Evaluating Canadian Municipal Energy & Climate Mitigation Plans:

Content analysis and potential for effectiveness in small and mid-sized Canadian communities

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Summary

Energy and climate change mitigation plans from 14 Canadian communities across four provinces were evaluated via plan coding to determine general content and potential for effectiveness. Plans provided sufficient background information on the local context of GHG reduction planning, providing justification for the mitigation action items plans selected to pursue. Fitting mitigation actions into the local climate planning context suggested a high potential for effectiveness. GHG reduction targets varied greatly across plans considered, and within each province. The presence of some high reduction targets aimed to be completed over short time frames introduces doubt in a plan's effectiveness. The presence of provincial reduction targets and various challenges identified by communities were thought to contribute to effectiveness. Communities located in a province possessing a provincial target, and communities facing less challenges from phenomena outside of their control, are more likely to have effective plans due to fewer barriers present. The 14 plans considered lacked sufficient implementation and monitoring strategies. Without a detailed plan for how to carry out GHG reduction actions and follow-up on the success of those actions, potential for plan effectiveness decreases.

List of Acronyms

CCAP: Climate Change Action Plan

CEP: Community Energy Plan

FCM: Federation of Canadian Municipalities

GHG: Greenhouse Gas

GTI: Getting to Implementation

ICLEI: International Council for Local Environmental Initiatives

IPCC: International Panel on Climate Change

PCP: Partners for Climate Protection

Introduction

Climate Change & Cities

Cities today contribute the majority of the world's energy-related greenhouse gas (GHG) emissions (Floater & Rode, 2014). In an analysis of 468 world cities, New Climate Economy research estimated urban areas release over 50% of GHG emissions. The International Panel on Climate Change (IPCC) states a two degrees Celsius average global temperature rise will result in catastrophic global feedback loops harming both the land and those who inhabit it (IPCC, 2007). In light of recent international agreements including COP21 in Paris, all levels of government worldwide need to take action on climate change.

Energy generation and transportation systems contribute most to GHG emissions in cities (Andersen et al. 2009). Private transport is 95% dependent on oil and accounts for over 50% of global oil consumption (Andersen et al. 2009). An increase in the use of private transportation is leading to increased emissions (Andersen et al. 2009).

Dodman (2009) makes four arguments for why cities should be leaders in reducing GHG emissions to combat climate change. First, local governments have control over land-use planning, transportation, and industrial regulations, and can implement GHG reduction programs in these areas. Second, the density and number of people living in urban areas enables efficient technology including co-generation, waste-to-energy, and transit systems. Third, the population density of cities allows ideas, innovation, and behavioral change to spread quickly. Last, climate change mitigation leads to other benefits, including efficient power generation and increased health due to better air quality.

Fossil fuel dependence and recognition of climate change has led many nations, regions and municipalities, including many in Canada, to take action by creating climate mitigation plans to reduce energy use and, subsequently, GHG emissions.

Good Practice in Climate Change & Energy Plans

Tang et al. (2010) developed the first empirical model for evaluating local Climate Change Action Plan (CCAP) quality through plan coding, stating quality depends on nine independent variables including political will, wealth and the existence of state mandates.

Lund and Kempton (2008) point out two large-scale energy system problems which need to be addressed through these plans: (1) replacing oil with alternative fuels in the transportation sector and (2) balancing energy demand and supply in a volatile market. Marsden and Rye (2010) note the transportation sector represents significant potential to cut emissions; however, low plan ambition has limited success. Goals, policies, and actions set in climate change and energy plans should reflect the best emerging science available, since radical

steps are necessary to combat climate change (Wheeler, 2008). Hofman and Li (2009) indicate energy and climate change plans in Canada should strive to include compulsory policies to achieve tangible GHG emission reductions. Research also suggests governments should use a backcasting approach when creating plans (Robinson 1982; Wheeler, 2008). Backcasting sets targets first, then works backwards to create policy leading to the targets. Backcasting reveals the implications of decisions for the future (Robinson 1982; Wheeler, 2008).

Cities are the key link between energy generation and consumption. Cities present an opportunity to reduce energy use and subsequently, GHG emissions (St. Denis & Parker, 2009). Adoption of climate change and energy plans on the municipal level is crucial in addressing climate change in terms of creating an accurate inventory of GHG emissions, and setting long-term targets and appropriate policies (Tang et al., 2010). Evaluating the content and potential effectiveness of local plans can bring insight into plan quality and the ability of local governments to champion GHG emissions reductions.

Local Challenges & Solutions for Climate Change Mitigation

Climate change mitigation refers to actions and efforts aimed at reducing or preventing GHG emissions (United Nations Environment Programme, n.d.). Mitigation ranges from making technology more efficient to creating new technologies to harness renewable energy and invoking behavioural change (United Nations Environment Programme, n.d.).

