an urban neighbourhood can withstand adverse environmental conditions such as storms and floods. It can also be interpreted as how humans anticipate and prepare for the future to a much greater degree than ecosystems can (Dale and Newman, 2006). In the context of 'social resiliency', it becomes more difficult to define and interpret resilience due to the complexities with human dynamics and social networks within a community. However, it can be measured "using indicators such as the variability of income, stability of employment, wealth disparity, and demographic changes" (Newman and Dale, 2006, p. 21).

History of Green Urbanism:

Although the origins of green urbanism are difficult to trace, its founding principles can be linked to prominent urban scholars such as Lewis Mumford and the renowned landscape architect, Frederick Law Olmsted, during the emergence of professional urban planning in the late nineteenth century (Eisenman, 2013). The Green urbanism movement was a part of a holistic vision that sought to directly address issues such as increasing population growth, pollution,

energy security, and the destruction of natural ecosystems. Rising awareness with respect to the ecological footprints associated with cities and the progress made towards documenting and measuring them catalyzed this shift in thinking (Beatley, 2000). Many large American cities during the industrial revolution were undergoing rapid urban development and reflected a wasteful use of resources. This is best encapsulated by the great American historian Lewis Mumford's stance on the modern city, who critiqued it as a place that is ridden with congestion and pollution (Mumford, 1961). Green urbanism sought to rectify these urban problems and attempted to shape more sustainable places, communities, and lifestyles. This new vision also encapsulated the necessary programs, policies, and innovative designs and concepts that aimed to achieve urban sustainability (Beatley, 2000). For example, this included introducing policies and guidelines to minimize the dependence on automobiles and promote transit use, finding methods to reduce waste production, embracing sustainable building features such as green roofs, increasing the availability and accessibility to green spaces, and implementing renewable energy initiatives in order to localize energy generation (Beatley, 2000).

It is also important to mention Ebenezer Howard's Garden City model that spurred the idea of the 'eco-city', which is commonly linked to green urbanism. Similar to Lewis Mumford, Howard was also discontented with the social and environmental consequences stemming from industrialization. The planning elements featured in his concentric ring diagram included a central park, radial roads, zoning for different land uses, abundant open spaces, and a greenbelt (Clark, 2003). Howard is the most notable figure associated with the greenbelt concept, which is now employed as a policy tool adopted by various contemporary urban centres (Keil and MacDonald, 2016).

Application of Green urbanism:

Although the concepts of green urbanism are drawn from various branches of ecology such as ecosystem ecology, community ecology, and pollution ecology, their application in urban planning, energy management, and other human systems is more extensive, and applied at different scales. Green urbanism can be implemented from the design and construction of individual buildings to the everyday lives of citizens. For example, such a lifestyle would include shorter commutes that use public transit, investing in locally produced food and products,

reducing and recycling waste, increased access to green spaces, and consuming electricity produced from renewable sources. These activities would ultimately contribute to an overall reduced carbon footprint per person compared to more mainstream everyday life. The principles of green urbanism therefore entail efforts to reduce the consumption of energy, waste, and water during the different stages of a building or neighbourhood's life cycle (Lehmann, 2010).

Green design is a part of green urbanism, in that today's urban and architectural design elements have to consider a building's use of energy and materials over the course of its lifecycle, operations such as for lighting, heating and cooling, as well as changes in its use (Lehmann, 2010). As such, green urbanism can be implemented at the individual household or dwelling unit level through improved insulation, triple-glazed windows, efficient ventilation systems, air-tight construction, bio swales, and low-carbon building materials" (Cervero and Sullivan, 2011, p. 210). One concept that is often associated with green design is known as 'Biophillic design', which involves creating urban environments that are designed with better integration with natural ecosystems (Wilson, 1984). Elements of biophilic design such as green vegetation and biowalls in buildings for example, are claimed by researchers to provide various benefits to residents in the form of increased resiliency and regenerative capabilities, clean water, and the cleansing of urban air (Marcucci and Jordan, 2013).

At the community scale, green urbanism principles can be implemented through infrastructure provision, where green infrastructure planning can reap numerous economic, social, and environmental benefits. Integrating elements of green design such as green roofs, biowalls, and other vegetation into the built environment can build resiliency and make cities more versatile when facing the adverse effects of climate change (Cervero and Sullivan, 2011). With green urbanism, surface parking lots and paved surfaces are also replaced with community gardens and parks such that the 'urban heat island effect' is reduced and storm water management systems are improved (Cervero and Sullivan, 2011). This also has the added effect of disincentivizing automobile use. In terms of energy generation and usage, green urbanism entails designing communities that are more energy efficient and have a reduced carbon footprint. It also seeks to tap into renewable sources of energy such as from solar and wind, as well as biofuels generated from organic waste. Transit-oriented development is also a key part of green urbanism, which aims to create places that are compact and accessible through a variety of transit options (Cervero and Sullivan, 2011). The core principles also aim to redesign cities that are sprawled out

and disconnected into more compact developments that are of medium-density, while achieving a balance of residences and employment (Lehmann, 2010). By locating residential centres in close proximity to mixed-use developments, green urbanism can further aid in achieving social sustainability by creating accessible communities that support a variety of building types and mixed-income housing options. This may also help to address issues of social equity and marginalization through the development of more integrated neighbourhoods that comprise of a diverse population (Lehmann, 2010).

Green urbanism also extends to the broader, regional scale as its concepts focus on enabling cities to assist in regenerating ecological systems. Habitat loss and fragmentation are common consequences of urban development, which is evident across a majority of metropolitan areas in North America. Connecting green corridors in urban regions can effectively maintain ecosystem services by protecting these natural habitats and sustaining biodiversity (Rudd et al., 2002). "Ecosystem services" is broadly defined as "the biophysical and social conditions and processes by which people, directly or indirectly, obtain benefits from ecosystems that sustain and fulfill human life" (Millennium Ecosystem Assessment, 2005). It is a concept that involves the use of sustainable management practices and the conservation of natural ecosystems as part of an overall adaptation strategy to mitigate the adverse effects of climate change in vulnerable communities, while at the same time providing co-benefits for both people and biodiversity (Conservation International, 2017).

In the context of land use planning, green urbanism principles can be adopted through an ecosystem services approach. Here, planners and developers can perhaps allocate more resources towards conserving natural resources and overcome the bifurcation between nature and urbanity. In urban settings, an ecosystem services approach may take the form of integrating ecological systems and the services they provide within the built urban environment (Cowell and Lennon, 2014). Our current planning practices separates the built environment from natural ecosystems. In addition to building resiliency however, greening the built environment must also be functional. Connecting green biological corridors in urban regions can effectively maintain ecosystem services by preserving natural habitats, sustaining biodiversity, mitigating storm water runoff, and providing ecological benefits. The City of Stockholm for instance has made progressive strides towards reducing its carbon emissions. It takes the unique approach of merging natural habitats and urban public transport systems such walking/cycling trails together. The city's green

networks have the dual function of preserving natural ecosystems, while also creating recreational open spaces for physical activity. Furthermore, it applies various innovative techniques in its built environment that embrace natural ecosystems. These include integrating various sustainable design elements such as community gardens, large and heavily planted residential courtyards, and infiltration beds installed along boulevards that collect storm water (Lennon, 2014). Stockholm has also committed to limiting the growth of its street infrastructure to enhance social connections by creating a dense urban core, while focusing on improving public transit and pedestrian accessibility (Erixon et al., 2013). This combination of progressive design strategies has effectively lowered its greenhouse gas emissions and has made Stockholm a sustainable model for other cities.

In the context of energy planning, research has shown that designing urban environments with green spaces, green roofs, and parks can reduce the average temperature within urban environments, thus mitigating the 'urban heat island effect' (Cervero and Sullivan, 2011). This can lead to reduced energy consumption in buildings and homes, thereby reducing carbon emissions and electricity usage during peak usage times (such as during the day when temperatures are high), and also increasing the stability of urban electrical grids. Green urbanism can therefore be considered a holistic practice in urban and energy planning that has the potential to support greener everyday urban life and the creation of greener urban spaces. The concepts behind it could be embedded into planning practices and adopted by decision makers and planners in order to plan for a more sustainable future. However, there are various underlying social, cultural, and political challenges that must be addressed. Green urbanism ideals are often implemented inconsistently across governing bodies, as there is much misinterpretation when it comes to defining key terms such as 'sustainability'.

Definition of Sustainability

The ambiguous nature of the term 'sustainability', has made it difficult for authorities and urban planners to settle on a clear-cut, idealized model or approach to urban design (Jabareen, 2006). Political and economic discourses, cultural narratives, and corporate cultures across different industries often shape the concepts that characterize 'sustainability' and formulate these approaches. One of the most common definitions of sustainability is the "capability of being maintained at a certain rate or level" (Moore et al, 2017). In the context of business and

organizational innovations, sustainability is regarded as "the point at which new ways of working become the norm and the underlying systems and ways of working become transformed in support" (Moore et al, 2017). In public transportation planning, sustainable approaches are determined by their impact on the environment and society and are driven by three components: environment, society, and the economy (Patlins, 2017). These various definitions of sustainability are scattered across multiple sources of information and are inconsistently described in current literature, thereby making it problematic to find a perfect definition.

Sustainability is sometimes used as an instrument to attract interest or stimulate demand. Embracing green design elements often involves significant upfront capital costs and this has produced the major challenge of retrofitting existing neighbourhoods and implementing green design features in new developments. Private developers regularly market 'sustainability' to their clients, sometimes misleadingly. Sustainability in this case, therefore functions as a tool for creating attractive urban spaces in order to enhance public perception and reinforce competitiveness on the global market. This is known as the 'sustainability fix' (While et al., 2004). This often presents a notable obstacle for implementing green design. Corporations and businesses can also employ techniques to falsely promote their products and services under the label of being "environmentally friendly" (Marquis et al., 2016). This is often carried out through false advertising, where renderings and animations feature attractive green products that are not accurate representations of the final design scheme. This is known as 'green washing', which is defined as "the act of disguising efforts to create attractive developments" (Gallicano, 2001).

Social Sustainability

One of the principles behind green urbanism involves striving to achieve social sustainability (Lehmann, 2010). Scholarly literature defines it as one of the pillars of sustainability that focuses on the connections between an individual's quality of life and the institutional processes that shape and influence it (Slade and Carter, 2017). In an increasingly performance-driven and profit-oriented neoliberal economic system, governing authorities self-limit their capacity to deliver desirable social outcomes such as equality and mobility. The concept of sustainability is also often connected to building performance, by considering the way in which people use spaces and how they influence their wellbeing (Hansen and Schaltegger,

2016). Green urbanism thus seeks to achieve social sustainability by addressing issues of urban poverty, vulnerability, lack of affordable housing, marginalization, and social exclusion, in order to improve the quality of life for residents. This suggests that both green urbanism and social sustainability are fundamentally critical of neoliberalism. It is important to note that terms such as 'equity' and 'social justice' are one of the most significant ethical principles of social sustainability (Slade and Carter, 2017). There are basic psychological needs that people have in relation to their living environments. Social sustainability comes into play in urban design and green infrastructure planning by looking at these psychological needs and human wellbeing when designing how people use and enjoy spaces (Hansen and Schaltegger, 2016).

In this paper, I take the term 'green urbanism' to mean a holistic concept that is multi-scalar in nature and stretches from individuals to the entire urban region. It involves multiple actors including citizens, governments and their agencies, boards and commissions, corporations and non-profits. It also encompasses policy documents in urban and energy planning and involves establishing an integrated approach towards energy planning. Lastly, it touches aspects of everyday life like the individual home, the workplace and transport, while also addressing questions of social and environmental justice. Green urbanism thus encompasses all of the above. Key to my concept of sustainability is social sustainability and a commitment to social equity and justice. Here, I take sustainability to mean undertaking a holistic approach to energy management within communities, where citizenship democracy is upheld. Progress made towards achieving green urbanism can be made in key components of urban systems, which include energy management processes. The following section will examine how community energy planning and community power can play a fundamental role in helping to achieve a better integration of energy management and land use planning processes.

Community Energy Planning and Community Power

It is expected that falling costs in sustainable energy technologies and advances in computing will ultimately lead to our communities being powered by distributed energy systems and clean sources (Farbridge, 2017). This shift towards a more decentralized energy system will ultimately require new governance models for cities entering this new energy frontier. CEPs can function as an important step towards facilitating this transition by identifying local economic

development priorities, prioritizing sustainable initiatives, empowering communities to take an active role in energy management, retaining cash flows within local communities, providing the legal framework for implementation, and establishing the role of local governments and key players. This is vital for a more coordinated transition in order to mitigate risks and ensure that the process is based on collaboration, equal opportunity, sustained resilience, and shared prosperity.

Community Energy Planning

Community energy planning originated from realizing the significance of how land use patterns affect energy consumption and plays a key role in determining the energy footprint of an urban area (Singh et al., 2017). It represents how decisions relating to energy management and improving energy efficiency are being considered at the community level and neighbourhood-scale (Dennis and Parker, 2009). A Community Energy Plan (CEP) demonstrates how designing for sustainable energy can bolster community objectives such as greenhouse gas emissions reduction, creation of local employment, generate cost savings, and develop a more integrated community energy system (City of Burlington, 2014). They are essentially road maps for communities to help them conserve and secure energy, reduce their carbon footprint, and prepare for a more sustainable future.

The CEPs of municipalities in Ontario are typically formulated through a collaborative effort between city officials, educational institutions, enterprises, environmental and community organizations, as well as advisors that may include climate scientists, energy experts, ecologists, and planners. Municipalities initiate this process through a series of workshops and steering committee meetings. These meetings serve to map major actors, create an advisory committee, highlight key principles of the CEP, and form relationships with communities. The major components of a CEP include: a preliminary feasibility study to determine the baseline energy consumption of a community, a list of areas in need of finance and improvement, the challenges and issues associated with future growth, a vision of a sustainable future to the community, building staff and financial capacity, strategies for raising energy literacy, exploring strategies for implementation, and finally a list of sustainable objectives for the community (City of Guelph CEP, 2007).

A few key commonalities amongst CEPs based in Ontario are: urban intensification, energy data-mapping and monitoring across communities, improving energy efficiency, building more sustainable transit systems, and identifying strategies for energy generation and distribution at a local scale (such as with renewable energy and district energy systems).

CEPs mobilize local residents and respective municipalities; thereby "democratizing" energy use by shifting energy generation from predominantly centralized, grid-based, and monopolized generation processes to localized, even individualized energy generation capacity (Dennis and Parker, 2009). This bottom-up approach from the community level is an integral component of CEPs. By implementing CEPs, community members can take an active role towards managing their energy use in the supply and demand processes (Dennis and Parker, 2009). However, instituting a CEP has been difficult for certain jurisdictions and/or municipalities due to their lack of energy planning experience. Furthermore, there have been case studies where CEPs have been written in a language that is primarily targeted to municipal council. This inevitably creates obstacles for communities when it comes to the implementation stage, as the general public may sometimes find it challenging to interpret the plans and the goal of citizenship democracy, which is never truly fulfilled (Dennis and Parker, 2009).

Remote Canadian regions have some of the strongest proponents and beneficiaries of the CEP model. Northern communities in Ontario are primarily dependant on diesel fuel generators, which are associated with high operating costs, complex relationships between stakeholders, and a significant carbon footprint (Dennis and Parker, 2009). This inevitably hinders local growth and development. The lowered cost of alternative renewable energy technologies may help to overcome some of the unique costs and challenges of energy development in these regions (Arriaga, 2012). Communities in the Northwest Territories, Nunavut and Northern Provincial regions are gradually shifting towards renewable energy sources such as wind and solar, and away from conventional fossil fuel-based power generation. By implementing CEPs, communities can help plan for future energy growth and continue the shift towards green energy production. There is flexibility in this process as CEPs can be applied at different scales, from improved green building design at the unit level, to expanded and interconnected district energy systems at the neighbourhood/ jurisdiction level.

What is Community Power?

Community power refers to the direct participation in, ownership of, and sharing collective benefits from renewable energy projects, by and for a local community (TREC, 2018). Community power projects are typically owned by community organizations such as co-ops, non-profits, educational institutions, and charity groups. The ownership model behind most community-power projects is based on a democratic process where local members invest their resources and time into their own communities. This reaps numerous benefits in the form of reduced carbon emissions, local employment opportunities, increased resiliency from power outages and surges in energy pricing, retained flow of capital within the community, and cost-savings for residents (TREC, 2018). Energy-efficient buildings and local renewable energy systems also help communities to reduce their energy usage and attain energy security. This process shifts the ownership and power of energy-generating facilities towards a more decentralized system. Creating 'net zero communities' can be an important step in this regard as these communities offer opportunities to integrate municipal land use planning and local energy management processes (Community Energy Knowledge Action Partnership, 2018).

Net Zero Building

Net zero building can be perceived as an approach to community energy planning. It is a building system that primarily uses sustainable materials with minimal embodied energy and is self-sufficient in that it produces its needed energy and water throughout its life cycle (Hossaini et al., 2015). These buildings therefore contribute less overall greenhouse gas emissions than other types of green buildings such as near-net zero, or zero-waste buildings. Given that the environmental footprint of the building sector accounts for approximately 40 percent of the global energy consumption, it is important that new developments are built to higher standards relative to other sectors where energy and emissions are more 'fixed' (Hossaini et al., 2015). By integrating green design in tandem with renewable energy sources, jurisdictions can help reduce their energy use while providing a multitude of other benefits to themselves and those around them.

Although existing government guidelines include policy objectives of "net zero communities" (Climate Change Action Plan and the Growth Plan for the Greater Golden Horseshoe), planning for net zero communities underscores various social, political, and economic challenges when it comes to integrating municipal land use and energy management. The high upfront costs associated with net zero communities for instance, poses a major barrier. An example of an existing net zero community in Ontario is the London West Five development, which comprises of a net zero office building and ninety townhouses. There are also plans to develop more net zero communities over the next few years in Toronto, Guelph, and Brampton (Community Energy Knowledge Action Partnership, 2018).

Energy Democracy

The concept of "energy democracy" is used to describe the social movement accelerating the clean energy transition by restructuring the conventional fossil fuel-based energy regime (Burke and Stephens, 2017). It offers a set of visionary principles that highlight guidelines for embracing technological innovation with the potential for political, social, and economic change. The term is increasingly used in discourse with respect to climate change, climate justice, and environmental conservation at the regional and national level. This movement also aims to develop policies that combine social justice and economic equity with the clean energy transition (Burke and Stephens, 2017). The energy democracy movement also identifies new opportunities for creating democratic renewable systems through active collaboration and project development at the local community level (Burke and Stephens, 2017). Here, it aims to harness the benefits of community participation in decision-making processes and investment in renewable energy developments (TREC, 2017). It aims to achieve this by providing a set of goals and mixed policy instruments to facilitate the clean energy transition, while creating democratically based systems and institutions (Burke and Stephens, 2017). CEPs can be used as a viable policy instrument in this regard by enabling citizens to play an active role in energy planning and resilience building. However, no single policy instrument can achieve the energy transition. The fundamental concept behind the energy democracy movement is to replace the monopolized carbon-based energy systems that have up till now, dominated energy production and management. The cumulative effects of this consolidated power have led to various issues such as social marginalization, toxic

pollution, privatization of natural resources, rising prices, energy poverty, and social and environmental injustices (Angel, 2017).

In the context of energy democracy, unequal power distributions have led to power plants and refineries being situated in low-income communities. In addition to the pollution of natural habitats and watershed systems, the proximity of these plants has also been linked to higher rates of asthma and premature death in these regions (Fairchild, 2018). Simultaneously, the effects of a centralized energy system based on fossil fuels has concentrated a significant amount of wealth and power into the hands of the few in control, thereby creating disparities in energy production and distribution within a particular region. In Ontario, fossil fuel monopolies have created various social, environmental, and economic issues that will be explored further in Chapter 3. In the global south, many cities are regularly subject to power outages due to a lack of infrastructure and electricity supply shortages. In the city of Accra in Ghana, the urban poor typically live in neighbourhoods where there is a limited supply of electricity (Silver, 2015). The pre-existing adverse conditions of these low-income settlements are exacerbated with disruptions in electricity, leading to lost revenues, damaged appliances, and hindering businesses and people from carrying out their everyday activities. These issues can be linked to neoliberal reforms in the eighties that led to the historical fragmentation of energy infrastructure and under-investment in electricity networks (Silver, 2015). These reforms comprised of financial programs and policies that shifted the power and control of infrastructure and government services to the private sector. These processes, as they relate to Ontario, will be examined in further detail in Chapter 3. The resulting effect had drastic effects on democracy and urban life, as market changes spurred by neoliberal forces led to the poor management of utilities and reduced financing for essential services such as energy networks. These underlying issues create significant challenges for urban environmental management, which is prevented from taking appropriate action and adopting a viable, ecological, and socially just approach.

Energy democracy seeks to resolve these issues by attempting to resist these social and environmental injustices, shift control of energy management and planning processes away from corporate interests towards community control, and use it as a tool for reaping social, environmental, and economic benefits for our communities (Fairchild, 2018). It also aims to bridge the planning-implementation gap between national governments and local communities that have long plagued green urbanism (Brand, 2007). Policies and regulatory frameworks based

on inclusiveness and environmental considerations could potentially be used to facilitate progressive change within communities and address the consequences of neo-liberalization.

To summarize, the theoretical frame that I apply to this research project is comprised of key elements that include green urbanism and community energy planning. The key analytical and conceptual ideas I look at include energy democracy and community power, while exploring how to use CEPs as an important ingredient in community energy planning in order to help attain green urbanism principles. The following section will examine Ontario's key climate change policies that have shaped its current approach towards green urbanism and energy management.

Chapter 2: Analysis of Policies and Regulatory frameworks in Ontario:

Although governing bodies in Canada have embraced visions of sustainability, they have had difficulty with reaching their goals. Existing sustainable policies and legislation are vaguely outlined and often subject to misinterpretation. This results in the planning-implementation gap that often impedes the development of sustainable communities. This chapter of the research paper critically examines Ontario's key policy frameworks and climate change mitigation guidelines that have shaped its approach towards green urbanism and energy management. First, it becomes necessary to provide an overview of Ontario's electricity sector development during the course of the twentieth century.

Ontario's Energy Transition – History, Development, and Moving Forward

On the heels of the 2015 United Nations Climate Change conference in Paris, nations across the world are formulating climate change actions plans in order to join the global effort to mitigate climate change and reduce greenhouse gas (GHG) emissions. CEPs can potentially act as a viable policy instrument in this regard. However, because energy management has occurred in relative isolation to urban planning and development for over a century in Ontario, new approaches to governance may be required to enable the effective implementation of CEPs (Farbridge, 2017).

The first industrial era was powered primarily by steam and coal, followed by a transition towards centralized electricity and oil. Various industries in Ontario during the early twentieth century mostly relied on steam power that was produced from American coal. However, with increasing prices and shortages in supply, local communities were concerned about their long-term livelihoods (Farbridge, 2017). This prompted local governments to tap into the new energy innovation known as electricity.

Because electricity was at first sourced from mostly cheap oil, residents did not pay much attention to energy usage and there was thus, a lack of established governance systems that oversaw regional energy management (Jones, 2007). This soon changed when fourteen Ontario cities banded together under the "Power for the People" movement and influenced the formation of the Hydroelectric Power Commission of Ontario (later renamed Ontario Hydro), which was

established in 1906 (Farbridge, 2017). This was a publicly owned electric utility funded by the government and it was formed to build transmission lines and supply municipalities and consumers with power. The cheap and plentiful electricity generated by Ontario Hydro was first sourced from private companies operating at Niagara Falls (Norrie and Love, 2009). Ontario's electricity system is among the world's oldest integrated electricity grids and is comprised of various large generation facilities (hydroelectric and nuclear plants) that were built later in the twentieth century.

To meet increasing consumer demand, Ontario Hydro also carried the additional task of integrated electricity system planning, eventually growing into one of North America's largest electricity corporations in the nineties. This centralised approach to energy management included programs such as the demand/supply plan introduced in the late 1980s, which sought to better manage consumer demand for energy (Norrie and Love, 2009). Up until 1998, Ontario's electricity generation and transmission systems were owned and operated by Ontario Hydro. It is expected that Ontario's electricity supply mix will change significantly over the next ten years. With the phasing out of coal-fired plants in 2014 as part of Ontario's *Climate Change Action Plan* (CCAP), the current energy generation mix comprises mostly of centralized facilities such as hydroelectric and nuclear plants, a legacy of the Ontario Hydro era (Norrie and Love, 2009). These nuclear reactors are expected to reach the end of their life cycle some time between 2015 and 2020. With the significant costs associated with refurbishing existing reactors, this inevitably creates uncertainty and raises questions with respect to the sustainable future of Ontario's energy sources (Hill, 2017).

The legacy of Ontario Hydro was brought to an end with the provincial *Electricity Act* in 1998 due to rising concerns with respect to improper management, overcapacity, increases in rates charged, and cost overruns (Norrie and Love, 2009). Ontario Hydro was then split into separate, state-owned transmission and generation components, which included: Ontario Power Generation (OPG) which is responsible for approximately half of all electricity generation in Ontario through nuclear power (the other half is sourced from hydroelectric, natural gas, and renewables), Hydro One which is an electricity transmission and distribution utility, Independent Electricity System Operator (IESO) which is responsible for managing the operations behind Ontario's electricity system, the Electrical Safety Authority which is responsible for electrical safety, and the Ontario Electricity Financial Corporation which is responsible for managing the

debt and financial risks of Hydro One. In order to protect consumers and the environment, promote low-cost energy, and open the electricity market to competition, the Legislative assembly of Ontario passed the *Energy Competition Act* in 1998 (Jim, 1998). After the Act was passed, this major restructuring and market transformation left a void for a few years where the centralized planning role, previously held by Hydro One existed. This changed with the creation of the Ontario Power Authority (OPA) in 2005 (which was later merged with IESO). However, in the years leading up to this, other agencies such as local electricity distribution companies (LDCs) began to take on the role of managing energy demand and overseeing system operation functions, thereby resulting in a hybrid system structure that mostly exists to this day (Norrie and Love, 2009). LDCs are distribution companies that own and operate electricity distribution assets and supply electricity to customers (Mowat Centre, 2016).

With the onset of climate change, rising environmental concerns, and increasing electricity prices, provincial authorities were looking to a range of public, private, and community groups to develop Ontario's conservation strategy in accordance with the targets established at the 2015 Paris Climate Conference. Despite the advances in renewable energy technologies and energy efficient products and services, there is a relatively undeveloped market for these products.

Green Energy Act – Growth Under the FIT Program:

Ontario's *Green Energy Act* (GEA) was introduced in 2009 and intended to stimulate renewable energy development, boost energy conservation, and create green jobs. One of the key components of the GEA was the introduction of its Feed-in-tariff (FIT) program, which expanded the opportunities for developing renewable energy projects (Green Energy Act, 2009). This incentive program sought to reward renewable energy producers through contracts with guaranteed rates on the price of electricity that was generated (through solar, wind, or hydro). In applying for contracts, producers conducted feasibility studies in order to determine if there would be a reasonable rate of return on a project. The microFIT program was also implemented for small non-commercial systems, while the FIT program was ideally for larger commercial projects. These projects ranged from large-scale solar or wind farms, to small-scale systems such as a solar panel on a homeowner's roof. It is worth noting that the applications for contracts were

open to a diversity of major actors, enabling many small-scaled projects to enter the electricity market in Ontario (Green Energy Act, 2009).

Furthermore, the GEA established a new form of co-operative, the Renewable Energy Co-op (RE co-op). A RE co-op is defined as: "A co-operative business or social enterprise, owned and governed by its members, which can generate and sell electricity, as well as raise financing for such projects" (TREC, 2016). RE co-ops empower communities that are lacking in resources to build energy projects that are community-focused, while generating both electricity and cost-savings. The core objectives of RE co-ops are to address the needs of their members, facilitate the development of community power projects, and ultimately create a more democratic and community-driven system when it comes to energy management (TREC, 2016). SolarShare is a good example of a RE co-op that has coordinated and managed a portfolio of community solar projects across the province that are valued at a total of approximately sixty million dollars (SolarShare, 2018). Oxford Community Energy Cooperative (OCEC) is another RE co-op in Ontario that is based in Oxford County. It facilitated the development of several solar projects and a wind farm that provides clean energy to meet the average demand of approximately 6,700 homes in Oxford County (OCEC, 2018). It is important to note that residents within the community currently own forty-nine percent of the wind farm project and OCEC recently opened solar investment opportunities to its members. RE co-ops have therefore, proven to be key players in Ontario's energy industry.

Despite these successes of the GEA, there has been much controversy with regards to its implementation process. Although RE Co-ops have produced various community power projects in Ontario, there is a restrictive regulatory environment for them. Ontario's *Co-operative Corporations Act* attempts to balance the business and social objectives of RE co-ops by outlining certain legal definitions and limitations in order to regulate the way in which coops are structured and how they operate (Shewan, 2012). One requirement in the Act for instance, requires RE co-ops to conduct at least 50% of its business operations with its members. Known as the "50% Rule", this regulation does not exist for cooperatives in other Canadian provinces and territories (with the exception of a more limited restriction in the Quebec coop legislation) (Shewan, 2012). There is a general sentiment amongst RE co-ops in Ontario that this rule is a major barrier to compete with other businesses. Furthermore, RE co-ops operating in Ontario are also restricted in their business operations as they are strictly confined to selling and generating

electricity from renewable energy sources (Financial Services Commission of Ontario, 2013). In contrast with local distribution companies (LDCs), they cannot distribute electricity. These limitations pose a challenge for RE co-ops to expand their business operations, enter the electricity market in Ontario, and implement community-scaled power projects that produce locally generated electricity.

Furthermore, the issue of high electricity prices for consumers has also been blamed on the FIT program (Corcoran, 2016). The prices that the government assigned for FIT contracts were arbitrary and in some instances, the prices reached 40 times the actual market value of electricity (Hill, 2017). This has been attributed to the policies behind the FIT programs, which did not consider pricing such as competitive bidding processes that would have lowered electricity prices. A lack of long-term foresight when formulating GEA policies ultimately led to locked-in contracts and negatively influenced Ontario's energy sector (Hill, 2017).

Although the FIT program was instrumental in establishing various renewable energy projects across the province, Ontario recently scaled back and closed FIT applications in 2017, thereby creating uncertainty with respect to the future of renewable energy development in the region. Furthermore, various RE co-ops and businesses focusing on renewable energy are now unclear of how to sustain their business models (TREC, 2016). A report from the right-wing think tank, the Fraser Institute titled "*Environmental and Economic Consequences of Ontario's Green Energy Act*," states that the GEA only generated minimal environmental benefits which cost approximately ten times more than alternate carbon reduction measures (McKitrick and Adams, 2014). In addition, there are many indirect costs that must be accounted for when integrating renewable energy systems into the conventional electricity grid. These costs stem from adding new generators from renewable sources and building the requisite infrastructure to support them. The 'Global Adjustment', a financial mechanism that is used by the Ontario Power Authority (OPA) to cover these costs, had the negative effect of further increasing electricity prices for Ontarians (McKitrick and Adams, 2014). More importantly, the recently announced plans to refurbish existing nuclear power stations in Ontario have compounded the issues pertaining to electricity prices, namely due to the exceedingly high costs associated with nuclear projects (Hill, 2017). These underlying issues faced with the implementation of the GEA have undermined its goal of stimulating clean energy development in Ontario.

The Pan-Canadian Framework on Clean Growth and Climate Change:

In spite of the setbacks of the GEA in Ontario, there has been a widespread increase in awareness regarding the threat of global climate change. The Paris Climate Conference in 2015 was a collective effort by 196 nations around the world, including Canada, to come together and address the issue of climate change (Rabson, 2017). Although not the first time, in the Paris accord, countries agreed to set national targets to reduce greenhouse gas emissions and formulate the necessary mitigation strategies and financing mechanisms. The ultimate goal of the agreement is to prevent the planet from reaching the two-degrees Celsius warming limit. According to a United Nations report, there is a general consensus amongst scientists and policymakers that limiting the average global temperature increase to no more than two degrees Celsius is critical, as further increases would send the planet on an irreversible trajectory and lead to dramatic climate changes that could create unbearable conditions for humans and natural ecosystems (Warrick and Mooney, 2014).

The Paris agreement committed Canada to a thirty per cent reduction in greenhouse gases from 2005 levels by 2030 (Tasker, 2016). A recent report however claims that Canada's climate goals lack clarity and consistency, with an unlikely chance of meetings its emissions targets (Office of the Auditor General of Canada, 2018). This report comprised of an audit that looked at climate change planning and emissions reduction progress in Canada between November 2016 and March 2018. It concluded that there are inadequate plans and procedures with respect to how exactly provinces and territories are going to measure, monitor, and report on their carbon reduction measures to meet 2030 targets (Office of the Auditor General of Canada, 2018).

Following the Paris agreement, the Canadian Government announced the *Pan-Canadian Framework on Clean Growth and Climate Change*. This was developed through a series of consultation meetings with the provinces and territories, as well as with Indigenous peoples "to meet emissions reduction targets, grow the economy, and build resilience to a changing climate" (Government of Canada, 2018). The plan outlines measures to mitigate carbon emissions across all sectors of the economy, create local employment, and stimulate sustainable development. It also includes economic policy tools such as a carbon taxes and cap-and-trade systems to enforce limits on greenhouse gas emissions.

Although ambitious targets, there has been much criticism voiced with respect to the feasibility of reaching Canada's climate goals. The UN for instance, has expressed how Canada's targets are too low and how they are lacking the crucial policy tools necessary to meet its emissions targets. The absence of legally binding mechanisms is also worth noting (Rabson, 2017). Furthermore, the process of settling on a unified approach by the federal government has been long and cumbersome, given that different provinces have varying degrees of political interest. Both Manitoba and Saskatchewan for example have been reluctant to impose carbon taxes on their industries (Rabson, 2017). Lastly, Canada's track record with meeting its emissions targets has been deplorable as it has been the third time the nation has failed to meet any of them since the Rio Earth Summit in 1992 (Report of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada, 2017).

Energy Planning in Ontario:

To meet Canada's emissions targets, many municipalities in Ontario have published energy planning documents in order to highlight their carbon reduction measures and mobilize local residents to take on an active role in community power projects. Different municipalities have different approaches when it comes to energy planning, with published documents titled as Community Energy Action Plans (City of London), Energy and Emissions Plans (City of Ottawa, Community Sustainability Plans (Greater Peterborough Area), Municipal Energy Plans (City of Markham), and Energy Conservation and Demand Management Plans (Niagara Region and the Town of Oakville). These plans can be distinguished into four main types: Corporate Energy and Demand Management Plan (CDM), Community Energy Plan (CEP), Municipal Energy Plan (MEP), and Climate Change Action /Sustainability Plan.

1) Corporate Energy and Demand Management Plans (CDM):

According to the Ministry of Energy, all municipalities are required to develop a CDM Plan and update them every five years starting in 2019 (Government of Ontario, 2018). In addition, the plans are also required to be publicly available on municipal websites and include annual energy reports. Although CDM plans are closely aligned with municipal climate change

strategies, as the title suggests, they focus more on the business case for implementing energy conservation measures at the corporate level across municipalities and mitigating the risk of increasing energy prices (compared to other energy planning documents). Energy CDM plans therefore provide information on what steps public agencies are taking towards conserving energy, proposed reduction measures, estimated costs and benefits, and the public agency's GHG emissions report.

Guelph's 2012 *Corporate Energy Strategic Business Plan*, for instance, aims to guide Guelph's approach towards improving energy management. The plan outlines Guelph's conservation goals and objectives and also provides information on its energy consumption and GHG emissions report. Key components of its CDM plan highlight energy management methods to reduce operational costs across municipal facilities, financial management strategies to mitigate the long-term risk of increasing energy prices, action plans for developing reporting procedures and monitoring methods, public communication practices, and the technical aspects of energy management (Guelph, 2012). These components parallel those in other CDM plans, such as the ones published by the Town of Oakville and the City of Kitchener. In terms of the key technical approaches towards energy management, the implementation of energy efficiency retrofits at city-owned facilities and energy benchmarking are apparently the preferred approaches (Oakville, 2014).

Relative to other energy planning documents, it becomes evident that CDM plans focus chiefly on the quantitative aspects of energy management and GHG reduction. Due to the threat of increasing energy prices, cost of developing new fossil fuel reserves, carbon pricing, and the costs associated with new energy infrastructure, the attention towards devising appropriate business strategies is understandable (City of Guelph, 2012). According to Guelph's CDM plan, municipalities currently face energy price increases in excess of four times the current cost of living index, as measured by the consumer price index (CPI).

In Guelph's CDM plan, economic modelling was conducted to predict long-term corporate utility costs and project business-as-usual scenarios till the year 2023. The predicted cost savings as a result of investments in corporate energy management were also indicated (City of Guelph, 2012). The plan highlights how these investments will mitigate the city's future risks due to growth and increasing energy rates. Furthermore, the plan acknowledges the non-quantifiable benefits such as reduced GHG emissions, improved resiliency to climate change,

increased capacity for deeper energy reduction measures, and the adoption of best practices relating to energy management and climate change accounting.

In examining the CDM plans of Guelph, Oakville, and Kitchener, it was found that the formatting and content differed in some measure. Although the plans lay out comprehensive strategies for mitigating energy consumption, they vary in their priorities. As mentioned, Guelph's CDM provides detailed analysis of economic modelling scenarios. However, when it comes to public engagement strategies, only vague language is used. There is minimal reference to public information sessions, educational programs, or consultation meetings. In addition, reporting procedures and the dissemination of information to the public are only briefly mentioned, thereby showcasing a lack of energy democracy principles. In contrast, Oakville's CDM plan outlines clear approaches for public engagement strategies. These include specific action plans for holding public consultations and developing educational strategies in order to foster a culture of conservation (Town of Oakville, 2014). It is also important to note that developing a CEP and increasing public participation in energy programs are indicated as priority objectives.

As with other types of energy planning documents, these differences in priorities are just as pronounced. This reflects the inconsistencies with respect to the ideal definition of 'sustainability' across various jurisdictions. In general however, CDM plans prescribe energy management strategies for municipalities in order to better mitigate the risks associated with increasing energy budgets, future development, and climate change. Given that institutional facilities are typically 'base loads' (as they demand the minimal level of electricity on a grid for a given period of time), the emphasis on quantitative and technical approaches such as energy data monitoring/mapping and efforts towards reducing energy usage at the corporate level is expected. It also explains the comparatively limited stakeholder engagement and top-down approach in its formulation process. However, it is necessary to note that the development of a Community Energy Plan is often referred to as a priority objective for demonstrating leadership in energy management across various CDM plans. Perhaps this guideline leads to a more qualitative focus and emphasizes community engagement when developing energy management plans.

2) Community Energy Plans (CEP):

The process of developing CEPs is often funded through provincial sources or federal support networks such as the Federation of Canadian Municipalities. For instance, the Ontario *Climate Change Action Plan* provides twenty to twenty-five million dollars province-wide of funding through the Greenhouse Gas Reduction Account (GGRA) for municipalities looking to develop their CEPs starting in 2017 (Government of Ontario, 2018).

Compared to CDM plans, CEPs posses a more community-wide scope and include actions to reduce energy consumption and emissions. Examples of CEPs implemented in Ontario include the Port Lands Energy Plan (City of Toronto), City of Woodstock Community Energy Plan (Oxford County), and the City of Guelph Community Energy Plan. As shown in Table 2.1 on the following page, the key commonalities amongst CEPs largely focus on the areas of energy consumption, energy demand and response strategies, energy efficiency retrofits, urban densification, decarbonisation and electrification of transportation, district energy, and waste management. They also vary in their priority objectives. Energy efficiency improvements to existing building stock and higher building code standards for new developments for example, are commonly outlined as a preferred approach towards reducing carbon footprint. The same applies to district energy and transportation objectives such as more active-transportation options, and the electrification of transportation (including EV charging stations). Several CEPs also focus on community empowerment by developing action plans for increasing energy literacy, forming workshops to foster behavioural change and promote a culture of conservation. Although there are mentions of incorporating renewable energy systems into energy planning, there is a lack of comprehensive strategies towards integrating renewable energy into the energy mix of communities. The most common choice for renewable energy sources is solar. Energy storage is also rarely mentioned within action plans in most CEPs. In cases where it is mentioned, the language used is often vague and merely listed as a strategy to complement local renewable energy development.