Cities apply different strategies to reduce GHG emissions based on local context (Kennedy et al., 2014). Wealth affects the ability of a municipality to implement mitigation strategies, while climate influences the type of GHG reduction measures a city can take (Kennedy et al., 2014). Colder cities have a higher demand for heating buildings, and generally have higher building emissions than cities in mild climates. Kennedy et al. (2014) note communities in colder climates also demand more electricity; however, the emissions intensity of fuel used for electricity impacts emissions more than climate. High emissions from building energy use in any climate, particularly the household sector, have recently been highlighted (Huisingh et al., 2015). District energy systems provide an alternative to electricity from fossil fuels, and are viable in high density areas. Fuel switching is a common strategy in cities to reduce emissions. Switching to less carbon intense electricity sources promotes viability of additional emissions reduction strategies like electric vehicles and ground sourced heat pumps to replace furnaces.

Existing urban form presents a challenge to cities aiming to reduce emissions. Low density cities lacking widespread transit services generally have higher emissions per capita than compact cities (Kennedy et al., 2014). Small and rural communities may not have the option, ability, or will to densify (Kennedy et al., 2014). Wilson et al. (2013) quantified emissions from urban core,

suburban, and exurban communities in Halifax, NS. The team concluded residents living in commuter exurbs on the rural fringe have significantly higher emissions, particularly from transportation, than those in the suburbs and urban core. Density takes time, and transit systems may be costly to build in the short term without the density to support them (Kennedy et al., 2014).

Encouraging behavioral change from citizens is a challenge for municipalities. Local governments are creating non-profit organizations, such as the Moreland Energy Foundation in Melbourne, AUS, to advocate for low emissions, provide technical advice, and support households (Anguelovski & Carmin, 2011). Local governments often legitimize climate policies by establishing dedicated climate teams within a City department, or across several departments (Anguelovski & Carmin, 2011). The presence of a local champion for a community's climate program is beneficial. Leadership from elected officials, especially in the absence of senior government leadership, can push the climate agenda forward (Anguelovski & Carmin, 2011).

Climate change mitigation must be high on the municipal and citizen agenda to be successful (Kennedy et al., 2014). Communities pursuing emissions reduction actions reflective of their local land use, transportation, and energy context will fare better than those pursuing fast and cheap strategies (Kennedy et al., 2014).

Canadian Context of Climate Change Mitigation & Energy Plans

Rabe (2007) notes climate change plans from American states are more abundant than those from Canadian provinces. Robinson and Gore (2005) explain municipalities may not be enacting local climate change policies in Canada because the governance structure encourages municipalities to handle matters of local concern, while climate change is seen as a global issue. Additionally, municipalities in Canada often follow provincial mandates regarding policy. If there is no provincial incentive, requirement, or encouragement in place regarding climate change, a municipality is less likely to adopt a climate change plan (Robinson & Gore, 2005). As of 2007, only 65% of Canadians lived in a municipality formally committed to lowering GHG emissions (Gore, 2010).

Initiatives are currently underway to encourage the adoption of GHG reduction and climate change mitigation plans in Canada. Getting to Implementation (GTI) is a partnership between the Community Energy Association, QUEST, and Sustainable Prosperity. GTI's objective is to identify challenges and success factors regarding Community Energy Plan (CEP) implementation across Canada, define models to implement CEPs, and build a community of CEP experts for collaborative and effective implementation. GTI's

definition of CEP includes GHG reductions as a major priority (Getting to Implementation, 2016). Additionally, the Federation of Canadian Municipalities (FCM) Partners for Climate Protection program (PCP) is a network of Canadian municipalities committed to climate action through a five milestone process. PCP is the Canadian division of ICLEI's Cities for Climate Protection network. Members are guided through creating GHG inventories, setting GHG reduction targets, developing an action plan, implementing their plan, and monitoring results. Participating municipalities can apply for funding to assist their climate change efforts through FCM's Green Municipal Fund (Federation of Canadian Municipalities, 2016).

Climate change is a global issue that requires local action in order to make a difference (Tang et al., 2010). Comprehensive content analysis is needed to understand whether local Canadian GHG mitigation efforts have the potential to be effective. Large amounts of time and money are spent creating energy plans. International recognition that action must be taken now to prevent the projected two degrees Celsius warming means plans must be evaluated to determine if their content has the ability to reduce GHG emissions.

Purpose

The purpose of this study was to determine the quality of GHG mitigation plans through content analysis of climate change mitigation and energy plans in a sample of small to mid-sized Canadian communities. Plan quality is defined as the potential to be effective in meeting GHG reduction targets, based on the content of the plan. Measures of plan quality were determined through thematic coding analysis of the plans based on criteria developed from the literature.

Objectives

The objectives of the study were to:

(1) investigate the general content of a sample of Canadian energy and greenhouse gas reduction plans, with the goal of providing insight into content trends;

(2) determine if provincial goals are reflected in local plans, and if local plans incorporate provincial implementation strategies, funding mechanisms, or other incentives; and

(3) evaluate the quality of Canadian GHG mitigation plans.

Methods

Plan Selection

I first conducted basic Google searches using keywords like 'Canadian energy plan,' 'greenhouse gas mitigation plan,' and 'climate change action plan,' and searched by province to get a sense of local Canadian plans. The searches led me to a database of GHG mitigation plans on the Federation of Canadian Municipalities website under the PCP program.

I then developed criteria to refine plan selection. Plans chosen for the study fit the following criteria:

(1) A separate plan, adopted by a Canadian municipality or region, where reducing GHG emissions and/or mitigating GHG emissions is identified as a main objective;

Justification: A formal plan is not necessary for climate action and GHG reduction; many municipalities in Canada have taken action against climate change without the adoption of a formal plan. Actions taken without formal plan adoption were not included in the study in order to narrow the scope and create a controlled variable for which comparisons could be made. The presence of a separate and formal local action plan on climate change 'indicates systematic attention to the issue and plans can potentially establish an ongoing framework for action in which needs are analyzed, options are developed, the public is involved, and progress is evaluated' (Wheeler, 2008 pg. 482-483).

(2) From the year 2007 or later;

Justification: The IPCC released its Fourth Assessment Report (AR4) in 2007. The AR4 has been cited by hundreds of peer-reviewed academic papers and is considered the time when the world began to take greater note of human-induced climate change.

(3) From small to mid-sized Canadian communities;

Justification: According to the 2015 Canadian census, 46% of the country's population lived in the 6 major census metropolitan areas (CMAs) (Montreal, Ottawa-Gatineau, Toronto, Calgary, Edmonton, Vancouver) (Stats Canada a,b, 2015). I focused on small and mid-sized communities because they face different challenges to plan creation and implementation such as lack of resources, compared to the 6 large CMAs (Tang, et al. 2010).

(4) Still in use; and

Justification: Several plans I came across online and on the FCM database had run their course of implementation and were outdated (e.g. most plans from Manitoba set targets ending in 2012). Since this study focused on the potential for plans to be successful and the content of current mitigation plans, only plans still in use were considered.

(5) Complete FCM PCP milestone three (creation of a local plan) or higher.

Justification: Plan name and content varied slightly across the country; therefore, I selected plans from the FCM PCP database to introduce a controlled variable. All plans chosen followed the five milestone framework from FCM and ICLEI.

Using the above criteria, I created pools of plans from each province. Some provinces had many plans that met the criteria (e.g. British Columbia), while others had none (e.g. Manitoba). In order to select plans from across the country, I applied random sampling to BC and Ontario, while all eligible plans from Nova Scotia and Alberta were chosen. Plan selection resulted in 14 plans from British Columbia, Alberta, Ontario and Nova Scotia (Table 1). Only 14 plans were chosen due to time constraints. If time permitted, additional plans could have been coded from British Columbia and Ontario;

however, my goal was to look at a sample of plans from different provinces.

Plan Coding

I developed criteria for thematic coding analysis based on previous literature from Baynham, 2011; Tang et al. 2010; and Wheeler, 2008.

Climate change mitigation refers to actions aimed at reducing or eliminating greenhouse gas emissions (United Nations Environment Programme, n.d.). The coding criteria divided GHG mitigation strategies into five main categories of: energy, transportation, waste, land-use, and buildings. I chose the categories because municipal GHG inventories indicate the majority of emissions, and subsequently most mitigation actions, come from these five sectors. A 'general' mitigation category and 'other' category exist to include content either falling outside of, or encompassing all five of the mitigation categories (e.g. GHG mitigation from agriculture emissions).

The following content themes were coded within each mitigation category, and in the general information category:

(1) Fact Basis: Background information on climate change provided, emissions inventory broken down by category, several emission trends forecasted based on business as usual (BAU) and alternate scenarios, background information relevant to local context.

(2) Goals: Clear emissions reduction target set, emissions target set for each category, short and long term goals present.

(3) Policy: Content on policy is present, policy already exists or will be adopted.

(4) Implementation: Programs and regulations to support policy, funding opportunities, delegation of roles and responsibilities, explicit implementation plan or strategy.

(5) Intergovernmental Coordination: Reference to provincial and/or federal programs, initiatives or plans.

(6) Monitoring Progress: Goals and objectives are measureable, progress is trackable by indicators, there is a plan to follow-up on initiatives and review the plan regularly.

In addition to coding each mitigation category by content theme, I included 'emerging themes' and 'other' codes to capture interesting content and trends in themes that did not fit the previously established categories (e.g. concept of the municipality leading by example).