Table 2.1 – Priority Climate Change Initiatives in Municipal Community Energy Plans (Halim, 2019)

Sustainable Energy type	Identified as an interest in Energy Plans	Identified as Priority Target	Conducive Regulatory Environment	Available Funding Sources	Detailed Action Plans	Feasibility Studies Conducted	Pilot Projects Undertaken
Energy Efficiency	✓	✓		✓	✓	✓	
Demand Response	✓	✓					✓
Sustainable Transportation	✓	✓	✓	✓	✓	✓	✓
Community-Solar				✓			✓
District Energy	✓	✓		✓	✓	✓	
Alternative Fuel/ Biomass		✓		✓			
Energy Storage							

In analyzing the CEPs of twenty-two municipalities in Ontario, it is evident that there is an inconsistent approach when it comes to preparing climate change mitigation strategies. Some CEPs are often very detailed, with comprehensive, well-developed action strategies, while others are briefly outlined and lack depth. This may be attributed to a lack of internal capacity and knowledge within certain communities to prepare CEPs (Dennis and Parker, 2009). The plans also differ between municipalities by the extent to which the progress towards reaching their targets is measured. It is important to note that instituting CEPs has been difficult for certain jurisdictions due to their lack of energy planning experience. The technical skill and knowledge required for installing renewable energy projects might be a contributing factor to why renewable energy options are not listed as priority objectives in most CEPs (Table 2.1).

Citizen participation mentioned in CEPs also varied. The CEP for the City of Burlington for instance only briefly mentions how citizens can participate in Earth Hour and in online forums in order to generate discussions pertaining to energy conservation. In contrast, the CEPS for the City of Guelph and the Town of Newmarket CEP highlight active workshops and sessions

where community members from various socioeconomic backgrounds are invited to partake in the development of the CEP and energy conservation initiatives.

The major barriers for implementing the climate change measures outlined in CEPs include a lack of support from higher levels of government, funding, resources, and provincial legislation and policy. In contrast with CDMs, CEPs are not required to be published by municipalities. Until CEPs are embedded into the regulatory frameworks and planning legislation such as the Provincial Policy Statement or Official Plans, they will only function as voluntary guidelines for municipalities to meet their climate change targets, as they are not legally binding.

3) Municipal Energy Plans (MEP):

In 2013, the Ministry of Energy launched the MEP program in order to support local energy planning efforts (Government of Ontario, 2018). The program is designed to help municipalities better understand their community's energy needs, identify conservation opportunities, set strategic goals, and prepare implementation plans to meet their objectives. Similar to CEPs, MEPs take a holistic approach to energy planning by focusing at the broader, community level. It also examines energy generation and transmission infrastructure, land use planning, economic development, and energy literacy within communities. Also comparable to CEPs, MEPs are prepared with assistance from the Ministry of Energy and the Federation of Canadian Municipalities.

The course of developing MEPs involves stakeholder advisory groups that comprise of citizens and representatives from utility companies, municipalities, educational institutions, environmental organizations, public health agencies, and building developers. It is worth noting that the process of selecting citizens and the percentage of their total representation on advisory boards can vary between MEPs in Ontario. For example, the City of Vaughan's MEP stakeholder advisory group comprised of representatives from primarily utility companies, developers, district school boards, and transportation agencies. Consultation meetings that were held to develop the plan were primarily confined to these representatives, with limited citizen involvement. In contrast, the Municipality of Wawa's MEP consisted of a more comprehensive and multifaceted engagement process, with their advisory board comprising of a larger makeup

of citizens (The Economic Development Corporation of Wawa, 2016). Consultation meetings were divided into four types: Committee: Youth, Primary, Secondary and Resident. In the plan, primary and secondary "stakeholders" were identified as key players with regards to energy consumption. Residents were consulted through a variety of methods, including online, in person and/or phone surveys, as well as being invited to communication sessions in order to incorporate residents into the planning process (The Economic Development Corporation of Wawa, 2016). They were also incentivised with rewards such as iPads to maximize the results that were submitted. Furthermore, the Wawa MEP outlined priority targets that aimed to introduce energy educational programs, along with strategic action plans to implement them.

Similar to CEPs, MEPs provide an outline of detailed action plans for reaching municipal climate change mitigation goals. Vaughan's MEP goes one-step further by showing the projected cost savings, GHG emissions avoided, city investment required, as well as non-quantifiable benefits such as reduction in the urban heat island effect and improved air quality. Long-term monitoring protocols in order to track progress on city goals and targets are also included. The City of Vaughan's MEP is based on the initiatives highlighted in its Community Climate Action Plan (CCAP), a slightly different type of energy plan that will be examined in the next section. Like Vaughan's CCAP, the MEP provides an overarching vision for the city in reaching its sustainable objectives. It also considers the impacts of future growth and economic development, as well as exploring options for local clean energy generation (City of Vaughan, 2016).

MEPs can be perceived as an important tool for municipalities, in conjunction with CDM plans and CEPs in order to ensure energy security, foster a sense of conservation, and identify methods to reduce energy usage and GHG emissions. However, as with CEPs, without mandating requirements set by legislative bodies such as the Ministry of Energy, they will remain as voluntary guidelines in Ontario.

4) Climate Change Action Plans:

Ontario's Climate Change Action Plan (CCAP)

Similar to CEPs and MEPs, municipal and provincial Climate Change Action and/or Sustainability Plans highlight implementation strategies for energy and emissions planning. Ontario's *Climate Change Action Plan* (CCAP) is a five-year plan (2016-2020) that aims to facilitate Ontario's attempt to mitigate climate change over the long term (Government of Ontario, 2018). The document lays out an action-plan framework that covers a wide spectrum. To summarize, this includes initiatives for developing a green bank, cleaner transportation systems, energy efficiency improvements to existing building stock, mandatory energy rating disclosure programs for homes, greening programs for low-income family communities, energy literacy programs to improve consumer awareness, pollution reduction measures, conservation plans for natural ecosystems, and proposals to develop better partnerships with indigenous communities. The collective aim of the plan is to build capacity with respect to implementing green projects and ultimately transition Ontario towards a low-carbon economy.

As mentioned beforehand, the CCAP provides municipalities with funding to formulate their energy and emissions plans (Government of Ontario, 2018). This was funded through revenue generated through Ontario's cap and trade program and collected in the province's Greenhouse Gas Reduction Account (GGRA). The CCAP functions to prescribe how these savings are to be spent. To uphold transparency and accountability, the proceeds are required, by law, to be invested in projects and programs that reduce Ontario's GHG emissions (Government of Ontario, 2018). Similar to CEPs and MEPs, the initiatives set forth in Ontario's CCAP are also optional and serve to guide municipalities.

TransformTO: Climate Action for a Healthy, Equitable, and Prosperous Toronto:

The City of Toronto's *Climate Action Plan* also presents a set of actions for attaining long-term, low carbon objectives. Evidently, the key difference from Ontario's CCAP is that its scope focuses at the city level. This makes the strategies presented more context-specific, where it is supplemented by reports that highlight investment strategies and resource requirements (City

of Toronto, 2018). The City's Environment and Energy Division and the Atmospheric Fund, which was established in 1991 to assist the city in meeting its GHG reduction targets, led the development of *TransformTO*. Similar to energy CDM plans, future energy costs, projected savings, and GHG emission reductions as a result of investments in mitigation strategies across key sectors (which include buildings, waste, energy sources, and land use) are also estimated. It is essential to note that the process of developing the *TransformTO* plan and identifying key strategies included active community engagement methods, where more than 2,000 city residents participated (City of Toronto, 2018). This comprised of online surveys and community conversation events where community feedback helped to determine common areas of interest and identify best practices for implementation. The results of these community outreach events were subsequently shared online in the form of community engagement reports and submissions on the City of Toronto's website. In terms of addressing equity however, the language used is very sparse, with only a few references to improving equitable access to green space for instance, without any detailed actions plans (City of Toronto, 2018).

A core component of the plan includes a pathway document that suggests directions for reaching Toronto's long-term goal of reducing its GHG emissions by 80% by 2050 (City of Toronto, 2018). This includes a series of targets and clear timelines that aim to achieve near zero emissions in all new buildings by the year 2030 (Purcell, 2017). This serves to build regulatory confidence for the building industry in order to focus on optimizing the technologies and design approaches necessary to feasibly meet Toronto's sustainable objectives (Purcell, 2017). Currently, existing development guidelines such as the Toronto Green Standard and city building codes are not sufficient to meet these ambitious targets.

Toronto Green Standard (TGS):

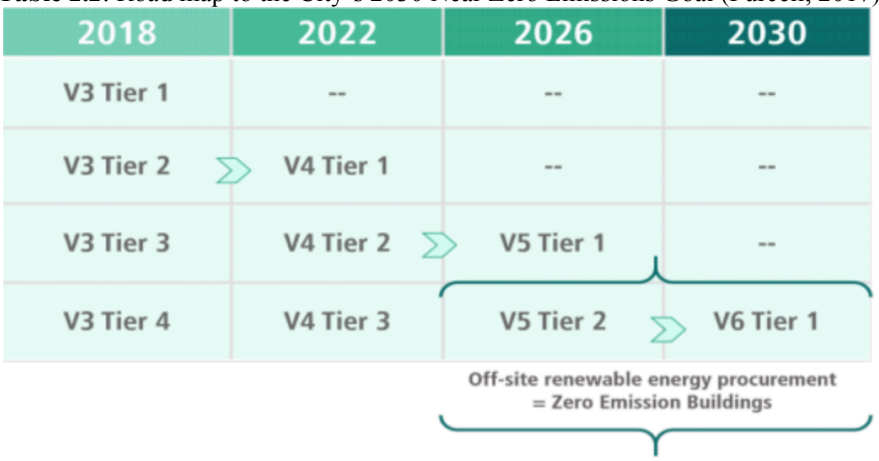
The TGS provides a set of tiered performance measures with supporting guidelines that promote sustainable site and building design in new and private developments (City of Toronto, 2018). Tier 1 of the TGS is mandated through the planning approval process while higher tiers (2 to 4) are merely voluntary standards.

Research has shown that the city has had difficulty with respect to incentivizing sustainable practices in the development industry. Despite updating the TGS to include higher

energy conservation targets for mid-to-high rise buildings in 2010, the numbers of buildings that have reached the new tier 2 targets still remain very few (Viola, 2013). Developers have argued that the incentive program was hastily implemented and rendered ineffective due to a lack of consultation with regulators (Viola, 2013). Furthermore, the industry was also struggling to keep up with Ontario Building code changes, as developers noted implementation issues due to the updated language used in the standard requirements. For example, there were issues with providing features such as at-grade bike parking, which directly conflicted with City rules governing building entrances and loading requirements (Viola, 2013). The latest updates to the TGS have also been problematic. Statements from U of T's engineering professor, Marianne Touchie, explain how developers are still allowed to build floor-to-ceiling glass walls that are poor insulators, which compromises the efficiency of heating and ventilation systems (Vasil, 2017).

TransformTO seeks to directly address theses issues and present a more feasible road map towards developing attainable building code policies. In partnership with the Toronto Atmospheric Fund (TAF), the city has developed a comprehensive Zero Emissions Building Framework to help guide the city reach zero-emissions performance standards by the year 2030 (Purcell, 2017). The first step in the plan was the development of version 3.0 of the TGS, which was recently approved by the city. It is important to note that the plan outlines gradual improvements to mandatory performance standards, with the ultimate goal of making Tier 4 near-zero emissions the mandatory design target by 2030, as shown in table 2.2 (Purcell, 2017).

Table 2.2: Road map to the City's 2030 Near Zero Emissions Goal (Purcell, 2017)



This long-term, incremental approach can potentially catalyze green building efforts. However, it remains to be seen how receptive the building industry will be to these changes in performance standards, and how effectively the city will enforce them over the years. Generally, each of these different types of plans are related and contain much of the same content, while striving to achieve very similar long-term goals.

Ontario's Long-Term Energy Plan (LTEP):

Ontario first implemented the LTEP in 2010. This plan outlined strategies towards ensuring that Ontario would be able to meet its electricity targets by 2030 and build a more sustainable energy system (2010 Long-Term Energy Plan). During the McGuinty government term from 2003 to 2013, Ontario formulated various carbon-reduction measures that targeted various sectors of the economy. These included energy demand management, conservation, reliable electricity transmission and distribution, and a focus towards developing Indigenous communities (2010 Long-Term Energy Plan). The plan ultimately sought to shift dependence from fossil fuels towards renewable sources of energy. It has been reported that one of the major achievements of the 2010 LTEP was the phasing out coal-powered generation in 2014 (Government of Ontario, 2018). Ontario was in fact, the first province to phase out electricity produced from coal power plants. This yielded many benefits such as improved air quality due to reduced GHG emissions and other air pollutants such as sulfur dioxide and nitrogen oxides. In addition, the number of smog days in Ontario has also plummeted from fifty-three in 2005 to zero in 2014 (Flanagan and Gass, 2017).

The phasing out of coal also contributed to the growth of the renewable energy sector in Ontario. LTEP's clean energy initiatives stimulated billions dollars of investments in the public and private sectors, while also creating jobs in the clean energy industry (Flanagan and Gass, 2017). There are now more than 30 companies in Ontario that specialize in manufacturing solar photovoltaic modules, wind turbines and the associated components (Government of Ontario, 2014). With projected falling costs for renewables, it is expected that the growth in the clean energy sector will continue.

In October 2017, the Ministry of Energy released Ontario's revised 2017 *Long-term Energy Plan* (Vegh et al., 2017). This document builds on the initiatives presented in the 2010 and 2013 plans. These include strategies for electrifying transportation, reducing energy demand,

modernizing the existing electrical grid by tapping into digital technologies, establishing a cap and trade program, developing Ontario's CCAP, improving community engagement, and promoting an emission-free building sector. Furthermore, the plan highlights support programs for low-income households, such as an expanded Green Ontario Fund and low-income conservation programs to help communities reduce their energy consumption and generate savings (Government of Ontario, 2017). In order to facilitate the transition towards distributed energy sources, the 2017 LTEP proposes legislative amendments and revised policy tools.

This includes an enhanced net-metering program, which serves to give building owners better access to renewable energy generation and storage. The net-metering program enables consumers to send the electricity they generate from renewable sources to the grid in order to obtain 'energy credits' and subsequently reduce their energy costs. The new changes outlined in the 2017 LTEP aim to increase consumer choice and includes options for third party ownership of renewable generation facilities, expanded size limits for eligible energy systems, and options to integrate energy storage systems (Government of Ontario, 2017). It also proposes increased flexibility for electricity distributors to implement 'virtual net-metering pilot projects' in order to examine the benefits and challenges of developing distributed energy structures that combine renewable energy technologies with storage systems. According to the 2017 LTEP, its long-term goal is to build a clean, reliable, and affordable electricity supply, while reducing GHG emissions and stimulating innovation in the clean energy sector.

In analyzing the 2017 LTEP, it is worth noting that there are several underlying issues that must be addressed. For instance, the plan aims to move forward with the refurbishment of ten nuclear facilities in Ontario between 2016 and 2033 (Vegh et al., 2017). Although it is indicated that this will benefit Ontario's economy in the form of increased employment and grid capacity, it is critical to note that there are inherent risks that stem from nuclear energy. The process is estimated to cost around thirteen billion dollars, - representing a significant pool of capital and resources that might have otherwise been invested in cleaner and safer renewable energy projects such as wind and solar, especially given the projected falling costs of these technologies (Schreiner, 2016). Moreover, centralized nuclear energy programs pose significant challenges for renewable energy development. Termed as the 'technological lock-in' problem, this issue will be explored further in the next chapter.

Additionally, there is an uncertain regulatory environment with respect to the new net metering policies. Currently, there are several restrictive clauses in existing regulations, as well as incomplete information being announced to customers – specifically, in regards to savings and the use of credits after entering the net-metering program (Gross, 2017). The high upfront costs and optimal site conditions required for renewable energy projects often deter consumers from investing in them. Policy tools such as third-party ownership and 'virtual net metering' would allow for more flexible partnerships between various entities such as municipalities, institutions, individuals, and homeowners. Third party ownership allows for third-party entities to own, operate equipment, and sell the generated electricity to consumers (Gross, 2017). Virtual net metering allows for electricity generated by a facility to be distributed to multiple customers in a community. These policies could therefore, remove existing barriers for participation and create new opportunities for consumers to participate in the program and generate their own electricity (Gross, 2017). Currently however, the policies are still under discussion and existing conditions are such that the electricity produced under net-metering programs can only be used for the generator's own use. This unclear and restrictive environment ultimately creates consumer distrust and drives away potential investors.

It is important to mention that there is a large gap between land use planning and energy management across municipalities in Ontario. Provincial growth plans and management strategies such as the Growth Plan for the Greater Golden Horseshoe, the Provincial Policy Statement, and Municipal guidelines such as the Toronto Official Plan, have limited (and vague) language with respect to energy planning, conservation, and management. This represents a fundamental weakness in the system of land use planning in Ontario, thereby making it necessary to improve these policy frameworks.

The Growth Plan for the Greater Golden Horseshoe:

The *Growth Plan for the Greater Golden Horseshoe* (GGH) first came into effect in 2006. It set guidelines for regional growth and outlined policies for urban development for the Greater Golden Horseshoe area that covers a large part of southern Ontario (Ontario Ministry of Infrastructure, 2006). Administered by the Ontario Ministry of Infrastructure, the Plan identified intensification targets, urban growth centres, infrastructure investment priorities, policies for

protecting natural ecosystems, and protocols designed to mitigate the negative environmental, economic, and health impacts associated with development in the region. The Plan builds on other key government initiatives, which include the *Greenbelt Plan*, the *Provincial Policy Statement* (PPS), and the *Planning Act.* Upon examining the GGH Plan, it can be deduced that the initiatives outlined within it aim to strategically mitigate urban sprawl, namely due to the emphasis on supporting the *Greenbelt Plan*. The greenbelt is an essential part of the *Greater Golden Horseshoe Plan*, as it identifies regions where urbanization should be prohibited in order to: protect Ontario's valuable agricultural and ecological features, reduce suburban development, and implement intensification strategies (Ontario Ministry of Municipal Affairs and Housing, 2018). It also complements other provincial initiatives such as the *Niagara Escarpment Plan* (NEP) and the *Oak Ridges Moraine Conservation Plan* (ORMCP), which also serve to provide ecological protections.

It is here where the close link between land use planning and community energy planning should be brought to light. Research has shown how planned densification strategies can be a practical way to reduce energy consumption in communities (Güneralp et. al, 2017). The same study even demonstrates that increasing urban density can have a slightly better impact on reducing energy consumption in buildings than making improvements to energy efficiency. This is because increasing the number of dwelling units and creating mixed-use spaces can utilize existing infrastructure more efficiently and deliver water, electricity, and other municipal services to more people in a smaller area using fewer resources and less energy. Urban researchers claim that there are added benefits to intensification such as reduced heating, cooling, and transportation costs. In Toronto for example, transportation emissions per capita were found to be almost four times higher in low-density areas than high-density areas (Singh et. al, 2017). Because transportation is one of the major components of energy and emissions intensity, accounting for approximately 34 percent of Ontario's GHG emissions in 2012, this finding has major implications for the positive role of urban density (Government of Ontario, 2014).

The intensification targets highlighted in the GGH and Greenbelt Plans could therefore be regarded as a feasible approach towards reducing energy consumption in communities. Logically, compact, 'walkable' cities enable people to live closer to one another, decrease their dependence on vehicular transit, reduce the average size of living spaces, and finally optimize the infrastructure and resources required to heal and cool these spaces. Research has shown that

denser inner-city regions have the lowest energy demands and carbon emissions per capita compared to new suburban communities and low-density city areas due to the higher energy-intensive infrastructure required for transportation and utility services in more sprawled out communities (Guhathakurta and Williams, 2015). With the expansion of the suburbs expected to increase energy demand, densification could conceivably mitigate the impact of this growth. However, it must be noted that there has been much controversy with respect to how densification initiatives were enforced in the GGH plan.

Following a decade of implementation, several criticisms have surfaced. A report which highlights the setbacks encountered in the implementation of the plan state how although the policies were designed to mitigate sprawl and ensure the protection of ecological systems, urban expansion continued (Allen and Campsie, 2013). In addition, municipalities failed to meet the intensification and density targets set by the provincial government and preserve important agricultural and ecological land features. This was attributed to a lack of incentives and penalties, unclear guidelines, and an uncoordinated approach across jurisdictions (Allen and Campsie, 2013). Furthermore, there are also concerns with respect to the capacity of existing urban infrastructure to sustain high-density development and growth in the region.

In 2017, Ontario released four of its updated land use plans, which collectively aim to facilitate the transition to low carbon communities in the GGH region, curb sprawl, manage growth, and protect natural ecosystems. These include the Growth Plan for the GGH, the *Greenbelt Plan*, the *Oak Ridges Moraine Conservation Plan*, and the *Niagara Escarpment Plan* (Ministry of Municipal Affairs, 2018). Coordination ensured that the plans worked together and aligned with the *Ontario Climate Change Strategy and Action Plan* (2016).