I organized coding data by creating a data bank in Microsoft Excel (blank sample found in Appendix A). Generally, plan content was easily sorted into the mitigation and content themes. Most plans had explicit sections similar to the six content themes. Plans usually began with background information and a fact basis, listed their goals, presented strategies to achieve goals in each mitigation theme through policy, and concluded with how to implement the plan and monitor progress. I recorded the details of each section in the data bank (e.g. in the goals section, the community's target and whether short and long term targets were present was recorded; in the policy section,

any mention of existing or potential future policy was recorded). If content related to overall plan monitoring or an overall reduction target, I recorded it in the 'general' mitigation category under the relevant content theme. When plans stated a policy or goal related to a single mitigation category, I recorded it in the appropriate mitigation category, rather than the 'general' category.

Linking Methods & Objectives

Objective (1) I will describe the general content of Canadian energy and GHG reduction plans considered in this study using the results from coding, emphasizing the emerging themes.

Objective (2) I will use the 'intergovernmental coordination' theme to determine whether provincial reduction targets, strategies and funding mechanisms are reflected in local plan content.

Objective (3) I will compare overall coding results to 'good practice' to determine potential for local plan effectiveness.

City	Province	Year of Plan Adoption	Plan Type	Population	Provincial Target Present
District of Saanich (BC)	British Columbia	2010	Climate Action Plan	113,000	Yes
Kelowna (BC)	British Columbia	2012	Community Climate Action Plan	147,739	Yes
Penticton (BC)	British Columbia	2011	Community Climate Action Plan	43,313	Yes
Sunshine Coast (BC)	British Columbia	2010	Community Energy & Emissions Plan	26,000	Yes
Victoria (BC)	British Columbia	2012	Community Energy & Emissions Plan	83,362	Yes
St. Albert (AB)	Alberta	2012	Local Action Plan	60,138	No
Stoney Plain (AB)	Alberta	2009	Local Action & Implementation Plan	10,544	No
Caledon (ON)	Ontario	2011	Local Action Plan	59,460	Yes
Guelph (ON)	Ontario	2007	Community Energy Plan	106,170	Yes
London (ON)	Ontario	2014	Community Energy Action Plan	432,451	Yes
Newmarket (ON)	Ontario	2016	Community Energy Plan	65,788	Yes
Thunder Bay (ON)	Ontario	2008	Community Environmental Action Plan	109,102	Yes
East Shelburne County (NS)	Nova Scotia	2010	Energy Strategy	6,707	No
Halifax Regional Municipality (NS)	Nova Scotia	2007	Community Energy Plan	359,183	No

Table 1. Summary of plans considered in the study. Population numbers were taken from the Federation of Canadian Municipalities (FCM).

Population data sources, and links to the plans from each province can be found here:

BC: http://www.fcm.ca/home/programs/partners-for-climate-protection/members-partners-for-climate-protection-program/british-columbia.htm. Updated Nov. 16, 2016.

AB: http://www.fcm.ca/home/programs/partners-for-climate-protection/members-partners-for-climate-protection-program/alberta.htm. Updated Sept. 29, 2016.

ON: http://www.fcm.ca/home/programs/partners-for-climate-protection/members-partners-for-climate-protection-program/ontario.htm. Updated Sept. 29, 2016.

NS: NS: http://www.fcm.ca/home/programs/partners-for-climate-protection/members-partners-for-climate-protection-program/nova-scotia.htm.Updated Sept. 29, 2016.

Results & Discussion

The following section discusses the findings of each content theme and the implications on plan quality. Each sub-section begins with an overview of trends, followed by several specific examples of findings. Finding examples illustrate differences in plan quality.

All plans considered provided plentiful background information on the local context of climate change mitigation. Fact bases provided justification of mitigation policies and strategies, indicating high quality and potential for effectiveness. Despite realistic mitigation actions relevant to local emissions and municipal abilities, greenhouse gas reduction targets were all over the map. The presence of provincial targets and resources may influence local targets. Implementation and monitoring strategies were lacking in nearly every plan, indicating low quality and less potential for effectiveness.

Fact Basis

Every plan I studied provided some background information on the science of climate change and its link to greenhouse gas emissions. All plans, except Victoria and Guelph, mentioned human-induced climate change. All plans provided some form of emissions forecasting of alternate scenarios, including a business as usual scenario. Each plan provided a breakdown of baseline year emissions by sector and fuel type. Mentions of the local context in terms of energy use, geography, and population projections were also common.

Inclusion of climate change facts and background information on the local context is necessary to help understand what mitigation actions are possible in a community (Tang et al. 2010; Baynham, 2011). For example, if population projections were not included in Newmarket's plan, presenting a reduction target in per capita rather than overall emissions could not be as easily justified. Caledon is the only plan not to mention densification as a strategy to reduce emissions (Table 3); however, Caledon is a relatively rural area where density would not make sense. St. Albert describes itself as a commuter town to the Alberta capital of Edmonton (City of St. Albert, 2012 pg. 13). St. Albert's plan recognizes a need to reduce transportation emissions, their largest contributor, by investing in transit infrastructure (City of St. Albert pg. 18). The presence of thorough background sections validated mitigation actions selected by each municipality, suggesting a high potential for effectiveness, as actions were realistic and addressed community needs.

Goals

Setting a clear, measureable target or goal is a key component of any plan (Robinson et al. 2005; Wheeler, 2008; Tang et al. 2010; Baynham, 2011). Target-setting uses a backcasting approach, where an ideal target is set then actions are presented to achieve

the target (Robinson et al. 2005, Wheeler, 2008). It may be difficult to determine the success and validity of a plan without a clear target. Climate change mitigation plans usually express their goal as a percentage reduction in total GHG emissions from a baseline year (in the past) to a target year (in the future).

Goals from the 14 communities considered varied greatly (Table 2). Targets ranged from a 7% reduction from baseline over 21 years (Sunshine Coast), to a 33% reduction over 8 years (Victoria) (Table 2). An ambitious GHG reduction target is defined by a high percent reduction value, early baseline year, and small gap between adoption and target year. London, Halifax, and Victoria appear to possess relatively ambitious targets, while the Sunshine Coast, Stony Plain, and St. Albert's targets are less ambitious (Table 2). An aspirational target may indicate high potential for plan effectiveness, as it may lead to drastic GHG reductions. However, an ambitious target should be paired with a strategy laying out how to achieve the target for greater potential effectiveness.

Finding 1: Setting a Clear, Measureable Target

Halifax's reduction target, seen in Table 2, was to reduce emissions 20% below 2002 levels by the year 2012; however, it is unclear if this is Halifax's actual target. The Halifax plan only listed this target once as their GHG reduction obligation under the PCP framework, and did not elaborate on whether this is the target the plan aimed to achieve (Halifax Regional Municipality, 2007 pg. 1). Halifax's vision statement set a relative, rather than absolute target. The plan does not explain how the municipality intends to compare emissions improvements to similar sized Canadian cities.

Vision Statement: 'In partnership with other agencies, HRM intends to achieve the most significant improvement to energy sustainability, security, renewable technology, and environmental emissions among similar sized cities in Canada over the next 10 years.' (Halifax Reginal Municipality, 2007, pg. 6)

The presence of an unclear target and vague vision statement suggest a low potential for plan effectiveness, as there is no clear target to measure success.

Finding 2: Baseline Year and Target Year Gap

Generally, GHG emissions from Canadian communities increase over time. It is more difficult to reduce emissions below 2000 levels than 2010 levels, because emissions were lower in 2000. An earlier baseline year, large gap between the baseline year and target year, and large percent reduction represents an ambitious target. When this logic is applied to Table 2, London's target is considered ambitious for having the earliest baseline year and largest gap. In contrast, St. Albert's target is less ambitious. St. Albert used the year 2008 as the baseline, had a 12 year gap, and aimed to reduce emissions by only 6%.

It is uncertain whether a more or less ambitious target will lead to greater GHG reduction potential and plan effectiveness. The effectiveness of a reduction target depends on implementation strategies. Less

ambitious targets may be more realistic, while ambitious targets without implementation strategies will remain unattainable.

Finding 3: Per Capita goals vs Overall Emissions Goals

Newmarket's targets were for per capita emissions, rather than total emissions. Newmarket aimed for each citizen to reduce GHG emissions by 40% from 2013 to 2031. Though a 40% reduction is ambitious, per capita reporting may be misleading. If a city reduces per capita emissions, but the population increases, total emissions could actually be higher in the target year than the baseline year. Newmarket's population growth rate was 2% higher than the national and provincial averages, and is expected to increase from 88,000 in 2016 to 101,000 by 2031 (Town of Newmarket, 2016, pg. 10). It is therefore possible Newmarket opted for an ambitious per capita emissions reduction target, as major reductions to total emissions may not be possible due to projected population increases. Significant per capita emissions can still achieve overall emissions reductions, even with a population increase.

City	GHG Reduction Target	Baseline Year	Year of Plan Adoption	Target Year	Years to Reach Target
District of Saanich (BC)	33%	2007	2010	2020	10
Kelowna (BC)	33%	2007	2012	2020	8
Penticton (BC)	10%	2007	2011	2030	19
Sunshine Coast (BC)	7%	2007	2010	2031	21
Victoria (BC)	33%	2007	2012	2020	8
St. Albert (AB)	6%	2008	2012	2020	8
Stoney Plain (AB)	6%	2000	2009	2016	7
Caledon (ON)	17%	2006	2011	2021	10
Guelph* (ON)	~70%	2005	2007	2031	24
London (ON)	15%	1990	2014	2020	6
Newmarket** (ON)	40%	2013	2016	2031	15
Thunder Bay (ON)	10%	2005	2008	2017	9
East Shelburne County (NS)	18%	2007	2010	2020	10
Halifax*** (NS)	20%	2002	2007	2012	5

Table 2. Greenhouse gas reduction targets for 14 Canadian communities. Baseline year represents when a GHG inventory was conducted, adoption year is when the plan came into effect, target year represents when the target is set to be met. All GHG reduction targets are in percentages from the baseline to the target year. Note that some municipal plans also listed long term goals (until 2050); however, the goals in this table were chosen because they generally are the same time period, or were the only goal listed.