The updated 2017 Growth Plan outlines goals to reduce traffic congestion, promote long-term economic growth, provide more housing options, and revitalize downtown regions to become more vibrant. It is worth mentioning that the development of the plan involved extensive engagement with the public, Indigenous communities, municipalities, and stakeholders (Ministry of Municipal Affairs, 2018). Some key highlights and major changes to the new Growth Plan include updated density and intensification targets for employment areas and urban growth centres, investment in transportation initiatives such as directing growth to major transit stations, and new requirements for municipalities to develop settlement area boundaries and housing strategies (Baker and Boritz, 2017). The housing strategy is recommended to work in conjunction

with minimum intensification and density targets to support the goal of building complete communities. This necessitates the careful consideration of the appropriate range and size of units of different building types in order to accommodate a diverse range of household sizes and income groups (Baker and Boritz, 2017).

Although it remains to be seen whether the policies in the updated Growth Plan will effectively resolve the issues and challenges faced during in the implementation of the previous iteration of the Plan, it is worth mentioning that the 2017 Growth Plan identifies conservation, energy efficiency, and demand management as important objectives to foster a culture of conservation (Ministry of Municipal Affairs, 2017). It also recognizes that alternative energy systems such as district energy generation and renewable energy technologies are model approaches towards building more sustainable communities. However, it is worth noting that the language used in the Plan relating to clean energy is vague and lacks comprehensive guidelines. Other challenges include political factors, which may comprise the long-term objectives set forth in the plan. During the campaign leading up to the Ontario general election, which took place on June 7, 2018, there were some charged political discussions with respect to land use planning and development. The leader of the Progressive Conservative party in Ontario, Doug Ford, recently stated his plans to rezone part of the protected Greenbelt area around the Greater Toronto Area and authorize housing development there (Benzie and Rushowy, 2018).

As mentioned beforehand, research has shown how land use patterns are an important determinant of a communities' energy and emissions footprint (Guhathakurta and Williams, 2015). Careful implementation, sustainable development standards, and a prudent review process can ensure that the Plan manages growth appropriately, without compromising the integrity of the GGH's natural ecosystems.

Official Plan

The updated Growth Plan for the GGH also requires upper and single-tier municipalities to formulate Official Plan policy frameworks and initiatives to reduce greenhouse gas emissions in existing buildings and new developments. An Official Plan provides guidelines for growth and development, defines urban boundaries for housing, industry, and commercial regions, manages municipal services such as waste management and road maintenance, and outlines community

improvement initiatives (Ministry of Municipal Affairs and Housing, 2010). Municipalities are required to review and update their Official Plans such that they conform to the updated Growth Plan by the year 2022 (Baker and Boritz, 2017). In addition, these plans are also aligned with other municipal growth management policies such as Ontario's 2016 Climate Change Strategy.

The *Toronto Official Plan* for instance, outlines sustainable initiatives that aim to reduce energy consumption within communities. This is worded in accordance with guidelines that manage development, transportation infrastructure, and land use designation (City of Toronto, 2015). Because increasing energy costs are one of the key considerations in planning for more sustainable forms of housing and transportation, the plan recognizes renewable energy technologies and energy efficiency measures as ideal approaches towards building a more sustainable city. Official Plans are prepared using input from residents, businesses, and organizations based within the community. This takes the form of pre-consultation sessions and public meetings that serve to gather valuable feedback and ensure that future planning and development will meet the needs of the community (Ministry of Municipal Affairs and Housing, 2010). Although the Growth Plan requires municipalities to incorporate energy and climate policies into their official plans, language concerning energy consumption is limited and only vaguely mentioned in these plans.

Upon reviewing Ontario's key policy frameworks and regulations with respect to energy management and land use planning, it becomes clear that there is room to achieve a more coordinated approach towards building low carbon and climate resilient communities. The aforementioned underlying issues and complicated development processes relating to green design render most municipal sustainable objectives difficult to attain. Although Ontario's climate change policies strive to foster a culture of conservation, attention towards energy management is largely absent in land use planning processes. With research demonstrating the strong link between urban planning and energy management, it becomes crucial to develop clearer and more comprehensive guidelines with respect to energy conservation in land use planning and development guidelines (Guhathakurta and Williams, 2015). Community energy plans can perhaps provide municipalities with a viable approach and strategic platform to engage with communities and develop a more comprehensive understanding of how and where energy is used. This could enable them to adopt a more grounded approach when it comes to mitigating GHG emissions and creating more sustainable communities. However, given that energy

management and urban planning and inherently complex aspects of our cities, there are various external factors that must be addressed.

The following chapter will examine the issues and challenges embedded within urban planning and energy management processes in Ontario. It will reflect on the political aspects of green urbanism and community energy planning. Factors such as public perception, privatization, industry lobbying, and the ‘technological lock-in’ problem all influence the dynamics of urban planning and implementation of energy conservation initiatives across Ontario.

Chapter 3: Issues and Challenges

Urban Governance

With sixty-eight percent of the world's population projected to live in urban areas by the year 2050 according to a UN report (United Nations, 2018), it is becoming increasingly apparent that urbanization will play a critical role in either mitigating or worsening the effects of climate change. Despite large urban centres being closely associated with significant environmental footprints, it has been suggested that introducing policies that directly influence urban consumption can possibly decrease consumption patterns and GHG emissions (Kusters, 2018). The rationale behind this approach is that since people living in large cities are dependent on the market place for their day-to-day consumption, they are more receptive to price signals. By integrating the environmental costs of production and consumption into market products and services, governing bodies can perhaps decrease the environmental footprint of cities (Kusters, 2018). Retailers and producers for instance can decrease waste and the embodied GHG emissions by producing products with a lower environmental footprint. Increasing urbanization also offers many other possibilities in terms of sustainable development such as more sustainable modes of transportation.

While municipal and provincial jurisdictions in Europe have progressive policies when it comes to energy consumption, resilience building, and the environmental protection of natural resources, Canada has fallen behind. Although governing bodies across the nation have embraced ideal visions of sustainability, they have largely been unsuccessful in their efforts to strategically achieve their goals. Existing sustainability policies and legislation are vaguely outlined and often subject to misinterpretation. This results in a planning-implementation gap that hinders sustainable development (Connelly et al., 2009). This creates little incentive for authorities and developers to embrace sustainable design elements and invest in quality infrastructure that has functional value. Furthermore, current projections made by Environment and Climate Change Canada anticipate more volatile weather patterns and extreme events (Caldwell, 2018). This will inevitably put a strain on existing infrastructure, which is already showing signs of distress across Canadian cities. As explored in the literature review and policy analysis sections, there are many issues and factors that can be attributed to this lack of progress.

Although the Paris Climate conference and a wave of environmental consciousness have led governing authorities to adopt sustainability objectives, to date, they have generally been unable to reach their goals. The complexity of the politics of urban governance, specifically in large urban centres has always been a major challenge. This can partly be attributed to the intricate dynamics of power distribution under neoliberalism (Ehnert et al., 2018). These power imbalances ultimately make it difficult for governing authorities to allocate the financial resources required to achieve urban sustainability. This has often led authorities from different levels of government to focus on cost-optimization and effectiveness. Short-term, project-based funding is often prioritized over long-term sustainability objectives. This creates considerable challenges for governing bodies wishing to secure funding for sustainable initiatives, as they are often regarded as unprofitable and risky. This puts a strain on their ability to promote sustainability and yield long-term community benefits (Ehnert et al., 2018). These issues will be further examined later in this chapter.

There is also an equally complex local environment at the neighbourhood or municipal scale (Peters and Pierre, 2012). In the previous chapter, an analysis of existing legislation and regulatory frameworks pertaining to sustainability were found to be lacking in clarity and consistency. These issues make it difficult for authorities to implement them at the local level.

Current urban governance practices show an emerging interest in sustainable development. This has led to active public participation being regarded as a key component for achieving local sustainability (Holden, 2011). An analysis of energy planning documents of various municipalities across Ontario for instance, indicates that increasing public participation in urban planning and energy management programs is regarded as a priority objective. However, the potential for rooted conflicts and disagreements between state representatives and the public (NIMBYISM) can deter governing bodies from exploring new approaches when it comes to managing city development processes (Holden, 2011).

As discussed in chapter 1, the ambiguous definition of sustainability also poses a major obstacle for authorities hoping to develop a standardized framework for sustainable initiatives (Jabareen, 2006). Sustainability indicator systems (SIs) are a series of strategic measures used by planners, policy experts, private companies, and community groups to evaluate the performance of different aspects of sustainability that have been determined to be important (Holden, 2011). They can function as a tool to better inform decision-making when it comes to implementing

sustainable solutions for land-use planning and/or energy management. Although governments have attempted to develop general SI systems, they have achieved limited uptake across policy frameworks. A research study undertaken by Meg Holden looking at the potential to develop a SI system in the Metro Vancouver region revealed that public NIMBIYSM, widespread misinformation with respect to sustainability, and the unwillingness to change policies and behaviours at different geographical scales were important challenges to consider (Holden, 2011). The next section will examine how changes in political dynamics due to neoliberal forces play a key role in influencing urban sustainability transitions.

"Common Sense" Neo-liberalism:

The advancement of urban neoliberalism in the twenty first century has often involved a coordinated and politically directed process of change that has resulted in the restructuring of capitalist production, trade, and consumption (Keil, 2002). This period has been speculated to begin with the governments of Ronald Reagan in the U.S and Margaret Thatcher in the U.K, which ushered in new policies and ideologies that introduced deregulation, privatization, the liberalization of markets, free trade, downsizing of government operations, and drastic cutbacks in the welfare state (Harvey, 2000). These processes are often associated with capitalist accumulation, which can influence urban processes and create various social and environmental issues (Keil, 2002).

A clear example of this transformation occurred during Ontario's Progressive Conservative (PC) government under Mike Harris, in power from 1995 till 2003. During his term, changes in provincial policies led to the extensive deregulation of government processes and operations (Keil, 2002). Under Canada's constitutional system, municipalities are not given autonomy as they are referred to as 'creatures of provinces' and wholly subject to provincial legislation. Because of this, municipalities are coerced into adopting provincial policies. Harris implemented his campaign platform of a "Common-Sense Revolution (CSR) (Bradburn, 2018). The CSR encompassed a program of policies that aimed to shrink the size of government by means of reducing governmental operations. These aimed to reduce income tax by thirty percent, freeze hydro rates, deregulate university tuition, restructure labor laws to weaken power of

unions, and explore the selling of public assets in order to reduce the provincial debt (Bradburn, 2018).

The concept and philosophy behind CSR was also adopted by other governments across across the world. In the United Kingdom during the 2000 elections, the Conservative party outlined plans to privatize health care in order to reduce governmental costs (Dixon, 2000). It also aimed to liberalize the National Health Service (NHS) in order to reduce the effect of politicians on the management of the NHS. A similar effect took place in Australia under Premier Jeff Kennett's government in the Australian state of Victoria. During his term from 1992 to 1999, he contracted commissioners to replace local city councils in order to oversee amalgamations and efficiencies, deregulation of planning, and mandatory competitive tendering (Munro, 2015). It is worth noting that Premier Kennett himself described the neoliberal transformation of government during his term as a 'common-sense revolution'.

During the implementation of the CSR in Ontario, there were drastic changes made in the form of austerity measures. Cuts in public sector employment, environmental and social re-regulations, welfare cuts, and restrictive legislation had lasting effects on the Ontario economy (Keil, 2002). Furthermore, the amalgamation of governing bodies resulted in the formation of bigger local state institutions. This had detrimental effects on various sectors. For instance, new regulatory protocols in the education sector led to increased class sizes, stagnating salaries, changing curriculums, and reduced budgets (Keil, 2002). The CSR also led to the deregulation of Ontario's environmental management practices. The Walkerton tragedy in 2000 (in which seven people in a town of 7,000 died) and further cuts to other government programs and services eventually sparked violent protests. The Walkerton case will be examined further later in this chapter. Changes in political climate therefore result in the reorientation of economic policies and socioeconomic conditions in cities.

This concentration of power as a result of neo-liberal processes ultimately undermines democracy and skews public priorities (Brand, 2007). Following Harris's term, the McGuinty Liberal government (2003-2013) sought to undo the damage and reinforce progressive policies. For example, the *Green Energy Act of 2009* implemented during his term introduced environmental initiatives, under which coal-generated electricity was successfully phased out (Government of Ontario, 2014).

While the McGuinty government initiated some progressive energy policies, at the same time, there was plenty of evidence of the various instabilities faced in public management and financing of large-scale infrastructure projects in Ontario (Addie, 2013). The current transportation crisis in Toronto illustrates how the lack of public investment and the disconnected transportation network has resulted in traffic congestion to the point where it has suppressed economic growth. These issues have been attributed to years of infrastructure underinvestment, rapid economic and population growth in the region, and the lack in foresight and strategic planning (Addie, 2013). It was the proposal of an extensive LRT network aptly named, "Transit City" by former Toronto Mayor, David Miller in 2007 that finally sparked a long overdue reorientation of urban transit planning. His plan was perceived to be the solution that would solve Toronto's transit woes and improve accessibility and sustainable development in the city. Eventually, the establishment of a transportation institution named Metrolinx ushered in the integration of both city and provincial planning and the equally needed restructuring of public-funded developments (Addie, 2013). However, the 2008 global financial crisis and conflicting opinions in city politics had stimulated intense debates. This halted the development of Transit City lines and the project was ultimately cancelled after Mayor Rob Ford, a critic of Transit City, was sworn into office in 2010 (Addie, 2013). Political discourse and the mismanagement of resources therefore present other major obstacles that suppress sustainable growth and development.

Changes in the political spectrum can also have major impacts on environmental initiatives. Government anti-climate agenda in the form of incentive programs for fossil fuel industries for example, can render climate resilience and energy policy fragmented, unclear, and lacking any hard targets and goals (Caldwell, 2018). Although Canada has pledged to reduce its greenhouse gas emissions as part of the Paris Climate conference of 2015, the Progressive Conservative (PC) win in the June 7th, 2018 Ontario elections will inevitably make it difficult to reduce the province's carbon emissions. Soon after winning majority government, the leader of the PC party, Doug Ford, announced plans to cancel the Green Ontario Fund (Kalinowski, 2018). The Liberal government introduced this $377 million rebate fund as a climate change initiative to stimulate growth of the green building sector and enable homeowners to improve the energy efficiency of their homes (Kalinowski, 2018). This was being cancelled as part of Ford's

elimination of the cap-and-trade policy program that was planned to finance the Green Ontario Fund.

The Ontario Liberal government under Kathleen Wynne (2013-2018) implemented a cap-and-trade system in order to lower greenhouse gas emissions by placing caps on the quantity of pollution that particular industries can emit (Jeffords, 2018). The plan was expected to generate approximately $1.9 billion annually to be used for green investments, as well as improve the efficiency of existing infrastructure through the Green Ontario Fund (Rieti, 2016). Doug Ford's election campaign revives CSR policies in that his campaign is based on reducing government spending on public sector services, cutting taxes, and consistently opposing climate change programs such as cap-and-trade and carbon pricing (Ontario PC, 2018). Neoliberal city administrations are thus very susceptible to political dynamics. Perhaps a novel and different system of politics could address the underlying issues that have hindered progress for so long.

Monopolization of Power

There are three major entities that play a key role in the governance of Ontario's energy sector and shape its regulatory structure. These include the provincial government, the Ontario Energy Board (OEB), and the IESO. The government is tasked with setting and implementing policy, as well as exerting its authority to control others in the sector (Mowat Centre, 2016).

The OEB was founded in 1960 as a detached public agency (SolarShare, 2018). As Ontario's independent economic regulator for the energy sector, the OEB establishes the rules for electric and gas companies operating in Ontario, regulates LDCs, sets energy rates, monitors the wholesale electricity market and energy companies, develops new energy policies, and provides information tools to improve energy literacy for consumers (Ontario Energy Board, 2018).

It also licenses participants within the energy sector such as the IESO, generators of electricity, transmitters, distributors, and retailers. The Board oversees the electricity market by conducting audits and monitoring activities with respect to utilities' financial operating performances in order to ensure that energy companies adhere to Board decisions and orders (Mowat Centre, 2016). The OEB is mandated by the *Electricity Act (1998)* to ensure that: "the interests of consumers are protected with respect to prices and the adequacy, reliability, and quality of electricity services" (Electricity Act, 1998).

The Independent Electricity System Operator (IESO) is the province's independent planner and system operator and is directed by a board of governors appointed by the government of Ontario (SolarShare, 2018). It was initally known as The Independent Marketing Operator (IMO) and was renamed in 2005. The OEB establishes its fees and licences. It is tasked with managing the operations behind Ontario's electricity system and balancing the supply and demand of electricity in the province (IESO, 2018). This involves coordinating with neighbouring jurisdictions as part of an integrated North American electricity market (Mowat Centre, 2016). Furthermore, it is also responsible for planning the province's long-term energy needs and developing regional planning strategies to meet these requirements (Mowat Centre, 2016). Promoting a culture of conservation is another one of the IESO's mandates. This includes the development of energy conservation programs and the supervision of LDC's conservation and demand management activities.

There are various issues that stem from the monopoly exerted by the OEB and IESO over Ontario's electricity system (Oji and Weber, 2017). For instance, several criticisms have surfaced with regards to the process of conducting financial operations by the IESO. A complaint issued by the auditor general of Ontario, Bonnie Lysyk, accused the IESO of administering false accounting practices earlier in 2018 (The Canadian Press, 2018). This prompted a special audit of the agency. Efforts to resolve the issue were difficult since both the IESO and the OEB were uncooperative and failed to provide the necessary information during the auditing process (The Canadian Press, 2018).

There is also a lack of public trust and accountability associated with the Board and the IESO. Participants as part of a focus group conducted in 2010 stated that they did not understand the meaning of the charges on their electricity bills and were unaware of the OEB's obligation to protect consumer interests (Office of the Auditor General of Ontario, 2011). Furthermore, the results of a stakeholder survey in 2010 showed that respondents rated the Board poorly with respect to its consumer outreach and public education efforts (Office of the Auditor General of Ontario, 2011). Similar results were recorded in focus groups from previous years. This lack of public understanding and negative perception ultimately leads to a distrust of the OEB (Office of the Auditor General of Ontario, 2011).

Under the OEB and IESO, there are also various restrictions and limitations in place that hinder the development of community power projects. Community-owned power organizations

such as renewable energy cooperatives (RE co-ops) for instance, are entirely dependent on the IESO since it is the only client for cooperatives in Ontario (Oji and Weber, 2017). They are also reliant on the Feed-in-Tariff policy, which forms the basis of the relationship between RE co-ops and the IESO through contracts (Oji and Weber, 2017). RE co-ops often face difficulties when raising capital to finance renewable energy projects since finding investors can be challenging. This is partly due to provisions in the FIT contract, which mandate the participation of RE co-ops to operate renewable energy projects (Oji and Weber, 2017). As discussed in chapter 2, with the closing of FIT applications in December 2017 and the unclear conditions outlined in the new net metering policy, the future of RE co-ops in the province is now uncertain. The scope for business operations for renewable energy cooperatives in Ontario is therefore highly limited.

This culmination of issues interestingly parallels those faced in the land-use planning realm in Ontario. The Ontario Municipal Board (OMB) was an independent administrative board in the province for several years. It processed appeals on municipal decisions with respect to planning and development matters, as well as on issues relating to zoning bylaws (Cross, 2017). However, the OMB has long been criticized for catering to the interests of developers to secure profits at the expense of upholding public interest (Cross, 2017). This consolidated power created several other issues in the form of rapid and uncontrolled growth, cumbersome development processes, disregard of environmental and citizen concerns, distrust of the OMB, and the diminished power of municipal councils to govern their communities (Swail, 2017).

Following complaints for several years, the government replaced the OMB with the Local Planning Appeal Tribunal in April 2018, which has more limited powers and a reduced scope (Swail, 2017). These steps sought to shift the balance of power towards local communities, strengthen municipal democracy, and empower local planners and residents to make their own decisions (Cross, 2017). Although the effects following the dissolution of the OMB are yet to be observed, a similar approach could perhaps be replicated across Ontario's energy sector. A restructuring of the OEB and legislative amendments that aim to grant more flexibility for renewable energy cooperatives and community power practitioners could empower citizens and give local communities more autonomy. Perhaps this could facilitate the transition of our centralized energy grid to one that is based on low carbon production and consumption in a localized context. This may also close the planning-implementation gap between the provincial and municipal levels of government and help local communities achieve energy democracy.

Technological Lock-in

The key responsibility of the IESO and OEB is to maintain balance in the supply and demand of electricity in Ontario (Mowat Centre, 2016). A large part of Ontario's electricity mix is comprised of nuclear power (59%), followed by hydroelectric (28.2%) and natural gas (6.7%) (Leslie, 2016). With nuclear power, electricity is generated from large plants such as the Pickering and Darlington power stations, which have a combined generating capacity of 6,600 Megawatts (Ontario Power Generation, 2018). These plants are owned and operated by the Ontario Power Generation (OPG), which produces more than half the province's electricity (Oji and Weber, 2017).

The nuclear sector in Ontario is relatively expensive and has been viewed as controversial by energy experts (Oji and Weber, 2017). There are several factors behind this. Because of the significant output of Ontario's nuclear sector, there is the problem of oversupply. To ensure the stability of the province's electrical grid, it becomes necessary to manage any 'surplus baseload generation', which primarily comes from nuclear and hydroelectric generation in the case of Ontario (Environmental Commissioner of Ontario, 2017). According to the IESO, periods of surplus baseload generation are defined as moments when baseload generation is higher than Ontario electricity demand. This surplus generation is managed through the electricity market by exports to adjoining power grids at prices lower than the cost of production (Environmental Commissioner of Ontario, 2017). When excess power is not needed or cannot not exported, it is 'curtailed' or dumped. This process involves the dumping of electricity by releasing steam from nuclear generators by the IESO (Ontario Society of Professional Engineers, 2017). Since Ontario is contractually obligated to cover most of the production costs associated with curtailed and exported energy, this can result in increased costs for ratepayers. A research study examining the components of Ontario resident's electricity bills for instance, revealed that payments for electricity generated from non-renewable sources such as nuclear and gas-powered plants, amount to the largest portion of consumer's electricity bills (Oji and Weber, 2017). Nuclear power plants in Canada are also required to be equipped with multiple sources of backup power to maintain grid stability and provide power in cases of emergency (Canadian Nuclear Safety Commission, 2018).

This culmination of factors, combined with the inflexibility of large nuclear power plants has led to an increased dependence on this current energy system (Oji and Weber, 2017). With alternate renewable energy sources such as wind and solar, there are similar fluctuations in electricity supply. However, in contrast with nuclear, the generating capacity from these renewable sources can be scaled up as needed (Oji and Weber, 2017). This can grant energy planners a higher degree of flexibility to manage supply and effectively balance the electrical grid.

The cumulative effects of the centralized nuclear energy program in Ontario has led to the 'technological lock-in' problem. This refers to a situation where a market becomes locked-in or stuck with a particular standard despite the existence of alternative options that are more economic (or provide more benefits) (Spulber, 2002). In Ontario, the nuclear energy sector and monopoly has created significant challenges for renewable energy development. The OPG's plan to refurbish the existing nuclear facility in Darlington is estimated to cost approximately 12.9 billion dollars (Hamilton, 2015). This represents a significant pooling of resources and capital, which could have otherwise been invested in renewable energy technologies such as wind and solar. This problem has also been faced in other regions in the world. A position paper published by the Sustainable Development Commission in the United Kingdom states that a nuclear program would "commit the UK to that technology, and a centralized supply infrastructure, for at least 50 years" (Sustainable Development Commission, 2006). This would significantly suppress research and development in alternative energy sources such as renewables.

These issues make it challenging to develop and integrate innovative and disruptive technologies such as solar and battery storage into our grids. Research has shown that a hybrid power system using a combination of renewables, energy storage systems, and a small portion of natural gas would actually equal the electricity costs compared to nuclear energy reinvestments (Hamilton, 2015). Despite advances in renewable energy projects and stimulated growth in the green industry due to the *Green Energy Act (2009)*, the monopoly held by the nuclear industry inevitably makes it tough to transition towards a decentralized energy system. Competition with large-scale nuclear power plants also poses major challenges for renewable energy cooperatives wishing to implement community power projects (Oji and Weber, 2017).

This dominance of the nuclear industry often leads to powerful relationships between key energy actors and government officials (MacArthur, 2016). This can make it extremely difficult

to bring about policy changes that aim to explore alternative options that may be in the public interest. The next section will examine the effects of industry lobbying on Ontario's energy and planning sectors.

Industry Lobbying

In Canada, the fossil fuel and nuclear industry lobbies have a long and documented history of influencing Canadian public policies at both federal and provincial levels (MacArthur, 2016). Neoliberal market forces within these sectors have led to the development of close relationships with provincial power authorities, planning agencies, energy companies, and environmental resource departments. This grants them a strategic position when it comes to shaping policies and ensuring continued business development (MacArthur, 2016). Often times, when imminent policy changes pose a threat to their business operations (and profits), actors within these industries will leverage their close connections with decision-makers in order to delay the process and mitigate possible negative outcomes (MacArthur, 2016). Given the variety of resource types across Canada, the specific configuration of major players differs across jurisdictions. In Alberta for instance, the dominance of the fossil fuel industry has led to a strong relationship between the government and private companies that specialize in drilling, refining, and distributing oil (MacArthur, 2016).

In Ontario's electricity sector, the nuclear and coal lobbies have played a fundamental role in hindering renewable energy development, opposing sustainable initiatives focused on promoting clean energy, and restricting the expansion of new actors such as by limiting grid access available for cooperatives (Etcheverry, 2013). This is due to the large concentration of nuclear facilities and industries in Ontario, which provides more than half of the province's electricity. With the industry paying approximately $1.5 billion in federal and provincial taxes, the economic significance of the industry is apparent (Bratt, 2012).

It has been claimed that one of the major reasons for the success of the nuclear lobby in Ontario over the fossil fuel lobby is due to the Nanticoke coal-fired generating station. This was known as one of Canada's top GHG sources since it played a large role contributing to air pollution and smog in the region (Benzie, 2018). The negative public perception of coal power and the Liberal government's phasing out of coal plants in 2014 are also important considerations

for the success of the nuclear lobby in Ontario (Flanagan and Gass, 2017). Although Nuclear power in contrast, does not directly emit GHG emissions in the generation of electricity, the process of extracting uranium, enrichment, transport, and construction of nuclear plants do (MacArthur, 2016). Furthermore, the problem of disposing and storing nuclear waste is also a pressing issue that is often not factored into decision-making and development costs (The Associated Press, 2017).

Another reason for the success of the nuclear industry in Ontario is due to the extensive and closely connected network of well-established actors. These include the OPG, Canadian Nuclear Energy Association, Atomic Energy of Canada limited, Cameco (one of the world's largest uranium companies, TransCanada Corporation, and various suppliers, reactor operators, provincial power utilities, and scientific associations (MacArthur, 2016).

With the 2015 United Nations Climate Change Conference increasing environmental consciousness, the stakes of nuclear lobbying efforts are high today. Enhanced public investment in climate change programs to facilitate renewable energy development present major threats to the nuclear industry (MacArthur, 2016). Negative public perception of nuclear power following the 2011 Fukushima meltdown also poses dangers (Bratt, 2012). It is therefore in the interest of the nuclear lobby to protect their business model and limit the introduction of new actors. As we have seen, this creates challenges for the growth of the renewable energy sector and developing climate change initiatives. Neoliberal market forces and CSR policies can further exacerbate the challenges faced in implementing green urbanism and energy conservation strategies.

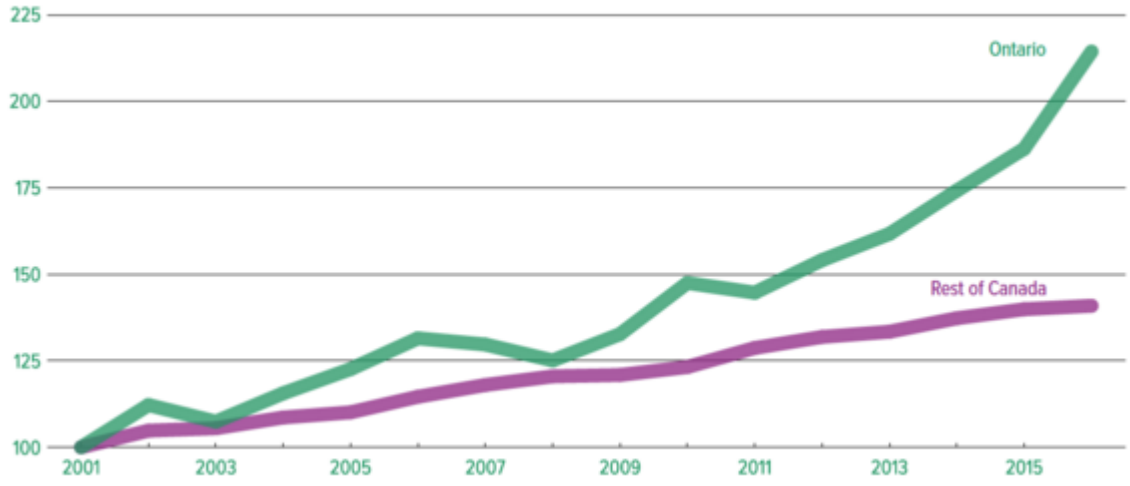
Privatization of Public Infrastructure:

Mike Harris' campaign of CSR during his term (1995-2002) led to various austerity cuts and reductions in government spending (Bradburn, 2018). It also brought about the privatization of public infrastructure in order to reduce debt and resolve operational inefficiencies. Unfortunately, the outcome of this approach had tragic results. The privatization of much of Ontario's water testing system led to the closure of water-testing labs and facilities in 1998 (Bourette, 2000). With the weakening of Ontario's Ministry of Environment due to more budget cuts under Harris' CSR, authorities failed to ensure that appropriate safeguards were in place to ensure quality control and maintain public health safety (Bourette, 2000). This led to an E.coli

outbreak which caused the tragic deaths of seven people, while making almost half of the town's population ill. The privatization of government-owned assets can therefore have adverse consequences. This can occur across different sectors. The long-term lease of Ontario's Highway 407 to private interests for example has resulted in increased costs for consumers and less revenue for the government (Fraser, 2015).

In Ontario's electricity sector, decisions involving private purchases of publicly-owned assets can have similar results while inducing major changes to the electricity distribution system. The cancellation of two gas-powered plants following a deal with a private company in Ontario for instance, has been blamed for surges in electricity rates (Fraser, 2015). It is has been claimed that a complete privatization of Ontario's power system could generate $50 to $100 billion (Solomon, 2018). This significant source of potential government revenue has made energy management a focal point during provincial elections over the past few decades (Sepulveda, 2018). Successive governments have often made decisions that have resulted in long-term structural issues within Ontario's energy sector. This has contributed to the dramatic increase in electricity prices in recent years (Sepulveda, 2018). Figure 3.1 below illustrates how Ontario's retail electricity prices have more than doubled from 2001 to 2016.

Figure 3.1: Electricity prices in Ontario (Sepulveda, 2018)



This process was initiated during Harris' liberalization of the electricity market in 2002. His Progressive Conservative (PC) government in 1999 split the public utility Ontario Hydro, into Hydro One (which is responsible for transmission and distribution), Ontario Power

Generation (OPG), and several other utilities. This was carried out with the overall vision of stimulating competition and privatization, while also reducing provincial debt (Sepulveda, 2018). The introduction of the *Electricity Competition Act (1998)* during this period brought in further changes to electric utilities operating in the province (UtilitiesKingston, 2018). The Act requires municipalities to set up corporate structures for managing or operating electricity distribution systems. It also outlines limitations for employees working at municipally-owned utilities, such as confining them to the role of electricity distribution (UtilitiesKingston, 2018). These policies aimed to level the playing field between private and public owned utilities, while shifting power from the public to the private sector (UtilitiesKingston, 2018).

The Liberal Government of Dalton McGuinty (2003-2013) continued this PC trend of privatizing electricity sector assets, leading to various long term effects (Sepulveda, 2018). This led to a drastic increase in the revenues of private and independent generators of electricity. These mainly comprised of corporations, investors, and high-income households who were able to secure lucrative long-term contracts and purchase solar panels (via FIT program) (Sepulveda, 2018). This increase led to an overall increase in electricity prices which was passed on to consumers (Sepulveda, 2018). This resulted in growing inequality and energy poverty, while posing an additional burden on low-income households. The controversial decision to privatize part of Hydro One by Kathleen Wynne's Liberal Government (2013-2018) continued to follow this trend. The privatization of municipally-owned utilities also makes it difficult for cooperatives to implement community power projects or enter the market. As discussed in chapter 2, this is because they cannot distribute their own electricity under current regulations. Partnering with a municipally-owned utility could therefore present an alternate option.

The growing trend of privatizing public infrastructure in Ontario has shown that there are significant repercussions. Lower quality service, public health risks, increased electricity rates, energy poverty, and income disparity are all important considerations when making governing decisions regarding public sector utilities. The next section will examine how the role of public perception has also been a major factor in influencing climate change initiatives.

Influencing Public Perception

State actors and industry lobbies often employ tactics to influence public perception in order to strategically hold power and protect business interests. This can impact the growth of the renewable energy industry in Canada. Wind energy development in Ontario for instance, has long been a controversial issue. This is in part, fueled by negative public misinformation.

There are various claims that wind turbines negatively impact human health. This presents major challenges for the implementation of community-oriented wind energy projects. A research study by Emmanuel Songsore and Michael Buzzelli examines the role of health risk perceptions associated with wind energy development (WED) and other related concerns in Ontario (Songsore and Buzzelli, 2014). It reveals how the media influence negative public perceptions of risks and how there is a lack of transparency between the public and officials working within the energy sector. There is even evidence of reports funded by petroleum companies which act as propaganda against renewable energy development in order to mitigate competition and maintain the value of their oil reserves (Goldenberg, 2012). Right-wing think tanks such as the Fraser Institute have also been documented to receive millions in funding from powerful oil companies based in the United States (Hong, 2012). Reports have shown that these fossil fuel lobbies spend around $115 million per year in order to oppose climate policy and hinder efforts to reduce carbon emissions (Williams, 2016).

These reports, along with public NIMBYISM have led to polarized community support for wind energy in Ontario. These factors can also have a strong impact on policy making, with city councilors previously proposing moratoriums on wind energy development in the province (Paperny, 2010). In order to effectively implement wind energy policies, the study recommends the need for increased community engagement during WED projects (Songsore and Buzzelli, 2014). It also emphasizes the importance of including scientific assessments from credible sources to accurately address public concerns. Here, it is important to note that the results of a scientific study conducted by Health Canada found that there are negligible health effects associated with wind turbine exposure (Aulakh, 2014).

In examining the issues and challenges associated with developing green urbanism ideals, it becomes clear that state actors and industry lobbies have used neoliberal policies and CSR reform as instruments to protect business interests and maintain their monopolies. Governments

and corporations alike have also used environmental discourse in order to win their constituency and influence public support, such as through ‘green-washing’ (Brand, 2007). As we have seen, this concentration of power can undermine democracy and lead to various negative social and environmental consequences. It can also adversely influence the dynamics of urban planning and the implementation of energy conservation initiatives in Ontario. Over the past few decades, swings in political climate have led to the shifting of priorities with respect to Ontario’s economy, environment policies, and social programs. With the PC party winning majority government in the 2018 Ontario elections, another swing of the political pendulum is imminent. This illustrates how the processes of urban planning and energy management is always dynamic and ever-changing.

The next chapter will explore case studies involving community power projects across jurisdictions in Ontario, the United States, and Europe. The examination of these projects will serve to better understand the underlying challenges and issues associated with community energy planning. It will also identify potential opportunities and recognize the mechanisms that were used to develop successful community power projects.

Chapter 4: Community Power: Case Studies

Community energy planning comes in many forms and development processes can vary significantly across different jurisdictions. This section of the paper will analyze six case studies that involve community-focused sustainable energy projects in Canada, Europe, and Central America. These were chosen to represent novel approaches to community energy planning which included localization, integration, and collaboration during their implementation process. It will analyze the conditions and factors that led to the application of sustainable initiatives, share insights from interviews with energy experts, identify relevant actors, review community engagement processes, and examine the mechanisms that enabled successful project development. Lastly, it will look at the major challenges associated with replicating similar community-oriented sustainable initiatives in Ontario. The first three case studies that will be explored include innovative sustainable programs and approaches to community energy planning that have yielded various benefits to communities, while also enabling residents to actively participate in their development processes. The other three case studies will focus on how energy cooperative models can empower citizens to play a key role in the development of low carbon strategies within their communties.

Sustainable Neighbourhood Action Plan (SNAP)

The first case study will examine the Sustainable Neighbourhood Action Plan (SNAP) developed by the Toronto and Region Conservation Authority (TRCA). This program attempts to help municipalities improve energy efficiencies, aggregate local community support, form partnerships at the local level, and develop the process for neighbourhood-scale sustainable retrofits (TRCA, 2018). It also aims to guide strategic infrastructure investments that will implement watershed and municipal plans, along with climate change strategies at the neighbourhood level. Because the conservation authority implements a range of climate change urban redevelopment initiatives in both the public and private sectors, it also hopes to build trust for long-term engagement with communities (TRCA, 2018).

An interview with Adriana Gomez, who works as a senior project manager for SNAP (Gomez interview, 2017), shed valuable insight on the SNAP program. SNAP was developed by

TRCA in order to help municipalities reduce the carbon footprint of their communities and improve their energy efficiencies (TRCA, 2018). It takes an integrated approach towards urban retrofit projects by actively engaging with citizens and consulting with community members in order to build long term relationships. Projects are implemented at the neighbourhood scale, where SNAP coordinates consultation meetings with local communities. Here, citizens play a key role in helping to identify and understand the barriers and drivers for urban (re)development within a particular neighbourhood (TRCA, 2018).

It is worth noting that this process considers the socio-economic context of communities and local interests to aid in decision-making. Furthermore, SNAP projects place an emphasis on collaboration and building relationships with different members of the community which include residents, businesses, community groups, and organizations. This local engagement is crucial for SNAP, as it helps to build local capacity for development. It also facilitates in preparing hollistic actions plans that aim to overcome implementation barriers and launch a range of sustainable initiatves that aim to improve resiliency (TRCA, 2018).

According to Gomez, SNAP is comprised of a project management team which guides decision-making. Depending on the neighborhood being considered for (re)development, the team may consist of members from different internal TRCA departments that include energy, planning, and watershed management. Being contingent on the nature of the project, it may also include ecological experts and representatives from organizations such as utility companies. Given that each of the SNAP projects are radically different, the project team is assigned according to the specific needs and conditions of each community project in order to apply a contextualized approach.

To date, SNAP has accomplished several neighbourhood projects. These include the development of neighbourhood action plans for six communities in the Greater Toronto Area (GTA): Markham, Mississauga, Toronto, Richmond Hill, Caledon, and Brampton. There are also future plans to engage with two other municipalities and/or communities in an advisory role. These projects aim to improve the energy efficiencies of neighbourhoods, initiate urban redevelopment projects, and implement climate change adaptation strategies (TRCA, 2018).

Retrofit projects implemented by SNAP are typically funded by provincial government grants and subsidy programs (such as GreenON), which are part of the proceeds from Ontario's carbon market. However, given the Progressive Conservative party win in the June 2018

elections and the imminent cancellation of the cap and trade program, this funding pool will likely be reduced over the coming years (Ontario PC, 2018). Other funding sources include financial assistance from the Federation of Canadian Municipalities (FCM), which provides capital and grants for development plans and projects. However, Gomez noted that the available funding is generally restricted to finished project development plans. There is limited funding available for the initial assessment of a neighbourhood and for the conceptual stages of projects, which often takes time. Furthermore, most funding programs are administered on the basis of requiring GHG emissions reduction. They do not consider other social benefits such as the improved quality of life, creation of green spaces, and increased employment opportunities. According to Gomez, the GHG criteria presents a major barrier for projects since a holistic approach is essential for community improvement projects.

Because SNAP attempts to stimulate neighbourhood retrofits (which may include different types of buildings), it provides incentive-based support programs (through government subsidies) which provide funding for energy efficiency renovations and sustainable urban initiatives. These come in the form of available grants for home energy audits and unlimited solar assessments for qualifying homes (TRCA, 2013).

One example of a SNAP community project took place in the West Bolton region in Caledon, where the Government of Ontario awarded a grant for the design and implementation of a Home Retrofit Program (TRCA, 2018). This project aimed to explore ways of expanding the retrofit program to more suburban households in order to reduce energy consumption within the community. Each SNAP neighbourhood project features unique characteristics which are based on the existing conditions of the neighbourhood. In the Black Creek community for example, localised basement flooding and erosion has long been an issue (TRCA, 2018). As such, SNAP initiatives included flood water protection measures, assessment of renewable energy sources, and naturalization projects to better manage rainwater runoff (TRCA, 2018). These initiatives complemented efforts to improve the energy efficiency of homes within the neighbourhood.