*.Guelph used per capita and in T rather than a percentage, so the approximate emissions reduction percentage was calculated using information provided in the plan. Guelph projected their plan will results in a drop from 16TCO_2/capita to 7TCO_2/capita, but realized their ultimate goal is to be 'lower than global average' (the global average is never stated but they stated the 7TCO_2/capita is 50% higher than the global average, so it was assumed global average is 3.5TCO_2/capita).

**Newmarket's GHG reduction target is in per capita percent reductions.

***Halifax does not explicitly state it has adopted this target, it is only mentioned as its obligation under the PCP framework, and that if corporate reductions go well, it aims to achieve 20% reduction from 2002-2012.

Mitigation

Mitigation efforts varied greatly across the 14 communities studied (Table 3). Though most communities included actions towards reducing emissions from each of the five mitigation categories (every plan mentioned energy, transportation, and buildings), waste was not mentioned in four plans (Table 3). In general, most action items were geared towards the main two GHG emitters (energy and transportation, as determined by GHG inventories).

Unbolded column headings represent common subthemes within each mitigation category, highlighting mitigation strategies used in most communities considered (Table 3). The common sub-themes of district energy, building retrofits, and densifying urban areas reflect major trends in climate mitigation identified by Kennedy et al. (2014).

Differences in mitigation strategies likely reflect the local context and local GHG inventories (Kennedy et al., 2014). Therefore, missing "X's" in Table 3 aren't necessarily bad; rather, "X's" indicate where municipalities concentrated mitigation efforts. Matching local context to mitigation strategies indicates high potential for plan effectiveness.

Finding 1: Leaving Out Waste

Four of the 14 communities studied did not include mitigation actions related to solid waste and landfills (Table 3). A municipal plan not listing actions related to one of the five categories, such as waste, likely reflects the local emissions and mitigation context, rather than a disregard for mitigation actions. In each of the cities considered, waste accounted for the lowest proportion of community GHG emissions. For example, waste accounted for approximately 2% of Eastern Shelburne's GHG emissions, while residential buildings accounted for ~40% (Eastern Shelburne Energy County, 2010, pg. 43). Some communities likely did not include mitigation strategies for waste because reducing emissions from the transportation and building sectors will have a greater impact on a municipality's GHG inventory.

Despite the fact waste only accounted for 3% of the community's GHG emissions, Thunder Bay's plan mentioned additional concerns with waste such as toxic heavy metals from electronics (City of Thunder Bay, 2008, pg. 62). Although mitigating GHG emissions from waste may not significantly impact total emissions, the additional environmental and health benefits from certain mitigation efforts should not be understated.

Finding 2: Agriculture Emissions

Caledon, ON and Penticton, BC included explicit plan sections to reduce agriculture emissions. Caledon reported 11% of their GHG emissions from the agricultural sector (Town of Caledon, 2011, pg. 15). The inclusion of agriculture as an additional climate change mitigation category by some communities is an example of how municipalities tailor their plans to the local context to achieve emissions reductions. The PCP framework generally omits agricultural emissions and considers agricultural emissions provincial jurisdiction,

therefore out of the community's control. Inclusion of agriculture emissions shows a strong commitment by the community to take responsibility for emissions (City of Thunder Bay, 2008, pg. 13).

Finding 3: Unaccounted Reductions

Victoria, the Sunshine Coast, and Kelowna incorporated back-up measures to achieve their emissions targets if not met by action items. Plans from Victoria and the Sunshine Coast considered buying carbon offsets for reductions that couldn't be met by action items. Carbon offsets are credits for GHG reductions acquired by one party, which can be sold to another party to offset the second party's emissions (Suzuki Foundation, 2014). Carbon offsets are usually traded in tonnes of carbon. For example, if Victoria missed its reduction goal by 300t CO_2, the city would purchase 300t of carbon offsets from a company that plants trees or produces wind energy. Stakeholder engagement sessions from Victoria and the Sunshine Coast discouraged purchasing offsets. Offsets are often viewed as an easy way out of making real change, as a community can buy its way out of GHG emission reductions (City of Victoria, 2012, pg. 77).

Implementation of Kelowna's climate change mitigation plan will only get the city 83% of the way to reaching the 33% reduction target (City of Kelowna, 2012, pg. 48). Kelowna is depending on the remaining 17% of reduction efforts to come from senior government policy and new technology (City of Kelowna, 2012, pg. 48). Kelowna's rationale for having 17% of emissions unaccounted is because BC's Provincial Government Action Plan only identifies actions to achieve 73% of their 33% target. Relying on senior government actions and non-existent technology appears to deflect responsibility away from the community creating the emissions. Accounting for only 83% of reduction targets illustrates a lower potential for plan effectiveness.