In addition, SNAP also offers workshops and information sessions for homeowners wishing to improve their energy efficiency. In 2012, TRCA launched a program which conducted an extensive ‘green makeover’ of homes in order to showcase the benefits of eco-friendly homes, educate homeowners and the building industry about installation and maintenance processes, and demonstrate the impact of green home renovations (TRCA, 2018). These programs aim to build

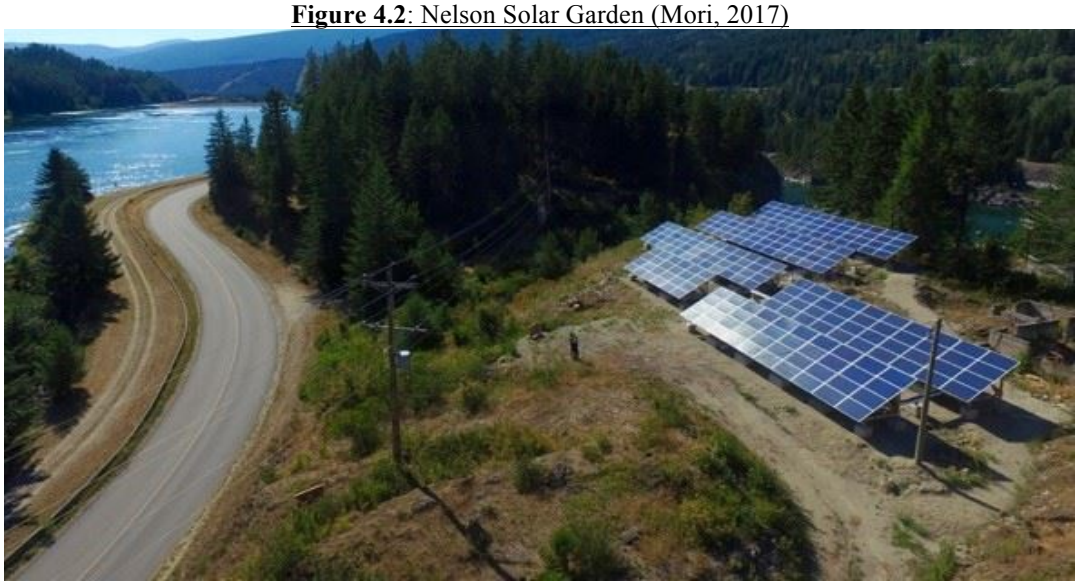
capacity and develop the technical skill set of homeowners and authorities to better implement and manage community-scale energy efficiency projects.

During the interview, Gomez highlighted the major challenges with developing community retrofit projects. Due to lengthy development procedures, permitting, and approval processes, municipalities often do not have the capacity to provide sufficient staff time and resources towards implementing community improvement initiatives. Another big challenge is the lack of transparency with respect to data sharing, as utility companies are often reluctant with sharing data on consumption patterns due to privacy concerns. This makes it difficult for municipalities to identify baseline energy usage levels within specific communities in order to set sustainable targets. Furthermore, there is also the concern of deficient building code standards and a lack of policy support for improving the energy efficiency of existing building stocks. Gomez explained how the pushback from the real estate industry, namely due to higher costs presents a major obstacle when it comes to enforcing green building design requirements. These underlying issues inevitably make it difficult to develop sustainable community projects that can achieve green urbanism.

Nelson, B.C Solar Garden

The following case study will explore a community-owned renewable energy project known as the Nelson Community Solar Garden, which is located in the City of Nelson with a population of 10,600 (Statistics Canada, 2016). Bullfrog Power, a renewable energy developer, and the City of Nelson announced the launch of the 60 kilowatt solar installation in 2017 (Bullfrog Power, 2017). It is Canada's first community solar garden installation that uses the "virtual net-metering" policy (described in detail in Chapter 2) (figure 4.2).

Figure 4.2: Nelson Solar Garden (Mori, 2017)



An interview with Carmen Proctor (on Thursday April, 26th), who first presented the solar garden concept to Nelson City council and worked as the project developer, provided an insightful perspective on the planning process. The idea behind the initiative was to showcase the future of how Canadians could support renewable energy projects in their community. Since the city owns its own municipal electric utility, Nelson Hydro, it utilized its close relationship with utility operators and worked with energy regulators to develop suitable net-metering by-laws. Because this policy tool is relatively flexible and allows for solar credits to be calculated as an annual rate, it helped to create an ideal business model for the project. B.C's virtual net metering policy is similar to net metering policies that have been implemented in other jurisdictions such as in Nova Scotia, Colorado, Maryland, and Washington D.C (BC Hydro, 2017).

The solar garden comprises of 248 solar panels and feeds directly into the grid owned by city's electric utility, Nelson Hydro. The system is expected to generate enough power to sustain roughly seven households. Because the project is intended to test the model for future expansion, it is therefore relatively small in scale. Proctor explained that B.C had a particularly long winter since the project was first launched in 2017 and the the estimated savings may therefore, be less than expected for the first year. However, she noted that the system had produced over half of the initial annual estimate by January 2018.

In order to finance the project, Bullfrog Power provided a pre-feasibility grant to the project and followed up with additional financial support during the construction phase (provided $35,000 in grants) (Forman, 2017). The City of Nelson provided $25,000, and the Province of British Columbia provided $20,000 in funding for the project (with a total capital cost of $80,000). The rest of the funding was provided by investors, where subscribers to the Nelson project purchased their solar panels at an upfront cost of $945, with no further payments required (BC Hydro, 2017).

Participants also had the alternative option of paying for every kilowatt-hour of power their panels produce over the solar installation's lifespan. As the panels generate electricity each month, each of the subscribers receive "solar credits" that are deducted from their monthly electricity bill (BC Hydro, 2017). These credits are calculated annually and are directly proportional to their contribution towards the solar project. Although the payback is not substantial, over time, all of the subscribers are expected to recover their initial investment through reductions in their annual electricity bill. These savings are estimated to begin at $28 per year and eventually grow to $50 over time (Forman, 2017).

During the interview, Proctor stated how the return on investment was not the major factor driving development. There was a strong collective commitment by individual investors and groups from the Nelson community to support clean energy in B.C. The panels were purchased by enthusiastic members which included local churches, homeowners, renters, and RE co-ops. The municipality of Nelson has the overall goal of incentivizing other cities across Canada to embrace the solar garden concept and replicate this model in their jurisdictions. According to Proctor, the city already had many municipalities across Canada reach out to them for inquires. Although net-metering laws are still under discussion in Ontario, the lessons learned from the successful implementation of Nelson's community solar farm can perhaps better

influence decision-making when it comes to eventually introducing Ontario's net metering program.

Community Energy Planning in Iceland

Iceland, with a population of 340,000, has become renowned for its extensive efforts in harnessing renewable energy and powering its modern economy (LivePopulation, 2018). This has not always been the case however. Until the early 1970s, much of the country's energy consumption was derived from imported carbon-based fuels such as coal and oil (Aldred, 2008). During this time, the country was also just emerging from a history of poverty and foreign leadership, as well as lacking basic infrastructure provisions. The nation was actually classified as a developing country by the United Nations Development Programme during the 1970s (Logadottir, 2015). With rising costs and the oil crisis of the 1970s creating instability across world energy markets, governing authorities began to review Iceland's national energy policy and explore alternate sources of energy to attain energy security (Logadottir, 2015).

The government shifted its focus towards renewable sources such as hydropower and geothermal, set funding for research and development for exploring resource areas, and built new infrastructure services and transmissions lines for these sources of clean energy (Aldred, 2008). However, it faced numerous challenges as it lacked the capacity, experience, and technical knowledge to undertake these massive changes. These are the same barriers that are faced by many countries today when undertaking efforts to implement sustainable initiatives and tap into renewable energy sources (Logadottir, 2015).

There are various mechanisms that led to Iceland's successful transition towards a more sustainable energy system. During the initial stages, Iceland collaborated with municipalities, the government, and the public by building trust and promoting an ideology which sought to find solutions and achieve sustainable goals (Logadottir, 2015). This was accomplished by promoting local empowerment and public participation through active engagement with citizens, businesses, and energy experts during the process of developing master plans for future community energy projects. It is important to note that in the beginning, there were inexperienced organizations in Iceland that lacked the technical knowledge and the financial resources for developing capital renewable energy projects. This challenging step was first taken by local entrepreneurs and

farmers, who had long term experience with respect to using primitive geothermal heating systems and early hydro projects to provide heat and electricity for their farms (Logadottir, 2015). Municipalities engaged with these innovative producers in order to build on their success and explored ways to implement these systems at larger scales. This process involved learning from local energy experts in order to explore solutions and produce plans to develop geothermal and hydro systems. This mobilized efforts to expand the clean energy concept across the nation. The municipalities which developed energy infrastructure and acquired access to geothermal hot water also influenced others to replicate their models. This course of development ultimately helped to establish coheshion between local communities and governing bodies (Logadottir, 2015). These mechanisms are critical for the long-term planning of renewable energy developments.

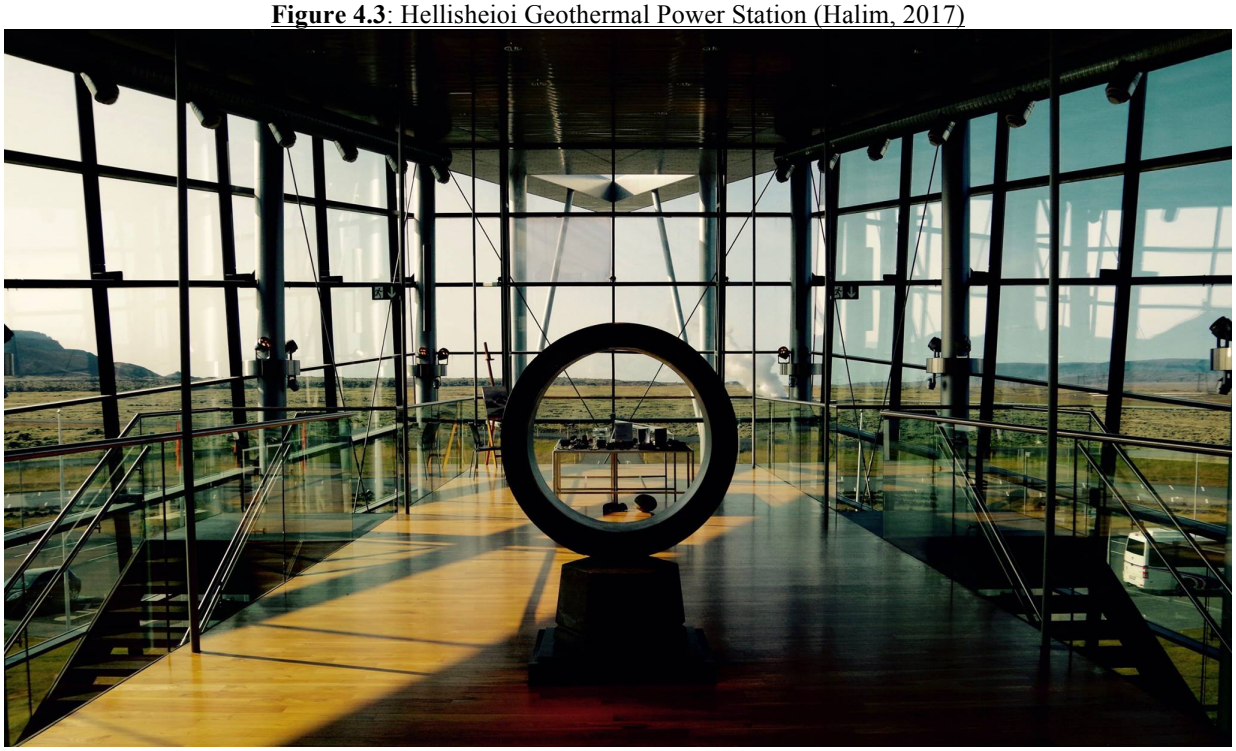
Furthermore, Iceland formulated a conducive regulatory framework that was complemented by government incentives in order to facilitate development (Logadottir, 2015). For instance, the Icelandic drilling mitigation fund helped to decrease the risk for municipalities when it came to planning geothermal projects. This funding worked by providing loans for preliminary geothermal research and test drilling, which are often costly processes, while also granting cost recovery for failed projects. The established legal structure also stimulated individual households to connect to the newly established geothermal infrastrcuture networks (Logadottir, 2015). In addition, politicians announced the successful development of geothermal projects and showcased "before and after" pictures in order to win their constituency and highlight the benefits of cleaner air as a direct result of tapping into renewable energy sources (Logadottir, 2015).

Today, Iceland meets 100 percent of its electricity needs using renewable sources, with 75 percent being generated through hydropower by harnessing the glaciers and rivers of the interior, and 25 percent coming from geothermal fields (Logadottir, 2015). These geothermal fields also function as tourist attractions with their bathing pools, while providing locals with a limitless and cheap supply of natural hot water (Aldred, 2008). It is worth noting that geothermal energy allows Iceland to provide 87 percent of its demand for hot water and heat through district heating systems (Gipe, 2012). Iceland's renewable energy developments have thus yielded numerous benefits in the form of reduced GHG emissions, clean air, hot water, cheap electricity rates, and increased energy security. During a trip to Iceland in 2016, I visited the Hellisheioi Geothermal

Power Station (Figure 4.3). With a capacity of 303 MW of electricity, it supplies the City of Reykjavik with clean energy and hot water for the city's district heating system (OnPower, 2018). A conversation with a maintenance worker at the plant revealed that he paid merely $30 per month for his electricity costs.

Although benefiting from abundant sources of renewable energy, Iceland's achievement in bringing together and mobilizing various actors and different levels of government can perhaps be replicated across other jurisdictions. Its successful implementation of community energy planning is a testament of how nations can overcome capital costs, political conflict, and internal barriers to develop green infrastructure.

Figure 4.3: Hellisheioi Geothermal Power Station (Halim, 2017)



Renewable Energy Cooperatives (RE Co-ops)

RE Co-ops have been regarded as key players within Ontario's renewable energy industry (TREC, 2016). Given their community focus and member-based governance structure, they provide ideal models for the implementation of community power projects. The next three cases studies will look at how RE co-ops have developed successful community-owned energy projects across different regions of the world.

European Federation of Renewable Energy Cooperatives (REScoop)

Across Europe, RE co-ops have been instrumental in driving the growth of the renewable energy sector. These cooperatives have built numerous renewable energy installations across Europe that generate and supply cheap electricity to their members. The European Federation of Renewable Energy Cooperatives (REScoop) is made up of a network of 1500 RE co-ops in more than fifteen countries and their one million members (REScoop, 2018). Their objectives are to achieve energy democracy, promote REScoop business models throughout Europe, empower citizens to actively engage in renewable energy projects, and facilitate the transition towards a more sustainable energy system. In recent years, REScoop has spearheaded major research projects that aim to develop technical skills and build capacity for implementing community power projects across Europe (REScoop, 2018).

REScoop's 20-20-20 project (2012-2015) for instance aimed to foster close collaborations across all the actors involved in the energy market in Europe. The objectives of the project were to identify the barriers for energy co-ops that differ from country to country, probe into why the barriers exist, explore and evaluate best practices, and find solutions in order to develop more sustainable cooperative models. The REScoop project also functioned as a platform to promote the idea of cooperative renewable energy generation in Europe, introduce the concept in countries where it has not yet been developed, and share its findings with other coops based in Europe (REScoop, 2018). Citizen-led projects are often subject to communication issues between resident-members and authorities due to the difficulties in navigating legal, technical, and regulatory requirements. REScoop sought to identify these barriers and empower citizens by giving them the tools to spread the results, while stimulating enthusiasm and interest with respect to REScoops (REScoop, 2018). The results of the project have helped to establish potential

business models for developing and managing REScoop cooperative projects (European Commission, 2017). It has also aided the European Union energy market to develop a collective understanding with respect to the barriers faced within the cooperative energy sector.

Another program developed by REScoop is the REScoop Plus program, which is built on the knowledge gathered and network established during the REScoop 20-20-20 project (European Commission, 2017). This three-year, European Union-funded project was launched in 2016 and is intended to promote energy efficiency as an important value-creating tool for businesses in Europe (Monaghan, 2017). The project involves RE co-ops across eight countries and aims to build a toolbox to enable other co-ops to implement energy efficiency services to their members. The objectives of the program seek to identify best practices and to carefully scrutinize them in order to build viable tools for RE co-ops across Europe (European Commission, 2017). As part of the program, there are several pilot projects under development that seek to evaluate the viability of generating energy savings under cooperative models (European Commission, 2017). The results of these projects have produced varying degrees of success. Research has shown that among members, REScoops can achieve up to twenty percent in energy savings through reduced energy consumption (Monaghan, 2017). The revenue generated from such projects can also be used to finance energy efficiency measures in public buildings, or pay the wages of a local energy expert to help citizens and local municipalities to improve their overall energy efficiency (European Commission, 2017). The ultimate goal of the REScoop PLUS program is to develop a toolkit with a range of best practice products such as communication tools, as well as to share the acquired knowledge with other REScoop members in order to facilitate the growth of community power projects.

Pajopower

A phone interview with Daan Creupelandt, a coordinator at REScoop, yielded insightful perspectives on several community power projects that the RE co-op known as Pajopower was developing (Creupelandt interview, 2018). Pajopower is one of REScoop's members and is based in Flanders, Belgium. It was founded in 2014 as a Belgian cooperative that aims to support sustainable development and build capacity for community-owned power projects (Creupelandt and Vansintjan, 2018). The cooperative provides consultancy services which include performing

audits in order to better inform retrofit projects. This is done to prioritize the different energy efficiency measures required for specific types of buildings/homes.

The cooperative issues shares and invests in renewable energy and energy efficiency projects in "hetPajottenland" and "de Zennevallei", which are two regions south of Brussels (Creupelandt and Vansintjan, 2018). All citizens are eligible to join the cooperative. After purchasing a share, citizens become co-owners of the projects and share in the profits. Pajopower's objectives are to mobilize local citizens and municipalities and help them to improve the energy efficiency of their buildings, reduce GHG emissions, and reach Belgium's overall climate change targets (CITYnvest, 2017).

During the interview, Daan was eager to share Pajopower's success with a large-scale street lighting retrofit project in Halle, a municipality South of Brussels. The project was delivered in collaboration with its founder, the NGO "Kyoto in het Pajottenland" (Creupelandt and Vansintjan, 2018). Initially, the municipality lacked the financial capacity and found it difficult in securing the necessary funding from banks. The investment was then financed by the the co-op, which issued shares and raised capital from local citizens who were invited to "adopt their personal street light". In the end, the cooperative managed to raise 225,000 euros from local citizens. It then provided the municipality with a soft loan to make the investment. In total, it retrofitted 445 public streetlights in two towns south of Brussels. The LEDs save the city 400,000 kWh per year and approximately 92 tonnes of carbon dioxide emissions (Creupelandt and Vansintjan, 2018).

Because municipalities often do not have the required financial resources for retrofit projects, Pajopower is also taking action to improve the energy efficiency of public buildings such as local schools and community centres. For public buildings, the co-op issue shares and uses third party financing (TPF) to finance energy efficiency measures (CITYnvest, 2017). TPF involves the raising of capital by a third party organization (which is not the customer/user) through the selling of bonds for example (CITYnvest, 2017). This approach is planned to be replicated and scaled up by Ecopower, which is another Belgian-based cooperative that provides services in energy efficiency and renewable energy production. These initiatives are a part of the REScoop MECISE (European Mutual for Energy Communities Investing in a Sustainable Europe) project (Creupelandt and Vansintjan, 2018). REScoop MECISE aims to support local energy communities by aggregating funding from local citizens who earn a return on their

investment, municipalities, and institutional investors. The end goal of the project is to provide technical assistance for authorities in order to help them reduce GHG emissions and facilitate the transition towards decentralised renewable energy systems across Europe (Creupelandt and Vansintjan, 2018).

Renewable Energy Cooperatives in Denmark

In Denmark, community-owned energy supply has been a key part of its history (International Labour Office, 2013). The nation is claimed to be the first to pioneer a new, decentralised utility system that is based on renewable sources of energy and cooperative structures (Conaty and Mayo, 2012). The Opec Oil crisis in the mid-1970s prompted various countries to review their national energy policies and explore alternative energy sources. Denmark formulated a plan to develop a decentralised energy model with more efficient and localised forms of energy generation (Conaty and Mayo, 2012).

Electrical power production was largely owned by consumer cooperatives and municipalities. These organizations established joint-venture municipal and cooperative ownership structures, which in turn have provided the necessary democratic legal structures for Denmark to localise and modernize its energy services system (Conaty and Mayo, 2012). For example, Danish law emphasizes “right to invest” principles. This system requires project developers to give local residents priority when it comes to financing a community energy program (Balch, 2015). The effect of this principle has yielded numerous benefits for communities, as members were given a higher stake in a given project, thereby reducing the risk of foreign/private buy outs and ensuring quality-control. This also incentivizes residents to invest in local energy projects, raises awareness on energy issues, and helps to build support for community-oriented energy conservation programs (Balch, 2015).

In the case of district energy, power production was generally based on the non-profit principle, where under Danish law, district heating systems that serve communities are not allowed to earn a profit (Conaty and Mayo, 2012). Today, district energy and combined heat and power (CHP) is widely implemented across most Danish cities and it is the largest source in terms of heat supply, with over 60 percent of space heating derived from renewable sources

(International Labour Office, 2013). A large proportion of Danish district heating companies are operated as co-ops, with approximately 300 of the 400 district heating networks are organized as consumer cooperatives (International Labour Office, 2013). With the majority of these co-ops having a non-profit model, they not only create an efficient energy system, but they also offer consumers affordable rates. The co-ops also provide low finance loans for local communities to implement district energy systems, enabling them to save two tonnes of carbon dioxide savings per household annually (Monaghan, 2017). With Denmark aiming to heat 70% of all its households with district energy systems by 2020, this cooperative approach can feasibly help the country's efforts to expand clean energy systems and meet its climate change targets.

An example of a district heating project in Denmark involves a wood pellet district heating system in the Town of Gjern Varmecaerk. The system serves a local school, most local homes in the area, a small industry, and an indoor swimming arena (Biomass Energy Resource Centre, 2009). The system services 490 customers and the plant is very compact in size, thereby making it unintrusive when it came to integrating it within its urban setting. It is owned by its customers as a cooperative. Gjern Varmevaerk is just one of hundreds of compact biomass district heating systems that have benefited from Denmark's coherent national energy policy towards building a sustainable future.

Denmark's cooperative governance model has also had success in the case of wind power. Wind cooperatives are currently well-established across the country, with local communities being actively part of the planning process in order to implement local wind energy projects (International Labour Office, 2013). The 2009 Danish Act on renewable energy introduced a mandate for all new wind energy projects to offer a minimum of 20 percent ownership to local people in order to stimulate local participation in new wind energy projects (International Labour Office, 2013). This led to the strong incentive to establish cooperatives. Furthermore, local policies also had significant impact on the viability of implementing community-powered projects. Additionally, financing for the purchase of cooperative shares is easy to obtain, with some local banks almost automatically providing loans. However, it is worth noting that the strongest driver for the development of wind cooperatives has been the strong general support for wind energy in the Danish population (International Labour Office, 2013).

Costa Rica – Coopesantos Wind Farm

Across the Atlantic in Central America, Costa Rica has also seen success in implementing community-powered projects. The nation has made ambitious strides towards diversifying its energy sources. In recent years, approximately 99 percent of its energy requirements are being met using renewable sources (Blasiak, 2011). In 2015, Costa Rica's clean energy sector generated enough electricity to sustain the country's energy requirements for 75 days (Fendt, 2015).

With the onset of climate change, the Costa Rican Electricity Institute (ICE) aims to promote the use of decentralized renewable energy systems in isolated regions. This is part of the country's broader energy management strategy that aims to electrify 100 percent of the population, significantly reduce carbon emissions, and promote research and development in the field of renewable energy (OLADE, 2011). Costa Rica's wind energy sector currently generates seven percent of the power for the country's electrical grid (Arias, 2015). With several planned wind farms underway by private and community operators, this production is expected to double in the next several years.

As part of a field workshop course in 2016, a visit to the Coopesantos wind farm shed in-depth insight on Costa Rica's wind energy infrastructure. This cooperatively-owned wind farm is located at an elevation of 2000 metres across a mountain range in Costa Rica (Figure 4.3). It has been touted as the first wind farm in Costa Rica constructed by a cooperative and connected to the national electricity distribution system (Gold Standard, 2018). A caretaker of the farm led my class on an engaging tour of the 13 megawatt installation and wind turbines. He explained how the farm was developed as part of a community cooperative for on-site power generation in order to address energy shortage issues in the remote region. It is managed by the "Coopesantos" cooperative, which organized a series of workshops across local communities in order to mobilize community support and generate financing for the project (Gold Standard, 2018). As part of these local efforts, a local participation program was organized in order to distribute the project revenues back to the local member-investors of the cooperative. The combined output of the wind turbines supplies around 40 percent of the energy demand for the local communities in the area, supplying clean electricity to 50,000 residents in mostly rural and underdeveloped areas

(Gold Standard, 2018). Not only does this mitigate thousands of tonnes of carbon emissions, it also helps to build community self-sufficiency.

Figure 4.3: Coopesantos Wind Farm (Halim, 2016)

The cost savings generated by the farm were used to make investments in social and public infrastructure such as school building retrofits, street lightning, and the construction of bus stops (Gold Standard, 2018). The project stimulated local business development and job creation, as well as building capacity for community members through workshops and informations sessions on renewable energy. The farm also acts as an important tourist attraction that contributes towards the country's thriving ecotourism industry. It was interesting to learn how land values in the area correlated to higher demand and pricing following the completion of the project. This is a stark contrast to communities in Ontario, where the negative perception associated with wind energy development leads to diminished property values (Nicol and Seglins, 2011).

A follow-up presentation to the tour of the wind farm shed light on the comprehensive environmental assessment process that was conducted prior to development. This included taking measures to mitigate any adverse effects to wildlife, which consisted of mapping bird migratory routes and cataloguing species, as well as taking care to minimize the uprooting of native plants that populated the slopes on which the wind farm was constructed.

With plans to expand the wind farm system to other nearby regions, the benefits of community-developed renewable projects are being recognized. Such cooperative models are often difficult to replicate across Canadian communities, where the lack of political will, funding, capacity, and polarized public support often make it difficult to mobilize citizens and implement similar sustainable projects.

Implementation challenges in Ontario:

Upon examining these six case studies, it becomes clear that there are diverse approaches to develop community power projects and that they may be undertaken at various scales and costs and by different actors to produce different results. Common mechanisms include public engagement programs and close collaborations with major actors such as energy experts and utility companies. In the case of SNAP for instance, this was achieved by actively communicating with residents and consulting with community members during the development of sustainable action plans for each of the six neighbourhoods (TRCA, 2018). Likewise in Iceland, coordination between different levels of government with local community members ensured the development of comprehensive master plans for clean energy projects. In both cases, input from local community members was critical in helping to identify the barriers, risks, as well as facilitate in finding possible solutions. In the case of Iceland, the feedback provided by public citizens, energy experts, and local businssesmen proved to be extremely useful for decision-making processes and was instrumental in helping Iceland to transition towards clean energy. Renewable energy cooperatives were also found to benefit from this bottom up approach to community energy planning by identifying major actors, building capacity through offering energy literacy programs for members, and mobilizing community support. It is worth noting that the emphasis on community building throughout each of the case studies has further helped to increase awareness on the importance of energy conservation, while also establishing cohesion between local communities and their governments.

Government incentive programs and subsidies were also found to be important for providing the financial resources required to initiate projects. Renewable energy cooperatives can further help in this regard by leveraging their close relationships with communities in order to

aggregate community investment, utilize social investment tools, and support the implementation of sustainable projects at the community-scale. These approaches to community energy planning have produced various benefits for communities, while enabling residents to actively participate in the planning process.

In addressing social and equity issues, the majority of the cases were located in regions with primiarly homogenous populations with low income disparity (Nelson B.C, Iceland, Denmark). Social issues were therefore relatively non existant compared to more diverse neighbourhoods in the SNAP case study for example (in Toronto). Although not formally involved in the project as of yet, SNAP has been engaging in discussions to take on an advisory role for the Mount Dennis Net Zero Community Initiative. Locally, this has been closest example of a comprehensive CEP planning process which considered social and equity issues. This initiatve aims to make the Mount Dennis community Toronto's first 'net zero neighbourhood' (Shazad, 2017). The Mount Dennis Community Association (MDCA) has been in the process of developing an action plan that outlines steps towards achieving 'net zero' status, as well as finding ways to reduce carbon emissions for the long term. As part of this action plan, the MDCA hosted a series of public meetings in order to engage with residents and community organizations. This engagement process involved a multifaceted approach, which included in-person meetings with residents, open houses, and information sessions. It also consisted of community outreach initiatives such as surveys that sought to better understand what sustainability means to residents and what they wanted for their community (Shazad, 2017).

An interview with Rick Ciccarelli, who is the MDCA lead for the project, revealed in-depth perspectives with regards to the Mount Dennis net zero community initiative (Ciccarelli interview, 2017). According to Ciccarelli, the project aims to improve the energy efficiency of homes and businesses within the Mount Dennis community, provide incentives for electric vehicles, encourage active transportation such as developing bike trails, and explore opportunities to implement renewable generation technologes such as solar panels and wind turbines within the community. The plan also outlines goals for connecting the community to Toronto's economy by increasing energy efficiency standards for developments in order to attract and accomodate new growth (Shazad, 2017).

It is important to note that the Mount Dennis community comprises of a diverse population with a large income disparity. This raised the crucial point of addressing social and

equity issues within the action plan. Accordingly, the plan aims to provide energy retrofits for social and rental housing, as well as provide subsidies for home energy upgrades in order to help reduce resident's electricity bills (Ciccarelli interview, 2017). This was planned to be subsidized with provincial green incentive programs. With the changing of the political climate after the June 2018 elections however, it is likely there will be considerable challenges for acquiring funding with respect to green infrastructure improvements in the community. An interview conducted with Rick Ciccarelli revealed that the major challenge associated with bringing the vision to fruition was the lack of financial resources and capital to initiate the project (Ciccarelli interview, 2017). In Ontario, it would take a really progressive government to commit funding to support these initaitives at different levels, or a foundation with deep pockets. These unfortunately do not exist in Canada. At the present moment in Ontario, this project more or less seems difficult to implement. The high upfront capital costs associated with green infrastructure was also prevalent across the six case studies examined.

In order to replicate similar sustainable energy initiatives in Ontario, there are various other underlying challenges that must be addressed. During my field placement at TREC, I undertook research that involved analyzing different community-power projects across the world, while also identifying the key barriers and constraints associated with replicating them in Ontario. An overview of these research findings is shown in Table 4.1 on the following page. The table lists the specific challenges for each type of community energy initiative. As discussed, common issues include high upfront capital costs and the financial viability of projects. Another major problem that municipalities often face in Ontario when considering sustainable programs is how risk will be mitigated, as considerable resources and technical experience are required for launching energy projects (Halim, forthcoming in 2019). These barriers are similar to the issues faced in Iceland, which initially lacked the capacity, financial resources, experience, and technical knowledge to undertake green infrastructure projects (Logadottir, 2015). In addition, there are also many legal and regulatory barriers that restrict the ability of municipalities and RE co-ops to build viable business models and necessary governance structures for such projects in Ontario.

Although changes in policy making are difficult to undertake, these research findings may help to provide a better understanding of the underlying issues, as well as inform and guide decision-making processes for governing bodies and community organizations planning to implement similar sustainable energy projects.

Table 4.1: Implementation Challenges in Ontario (Halim, 2019)

Sustainable Initiative	Challenges	Common Issues
District Energy	Lack of coherent and concerted policy framework. Incentive programs target individual small scale systems - this makes it difficult to scale up/ implement community-scaled systems. Legislative barriers which results in complicated approval processes (zoning/permitting).	
Demand Response Programs	'Behind-the-meter' (BTM)- is an unregulated space which prevents utilities and municipalities to develop business models for consumers in Ontario.	Risk mitigation & liabilities
Energy Efficiency	Costs associated with retrofitting older communities. Split incentive that pits owners against tenants (who actually pays and benefits from energy retrofit investments?).	Financial viability
Energy Storage	'Behind-the-meter' (BTM), limitation for RE co-ops under current regulations (they cannot distribute electricity).	
Community Solar	Uncertain regulatory changes around net-metering - third party ownership (confined to retailers). Presence of termination clause that allows LDCs to terminate contract. Consumer misinformation around what the new net metering policy and conditions will be.	High upfront capital costs/ Long payback periods
Electrifying Transportation	Fleet electrification is expensive. Lack of EV infrastructure and consumer range anxiety. Difficulties implementing charging stations due to zoning regulations, permitting, and complicated approval process.	
Wind Energy	Public/community distrust of wind energy development - NIMBYISM. Public support is polarized across Ontario. Moratorium on offshore wind projects in Ontario.	

Chapter 5: Exploring Alternative Models

Community Energy Planning – Bridging the Gap, Empowering Communities

The implementation challenges aforementioned have major implications for the future of sustainable development in Ontario. They also pose considerable barriers for achieving energy democracy. This chapter will explore alternative models and pathways that can enable municipalities and organizations to build capacity, empower citizens, develop technical knowledge and expertise, establish governance structures, and acquire the financial resources required to help local neighbourhoods create a more sustainable future.

Community energy planning is the first step in this regard. It allows municipalities to better manage their energy consumption through an integrated process by consulting with public citizens, energy experts, utility representatives, energy cooperatives, and community organizations. In light of extreme weather events and the decreasing costs of clean energy technologies, municipalities are beginning to recognize the advantages of developing electrical grid resilience in urban areas through community energy planning (Singh et al., 2017). In Canada, more than 170 communities representing over 50 percent of the country's population have developed a CEP according to the National Report on Community Energy Plan Implementation (QUEST, 2013). The report is published by Quality Urban Energy Systems of Tomorrow (QUEST), which is a non-profit organization that focuses on research with respect to energy conservation in urban areas. It was founded by representatives from governments, utilities, the energy industry, and the real estate sector (QUEST, 2013).

According to QUEST, municipalities can play a key role in integrated energy planning in Ontario and empower communities and local citizens to forge their own energy futures (Singh et al., 2017). The CEP implementation report was specifically designed to help municipalities understand how to work under current regulatory frameworks in order to better manage their energy consumption and plan for a more sustainable future. This includes steps that outline how to identify and engage with major actors, as well as share information with regards to energy conservation and demand management (QUEST, 2013). For example, it suggests opportunities for municipalities to collaborate with utilities such as electricity and natural gas companies in order to better integrate them within the planning processes. In addition, it also provides an

overview of current energy processes in Ontario and interprets how to apply an energy lens to land use and growth processes in the province (QUEST, 2015).

By taking this approach towards community energy planning, municipalities can help to promote local generation and implement energy retrofits. These in turn can reduce energy costs, increase energy security and reliability for residents and businesses, while also creating local employment opportunities and retaining cash flows within the community (QUEST, 2018). It can also support Ontario's efforts to reach its GHG emissions reduction target and shift power away from centralized energy monopolies that, as we have seen, create various negative effects for consumers and businesses alike.

Key Considerations in Developing an Integrated Energy Plan

There are several considerations when developing a comprehensive approach to community energy planning. QUEST's Integrated Community Energy Solutions: Municipal Policy Toolkit published in 2011 suggests that different components of a CEP should not be viewed individually, but rather as a whole system in order to attain a deeper understanding of the complex dynamics and interconnections between different aspects of energy planning (Singh et al., 2017). This would lead to an improved plan for GHG reduction strategies and energy savings programs.

However, there are many challenges when it comes to navigating the complex socio political conditions associated with CEP development. This is because CEP consultation processes generally include multiple actors who may have conflicting interests. The QUEST report identifies the municipal planning department, the provincial government, electrical utilities, and real estate developers as the top four major players in influencing CEPS (QUEST, 2013). As discussed in chapter 3, issues of neoliberalism, industry lobbying, public misinformation, and market forces also pose additional hurdles. With increasing electricity prices and the onset of climate change, it becomes critical for municipalities to develop alternative models to overcome these challenges and build more sustainable communities (Singh et al., 2017). Given the complexity of these challenges, the next several sections will identify five key considerations for achieving green urbanism and energy democracy ideals. They will also

establish potential pathways that could help governing authorities to overcome CEP implementation barriers and develop a holistic approach for sustainable development.

1. Structure for an Integrated Community Energy Planning System

To support community energy planning and facilitate new developments in Ontario, a necessary power structure must be in place in order to effectively manage the interests of relevant actors and ensure a democratic process. A research paper published by the Centre of Urban Energy at Ryerson University (CUE), which is an academic-industry partnership that researches sustainable solutions to urban energy issues, focuses on examining key considerations for developing an integrated urban and energy plan (Ryerson et al., 2017). The paper presents a model of how power system planning can allow for the better integration of community energy planning needs and requirements.

Power system planning comprises of a system of determining the energy infrastructure needs for the short, medium, and long term (Singh et al., 2017). It establishes the planning and logistics in order to develop the resources that encompass the generation, transmission, conservation, and demand management of electricity. Table 5.1 on the following page illustrates the existing configuration for formulating energy and urban plans at different levels in Ontario. The dotted lines and red arrows suggest how municipalities can become more integrated into regional planning processes by presenting CEPs at different stages of planning and consultation (Singh et al., 2017). The table shows how municipalities can utilize CEPs in order to inform decision making for regional planning processes, such as for the development of the LTEP (Bulk System Planning). This would ensure a coordinated approach amongst municipalities and their CEPs. According to the table, CEPs should also be integrated in the planning process for utility infrastructure (transmission and distribution). However, the table does not suggest how citizens can be actively involved in planning and/or consultation processes. This issue will be addressed in the next section. Furthermore, there is also a lack of detail with regards to how exactly these consultation meetings will be conducted and the extent to which municipal/provincial/regional feedback and CEP content will be integrated into power system planning procedures. In suggesting recommendations to this table, I propose that citizens be explicitly identified as key actors separately from ‘Planning Working Groups” as shown in the table, along with having them

engage with different levels of government and utility companies. There must also be attention paid towards including local businesses and other local organizations into the planning process. This would ensure a truly integrated community energy planning system.

Table 5.1: Different levels of planning in an integrated system (Singh et al., 2017)

Stakeholder Level	Task/Planning	Consultation Process
		Planning Working Groups
MOECC/OEB and IESO	Bulk System Planning (e.g. LTEP)	
IESO, LDCs and Transmitters	Regional Planning (e.g. IRRP, RIP) for ~21 regions	Standing Committee
Transmitters (i.e. Hydro One) and IESO	Transmission Planning	Members of Provincial, regional, municipal representative and the public
Distributers (~80)	Distribution Planning	
Municipalities	Community Energy Plans	Should communicate concrete plans to both Tx / Dx Plans, RIP and LTEP

2. Comprehensive CEP Implementation

As discussed, community energy planning can be a viable tool for municipalities to build sustainable communities. However, with different levels of government and various actors, it often becomes complicated when coordinating efforts and communicating objectives. This planning-implementation gap has long hampered efforts to reach sustainable goals (Connelly et al., 2009). To initiate a more integrated approach, it first becomes necessary for governing bodies to understand how the effects of changing land use patterns and urban growth can drastically influence current and future energy needs at different scales.

This can be achieved through a top down approach by developing a Provincial framework that clearly outlines the importance of CEPs and ensures the close cooperation with municipal and local levels of government in order to achieve long-term sustainable goals (Singh et al., 2017). This can be reinforced with CEPs providing specific roadmaps on how to achieve these objectives at different scales (from the neighbourhood level to the regional level).

For a bottom-up approach, the CUE research study emphasizes active public engagement as an important mechanism for an effective CEP planning process. This could take a multifaceted approach in the form of open houses, in-person public meetings, information sessions, and workshops that serve to identify key barriers and common interests, as well as explore possible solutions towards creating more sustainable neighbourhoods. Similar to table 5.1, this process can be formalized into a framework for guiding municipalities to conduct meaningful consultation with public members and actively integrate and/or address their feedback into decision-making processes (Singh et al., 2017). Introducing educational programs and courses may also bolster these efforts by increasing energy literacy and awareness of climate change issues in communities. These programs can also target municipal/provincial planners and utility representatives in order to educate them about CEP implementation processes. This can help to ensure that city administrations are aligned with municipal and provincial long term energy planning objectives. A combination of these steps could help to facilitate a transition towards a diversified grid in which Ontario's municipalities are no longer controlled by centralized power systems.