Finding 4: City as a Leader

Each of the 14 plans considered mentioned the municipality as a corporation should act as a leader in climate change mitigation. Many municipalities already have corporate GHG reduction strategies in place, while others were working on corporate strategies. Every community recognized in order to achieve GHG reductions in the community, the City must set an example of what can be achieved. Each plan also recognized it is easier to implement a corporate GHG emission plan than a community plan, as corporate GHG emissions are under direct control. Main mitigation strategies currently underway by municipal corporations include: upgrading streetlights to LED bulbs, upgrading vehicle fleets to fuel efficient models, requiring stricter energy conservation measures and LEED certification for new municipal building construction, and reducing energy use and stress on water and wastewater treatment plans by encouraging conservation. Establishing corporate mitigation plans demonstrates potential for GHG reductions because the City is committed to being a leader.

Mitigation Category							
City	Energy	District Energy	Local Energy Source	Transportation	Electric Vehicles	Reduce Vehicle Km Traveled	Carpooling/ Carshare
District of Saanich (BC)	X	X		X	X		X
Kelowna (BC)	X	X		X	X	X	X
Penticton (BC)	X	X		X	X	X	X
Sunshine Coast (BC)	X	X	X	X	X		X
Victoria (BC)	X	X	X	X	X	X	X
St. Albert (AB)	X	X	X	X	X		
Stoney Plain (AB)	X			X			X
Caledon (ON)	X	X		X	X	X	X
Guelph (ON)	X	X	X	X			X
London (ON)	X	X	X	X	X		
Newmarket (ON)	X	X	X	X	X		
Thunder Bay (ON)	X			X			X
East Shelburne County (NS)	X	X		X			
Halifax (NS)	X		X	X			X

Continued onto next page

	Mitigation Category									
City	**Buildings**	Retrofits	Ground-Source Heat Pumps	Solar Hot Water	Provincial Bldg Code Updates	**Waste**	Compost	**Land Use**	Density	**Other**
District of Saanich (BC)	**X**	X	X	X	X	**X**	X	**X**	X	NA
Kelowna (BC)	**X**	X	X	X	X	**X**	X	**X**	X	Senior Government & New Technology
Penticton (BC)	**X**	X	X	X	X	**X**	X	**X**	X	Agriculture
Sunshine Coast (BC)	**X**	X			X	**X**	X	**X**	X	Economy, Brownfields, Culture of Conservation
Victoria (BC)	**X**	X	X	X	X	**X**	X	**X**	X	Carbon Offsets
St. Albert (AB)	**X**	X	X			**X**	X	**X**	X	NA
Stoney Plain (AB)	**X**	X				**X**	X	**X**	X	NA
Caledon (ON)	**X**	X			X	**X**	X			Schools, Agriculture, Tree Planting, Local Food, Long Term Actions
Guelph (ON)	**X**	X	X		X	**X**	X	**X**	X	Water & Wastewater
London (ON)	**X**	X		X	X			**X**	X	Industry & Manufacturing
Newmarket (ON)	**X**	X	X		X			**X**	X	NA
Thunder Bay (ON)	**X**	X		X		**X**	X	**X**	X	Air Quality, Food, Pesticides, Water, Community Greening
East Shelburne County (NS)	**X**	X	X						X	NA
Halifax (NS)	**X**	X			X			**X**	X	NA

Table 3. Main categories for climate change mitigation, and common sub-themes. An 'X' denotes the community plan included the category as a main form of mitigation (bolded), evident by either listing it as a main heading within their plan, or it was assumed a major category due to actions presented (i.e. land use was not always a defined category; however, many mitigation measures for transportation and buildings related to the land use bylaw, it was therefore included). The 'Other' column represents main mitigation action headings outside of the 5 categories. Unbolded columns represent specific actions under each mitigation theme that were common in the plans.

Policy

Policies present an important tool for reducing community GHG emissions. Policies can encourage, promote and incentivize practices that reduce or eliminate emissions, while also de-incentivizing, banning, and discouraging practices that increase emissions. Plans with strong policy and high potential for effectiveness currently have these measures in place, intend to implement these policy measures, and mention complementary community plans that include policy geared towards reducing GHG emissions (Hoffman & Li, 2009).

Results in the policy category varied greatly. Several communities did not mention any policy in their climate change mitigation plans, while others aligned policy with official planning documents, or attributed a policy recommendation to each action item. Delineating specific policy proved difficult when coding plans, as some plans only mentioned 'consider adopting' GHG reduction policy.