3. Modernizing Urban Electrical Grids - Innovation and Disruption

In recent years, advances in technology have led to remarkable changes in how electricity is generated, distributed, utilized, and managed (Singh et al., 2017). Distributed energy resources (DER) are "electricity-producing resources or controllable loads that are directly connected to a local distribution system or connected to a host facility" (IESO, 2018). They have enabled citizens to actively participate in the planning, design, and operation of the electric utility industry (Singh et al., 2017). These distribution systems can include renewable energy systems such as solar panels, home automation systems, energy storage devices, electric vehicles, electrical appliances, and controllable loads such as HVAC systems (IESO, 2018). These energy resources are generally much smaller in scale than the conventional generation facilities such as nuclear power plants that serve most of Ontario's demand. These distribution systems allow for local energy generation opportunities (e.g. - using solar panels) and can be embedded in local electrical distribution systems in urban areas (Singh et al., 2017). Because clean energy sources are renewable and intermittent in nature (e.g. - wind and solar), they are difficult to forecast and

control. Furthermore, new innovations such as energy storage systems, micro grids, and blockchain technology are disrupting the traditional structure of the electric utility industry (Singh et al., 2017).

In New York for example, the emerging blockchain technology, which is a form of a decentralized and digital ledger, has enabled unique customer engagement energy services. The Brooklyn Microgrid project consists of a network that enables citizens to buy and sell locally generated solar power from one another (Spector, 2017). These 'energy credits' are traded using an app across a blockchain-enabled platform, where transactions are performed without going through the dominant regional utility, Consolidated Edison (Farbridge et al., 2018). These community-powered structures, along with the increasing capabilities of energy storage, is gradually making cities and governing authorities realize the benefits of local renewable energy generation and how they can play a key role in the transition towards a decentralized energy system (Singh et al., 2017).

These advances have major implications for the future of energy systems in Ontario. A report published by the Electricity Distributors Association (EDA) proposes a new way forward for Ontario's electricity utilities (Electricity Distributors Association, 2017). The paper notes that DERs can enable utilities to play a key role in helping to build a cleaner, more resilient, and less costly electrical system. However, there are certain regulatory and legal issues and constraints when developing DER systems in Ontario. Behind The Meter (BTM) generation in Ontario for instance is currently unregulated (Halim, forthcoming in 2019). BTM refers to energy systems/DERs that are literally located 'behind the meter' on the owner's property, and not on the side of the electric utility grid (PPC Solar, 2016). There are various limitations on BTM power produced on-site in a home, office building, or commercial facility under current BTM project rules set by the IESO in Ontario (Halim, forthcoming in 2019). This inevitably poses challenges for integrating DERs into the existing electrical system.

Alternative regulatory rules and market frameworks could enable municipalities and electrical utilities to create new business models for the implementation and growth of DERs and the renewable energy sector (Farbridge et al., 2018). CEPs can support this transition by working with industries, academic institutions, energy planners, and electricity operators in order to establish pathways and community energy initiatives to integrate these systems at different scales in Ontario (Singh et al., 2017). Furthermore, the EDA report could also function as an important

road map for decision makers, government agencies, and regulators to accelerate the energy transition (Electricity Distributors Association, 2017). The development of a shared vision could help to coordinate these efforts across different levels of government in order to truly realize the benefits of local generation and deliver societal and environmental benefits (Schoor and Scholtens, 2014).

4. Synergies between Municipalities and Energy Cooperatives

To facilitate the transition towards decentralized energy systems, RE co-ops and community-owned energy projects can offer a viable method of securing the necessary financial resources and mobilizing community support (Singh et al. 2017). As discussed in Chapter 2, the RE co-op sector has grown and facilitated the development of Ontario's renewable energy sector following the implementation of the Green Energy and Economy Act of 2009 (TREC, 2016). Through participation in the Feed-in-Tariff (FIT) program, both municipalities and RE co-ops have developed various community energy projects across Ontario. Because energy co-ops have close relationships with communities at the local level, they can leverage their expertise to mobilize key players and engage with local groups in order to aggregate community investment and support the implementation of sustainable energy projects. As discussed in chapter 2, municipalities have formulated various energy plans but most are not legally binding, lack consistent and comprehensive actions plans, and often lack the skills and resources to implement sustainable initiatives. RE co-ops can play an important role as major actors during community energy planning processes and work alongside municipalities to develop cohesive action plans towards achieving sustainable goals (Singh et al., 2017). Harnessing the co-benefits of RE co-ops and municipalities can also help to take advantage of the increasing trend towards energy storage and DER technologies in order to build a more resilient energy system.

There are several regulatory constraints for RE co-ops in Ontario. The structure of a RE Co-op differs from other traditional co-ops in that they must conduct at least 50 percent of its business with its members (Government of Canada, 2018). In addition, the business of an RE co-op limited to generating and selling electricity, while any surplus of the cooperative is to be distributed to members in accordance with its by-laws (Halim, forthcoming in 2019). These

restrictions inevitably place limitations on the ability of RE co-ops to develop community-owned energy projects in Ontario.

In seeking solutions to this issue, we can look to successful models of community-owned energy projects across Europe. Energy cooperatives have had a successful history of development in countries such as Germany, Denmark, and Sweden, which pioneered energy cooperatives over a century ago (Conalty and Mayo, 2012). Over the years, these nations established legal mechanisms and governance structures that supported energy cooperatives. As examined in chapter 4, 'right to invest' principles emphasized in Danish legislation for example, was instrumental in facilitating the growth of the cooperative energy sector. It also enabled Denmark to localise its energy services system. According to the CUE report, community-owned power structures and the renewable energy sector in Ontario are still in their emergent stages. Where they have flourished in other regions of the world, they have largely been slow to develop in Canada due to being heavily dependent on provincial energy policies and RE co-op regulations (Singh et al., 2017). Changes in these policy frameworks could help to support energy co-ops.

5. Legislative Changes and Financing Mechanisms

The CUE report outlines several recommendations to existing regulatory /policy frameworks in order to bolster efforts to support community-oriented energy projects. The first suggestion addresses the need to increase accessibility to financial resources for energy co-ops to develop infrastructure projects (Singh et al., 2017). The report also recognizes the potential of energy co-ops to develop district energy systems and combined heat and power (CHP) plants. Due to the neighbourhood scale at which these energy systems are typically implemented, energy co-ops are strategically positioned to leverage their influence at the local level and mobilize relevant actors. Modifications to existing legal and business conditions can further reinforce these efforts (Singh et al., 2017).

Monetary incentives (federal/provincial) are also crucial in providing financial support to co-ops and community organizations. These can be administered in the form of rebate programs, incentives, and reduction in taxes (Singh et al., 2017). Financial incentives for private developers can also stimulate them to partner with co-ops. Often times, RE co-ops lack the financial resources and technical expertise to implement energy projects. By partnering with private

developers, they can form mutually beneficial relationships by contributing their in-depth knowledge of local issues and close connection to community members. An alternate financial mechanism that is worth noting is Tax Increment Project financing (TIF). TIF is a type of public financing tool that has been used by various cities across the United States to fund community-improvement projects (2030 Districts, 2018). This tool can also be used to stimulate economic development by issuing loans to property owners to implement sustainable initiatives. To implement TIF, cities designate an area which owners of buildings located within the immediate vicinity would be eligible for financing. Property owners then agree to a higher tax assessment based on the estimated increase in property value that occurs as a result of implementing energy conservation measures (2030 Districts, 2018). TIF has been used to fund energy efficiency projects throughout the states, including investments in CHP and district energy (2030 Districts, 2018). In Toronto, there is the question of whether this public infrastructure financing tool can be extended for the implementation of energy-efficiency retrofit projects, as well as renewable energy generation facilities.

Modifications to building code requirements could also help communities to reach climate change targets and reduce their energy consumption. Just recently, California became the first state to mandate solar panels on new home developments. This policy will eventually go into effect in 2020 and will update the building code to require renewable energy installations (Green and Gstalter, 2018). With falling costs of solar panels, the economical benefits will only further drive residents to own their generation facilities.

Lastly, it is important to make regulatory changes to support community energy planning at different levels of government (Singh et al., 2017). As discussed in chapter 2, municipalities are wholly subject to provincial legislation under Canada's constitutional system. By granting municipalities more autonomy in existing policies, they can be shielded from radical changes in political climate and therefore, be more in control of their energy futures. Furthermore, existing legislation with respect to sustainable development and CEP guidelines are mostly voluntary programs. Mandating the integration of CEPs within regional growth plans and setting legally binding energy conservation targets would ensure that authorities are taking adequate steps towards achieving sustainable objectives and addressing the concerns and needs of local citizens.

Conclusions and Recommendations:

I began this paper by conducting a literature review of the key concepts associated with green urbanism and community energy planning and explored how CEP can be an important ingredient in achieving green urbanism and energy democracy ideals. I subsequently looked at key policy frameworks and regulatory guidelines with regards to energy management and sustainable planning in Ontario in order to attain a better understanding of the legal constraints and identify critical barriers for the implementation of sustainable strategies.

I also looked at case studies from around the world in order to examine innovative approaches to renewable energy generation and sustainable development. This helped to identify possible mechanisms that can help to replicate similar models in Ontario, while also better informing approaches towards integrated urban and energy planning. My findings revealed that community based energy cooperatives can act as key players in this regard by offering their expertise in community engagement and building capacity.

However, I concluded several issues and challenges in Ontario in terms of using CEP as a way forward to green urbanism, achieve energy democracy, and develop energy conservation strategies. These include a lack of legally binding policies, unclear municipal/provincial sustainability guidelines, neoliberal market forces, lack of technical experience and financial resources, changes in political objectives, fossil fuel and nuclear industry lobbying, and power monopolies that undermine democracy and create adverse effects such as energy poverty, increasing electricity prices, and pollution.

In suggesting recommendations, it becomes important to consider the results of the 2018 Ontario elections in which the Progressive Conservative party under Doug Ford won the majority government. As discussed, Ford has already announced plans to withdraw the cap and trade program, has cancelled the GreenON funding program, and eliminated electric vehicle rebates (Kalinowski, 2018). This resurfacing of CSR policies will undoubtedly hamper efforts to achieve municipal sustainable objectives for the next few years, while also posing considerable challenges for the future of energy democracy and renewable energy deployment.

However, in reflecting on the six case studies of community power projects in chapter 4, it is worth noting how the sustainable methods and progressive regulatory structures in countries such as Denmark, Sweden, and Germany have yielded numerous benefits for communities in the

form of clean air, reduced GHG emissions, cost savings, and energy security (Conalty and Mayo, 2012). Savings from sustainable investments have also been realized in Ontario through the efforts of RE co-ops. Economic modelling done for TREC for example, found that for every dollar spent through the province's FIT program, renewable energy systems generated an additional $2 in economic activity (Lipp, 2016). In addition, research has also shown how investments in green infrastructure such green roofs and resilience building can result in cost savings in the long run and enable cities to withstand extreme climate events such as heat waves and major storms (The Star, 2018).

Moreover, a report published by the Institute for Energy Economics and Financial Analysis (IEEFA) forecasts how investments in the fossil fuel sector is already showing signs of shrinking financially due to the increased risks as a result of the ongoing energy transition towards renewable sources, increasing market share of renewable energy and electric vehicles, and litigation risk as environmental issues are spreading (IEEFA, 2018). These findings have major implications for the future of energy planning across the world. It is also important to note that research studies conducted on consumer behaviour have shown that over 80 percent of global consumers are concerned about social and environmental issues and expect businesses to operate responsibly to address them (Sustainable Brands, 2018)

Recommendations:

These findings demonstrate that there is increasing consumer awareness of environmental issues and a general shift across world energy markets. This could help to spur efforts to instigate a common sense re-revolution, an Actual Common Sense Revolution (ACSR). This is what I propose as a way of addressing the underlying issues concerning urban and energy management. ACSR would be based on humanitarian ideals, egalitarian principles, and environmental and social justice. Whereas CSR represents conservative, anti-climate platforms that aim to reduce government operating budgets through austerity measures, a movement and/or platform based on ACSR would stand as a critique of CSR and neoliberalism/capitalism and focus on social and environmental justice.

In the context of urban energy systems, which is a critical component of major cities, it could begin at the household or community level, where local citizens and renewable energy

cooperatives could implement community power projects to generate and use their own electricity. With recent advances in DER and renewable energy systems, opportunities are abound for developing new business models that can enable citizens to actively participate in energy generation and distribution. Conservation and local generation at the household, commercial and industrial levels, will also be essential. ACSR would be thus have to be implemented by different players across various sectors in order to coordinate widespread efforts to attain sustainable and holistic outcomes. These processes could help to resolve the lack of capacity and technical expertise that often pose as major barriers to green urbanism and energy management.

ACSR may also help to realize the benefits of investing in social and environmental courses of action. In the context of urban energy management, a platform based on ACSR would focus on (re)acquiring critical public assets such as energy facilities and utility companies in order to reassert public control and shift power away from centralized planning systems. This will pose considerable challenges however, given the existing energy monopoly in Ontario and a well-established system that has been in place for decades.

Nonetheless, innovative technologies such as DER, micro grids, blockchain, energy storage, and renewable energy systems offer new opportunities to stimulate a destabilization of these power monopolies through democratically owned community energy projects. Implemented at a widespread scale through local decentralised systems, these efforts could force energy regulators such as the IESO and OEB to introduce progressive legislative changes across the energy sector in order to adapt to this transition. As discussed in chapter 3, a restructuring of the OEB and legislative amendments that aim to grant more flexibility for renewable energy cooperatives and community power practitioners could empower citizens and give local communities more autonomy. Perhaps this could facilitate the transition of our centralized energy grid to one that is based on low carbon production and consumption in a localized context. This may also help to close the planning-implementation gap between provincial and municipal levels of government when it comes to initiating climate change strategies, as well as support local communities in their efforts to achieve energy democracy.

Anti lobbying movements to phase out the nuclear power and fossil fuel sectors could also further this cause. In a coordinated approach akin to guerrilla warfare, these efforts under ACSR can facilitate the transition to a community-based energy grid, resist neoliberal forces, and

support regional efforts towards green urbanism. Because political decisions are often made to win public constituencies, these developments may also influence governments to introduce progressive legislative changes and regard environmental and social justice as desirable objectives. As such, community energy planning/ CEPs can function as a fundamental policy tool for authorities under ACSR. Through localization, integration, and collaboration, CEPs can be an effective way for governing bodies to take action towards developing more comprehensive approaches, from a bottom-up and community-driven approach, towards achieving energy democracy and green urbanism ideals.

Appendix A

Sample questions for Interviewees (Community Power Practitioners and Energy experts)

1. What led you to take on the role for the project?
2. In terms of progression, how developed is the engagement process?
3. How would you define green urbanism? (Define it in a sentence)
4. What was is the estimated payback period for the project?
5. What does the term 'sustainability' mean to the stakeholders involved in the project?
6. What were the major challenges and issues relating to developing the project?
7. To what extent are utility companies involved in the development of the project?
8. Do you feel that the current regulatory frameworks/ policies supports or inhibits sustainable development?
9. Are there any government incentive programs that are facilitate energy conservation measures?
10. What do you feel must be done to facilitate the development of greener communities in Ontario (from a policy and regulation standpoint)?
11. What are the long-term benefits of community energy planning? Do stakeholders (owners/tenants/residents) recognize these benefits?
12. Do you have a favourite green community? (anywhere in the world)

Appendix B

Sample Informed Consent Form

Date:

Name of Participant:

Study Name: *Green Urbanism from the Ground Up*

Researcher: *Nayel Halim, Student in the Master in Environmental Studies Program at York University, 4700 Keele Street, Toronto (nayelhalim@gmail.com).*

Purpose of the Research

What You Will Be Asked to Do in the Research: I will ask you questions about Community Energy Planning and Green Urbanism in order to learn your thoughts on this topic. The interview sessions will likely last between thirty and forty minutes and they will be recorded.

Risks and Discomforts: I do not foresee any risks or discomfort from your participation in the research. You have the right to not answer any questions.

Benefits of the Research and Benefits to You: A copy of the final research paper will be made available to you if you would like one.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to participate will not influence the nature of the ongoing relationship you may have with the researcher or with York University either now, or in the future.

Withdrawal from the Study: You can stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating, or to refuse to answer particular questions, will not affect your relationship with the researcher, York University, or any other group associated with this project. In the event you withdraw from the study, all associated data collected will be immediately destroyed wherever possible.

Confidentiality: The interviewing or recording process will be used to exclusively identify information for the purposes of research. Unless you choose otherwise, all information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research. The data will be collected by handwritten notes, and audio will be recorded with an electronic device. Your data will be securely stored on a password-protected laptop device and only I will have access to this information. The data will be stored for two years and it will subsequently be archived on a secure external hard drive. Confidentiality will be provided to the fullest extent possible by law.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact my Supervisor, Professor Douglas Young by e-mail (dogoyo@yorku.ca). This research has been reviewed and approved by the FES Research Committee, on behalf of York University, and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Research Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:

I, *(_____)*, consent to participate in Green Urbanism from the Ground Up conducted by *Nayel Halim*. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature _____ **Date** _____
Participant

Signature _____ **Date** _____
Principal Investigator

I understand that I have the right to remain anonymous during the Green Urbanism from the Ground Up conducted by *Nayel Halim*. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature _____ **Date** _____
Participant

Appendix C

List of attended workshops, webinars, and conferences:

1. Renewable Energy Mobility Workshop (Toronto) – December 2nd, 2016
2. U of T Sustainability Conference: From Policy to Practice (Toronto) – January 28th, 2017
3. Community Energy Planning: Guelph's Experience? (Toronto) – March 27th, 2017
4. Ontario Climate Consortium (Toronto) – May 11th, 2017
5. EDIT: Expo for Design, Innovation, Technology (Toronto) – May 26th – 27th, 2017
6. International Renewable Energy Academy (IRENA) (Woodstock) – June 19th - 23rd, 2017
7. Entrepreneurs in Renewable Energy: Series 3 (Toronto) - October 23rd, 2017
8. Federal Environmental and Regulatory Review Webinar (TREN) (Toronto) – November 1st, 2017
9. YPE Toronto - Minister Glenn Thibeault: Ontario's Long-Term Energy Plan (Toronto) - November 28th, 2017
10. Innovation in the Renewable Energy Sector: Where do we go from here? (Toronto) - January 30th, 2018
11. Net Impact Annual 360° on Business Sustainability Conference (Toronto) - March 2nd, 2018
12. NEST Energy Storage Policy Development Workshop (Toronto) - March 9th, 2018

Glossary

ACSR – Actual Common Sense Revolution
BTM- - Behind The Meter
CCAP – Community Climate Action Plan
CEP – Community Energy Plan
CHP – Combined Heat and Power
CPI – Consumer Price Index
CDM – Corporate Energy and Demand Management Plan
CSR – Common Sense Revolution
CUE – Centre for Urban Energy
DER – Distributed Energy Resources
EDA – Electricity Distributors Association
EV – Electric Vehicle
FCM – Federation of Canadian Municipalities
FIT – Feed-In-Tariff
GEA – Green Energy Act
GHG – Greenhouse Gases
GGH – Growth Plan for the Greater Holden Horseshoe
GGRA – Greenhouse Gas Reduction Account
GTA – Greater Toronto Area
IEEFA – Institute for Energy Economics and Financial Analysis
ICE – Costa Rican Electricity Institute
IESO – Independent Electricity System Operator
IMO – Independent Marketing Operator
LDC – Local Distribution Companies
LTEP – Long Term Energy Plan
MDCA – Mount Dennis Community Association
MEP - Municipal Energy Plan
MECISE – European Mutual for Energy Communities Investing in a Sustainable Europe
NEP – Niagara Escarpment Plan
NHS – National Health Service
NIMBIYISM – Not In My Back Yard
OEB – Ontario Energy Board
OCEC – Oxford Community Energy Cooperative
OMB – Ontario Municipal Board
OPA – Ontario Power Authority
ORMCP – Oak Ridges Moraine Conservation Plan
PPS – Provincial Policy Statement
PC – Progressive Conservative
QUEST – Quality Urban Energy Systems of Tomorrow
RE Co-op – Renewable Energy Cooperative
RES Co-op – European Federation of Renewable Energy Cooperatives
SNAP – Sustainable Neighbourhood Action Plan
TAF – Toronto Atmospheric Fund
TGS – Toronto Green Standard
TIF – Tax Increment Financing
TPF – Third Party Financing
TREC – Toronto Renewable Energy Cooperative
UN – United Nations
UPE – Urban Political Ecology
WED – Wind Energy Development

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