Finding 1: Inclusion of Binding Policy

Victoria's climate mitigation plan highlighted an important step the community took in 2010 to enshrine into bylaw the reduction target of 33% below 2007 levels by 2020 (City of Victoria, 2012, pg. 7). Victoria regularly and explicitly referred to Official Community Plan (OCP) policy and targets related to GHG reductions, stating 'the proposed OCP outlines further policies and strategies for achieving planning goals and targets relating to energy and climate change' (City of Victoria, 2012 pg. 13). Victoria's OCP also set transportation targets including minimum 70% of worker commutes occurring by walking, cycling and transit by 2041 (City of Victoria, 2012, pg. 64). Victoria referred to 11 additional strategies, policies and plans supporting the plan.

Victoria demonstrated a policy commitment to GHG emissions reductions by adopting an emissions reduction bylaw and having emissions reduction policy present in their OCP, indicating high potential to achieve its ambitious target (Table 2).

Finding 2: Regulation vs. Behavioral Change

The Sunshine Coast plan did not explicitly state adopted polices to encourage emissions reductions; rather, it referred to exploring, identifying, investigating, and creating GHG reduction policies. Intention to adopt new policy towards GHG emissions presents an important step, but demonstrates less potential for effectiveness than Victoria's bylaw adoption.

A lack of policy currently in place may be explained by the Sunshine Coast's plan stating 'another challenge identified was how to implement the plan with the least amount of regulation possible, while recognizing that information and education programs… are unlikely to be sufficient to achieve significant and sustained GHG emissions reductions' (Sunshine Coast Regional District, 2010, pg. 90). As further pointed out by the Sunshine Coast plan, education programs are critical plan components; however, regulation and policy

can spark behavioral change and ensure change occurs. Citizens and community stakeholders often require a push or incentive to make behavioral changes. Policy adoption can achieve behavioral change. The inclusion of policies or intention to adopt policies displays a commitment by a municipality to reduce emissions, and an increased likelihood of achieving reductions targets, especially when policies incentivize behavioral change.

Implementation

Implementation refers to how the plan will be achieved. It generally includes a timeline for action item completion, budget details, and responsible parties for each action item. An implementation plan provides direction to turn the goals of the plan into reality. Without an implementation plan, it is unclear how the goals presented will be carried out, if at all (Wheeler, 2008).

Table 4 summarizes implementation plan components from the 14 communities studied. Though nearly every municipality included an explicit implementation plan, many lacked details. Six of 14 plans identified a funding source for GHG reduction strategies, only four prioritized actions (Table 4). Eleven plans identified a responsible authority for carrying out mitigation actions, a small indication that reduction targets may be achieved.

Two communities with high reduction targets, London and Victoria, contained most of the implementation plan components, validating potential for plan effectiveness. Halifax, another municipality with a high reduction goal, only included four of seven components (Table 4). St. Albert and Stony Plain fall in the middle range of effective implementation plans, though their reduction targets were lower than most plans considered. The Sunshine Coast is the only plan that included all implementation components, despite setting a low reduction target. This could indicate high potential for effectiveness and realistic GHG reduction planning.

Finding 1: Implementation Plan Components

The Sunshine Coast covers every major component of an implementation plan, seen in Table 4. The inclusion of details for how to carry out each action item within the plan demonstrates a thoroughly thought out plan, intended to be implemented to its full potential. Little is left to interpretation because it is clear how the action items will be achieved.

Finding 2: Lack of Implementation Direction

Contrasting the Sunshine Coast's thorough implementation strategy, Thunder Bay's plan does not mention any implementation details (Table 4). The plan's 'Next Steps' section mentions establishing an Implementation Advisory Committee to implement and oversee the plan. While appointing a committee to ensure the plan is implemented is a step in the right direction, absence of implementation details could mean the plan is making empty promises. Unclear steps to achieve the plan's goals lead to questions on the

legitimacy of the plan and if the goals intend to be met (Wheeler, 2008).

Finding 3: Importance of Establishing Funding

One of the biggest challenges communities face to reducing GHG emissions and developing climate change mitigation plans is cost (Tang et al. 2010; Kennedy et al., 2014). In 2007, Saanich established the Carbon Neutral Reserve Fund (CNRF), setting aside $25 for every tonne of CO_2 equivalent emitted by the municipality, based on corporate GHG emissions. While the CNRF will go towards municipal operations to reduce emissions, it represents a funding model that could be emulated by other communities, or used to fund emission reductions incentives in the community.

Saanich's CNRF as a continuous funding source is unique. Other communities must rely on stretching city department funds or applying for grants to assist with implementation. If these financial sources fall through, action items are less likely to be achieved. Though only for municipal GHG reduction efforts, Saanich's model providing a dedicated funding source for GHG emissions reductions projects suggests greater plan quality.

Implementation							
		Approach		Finances		Responsible Authority Identified	
City	Explicit Implementation Strategy or Section	Prioritized Actions	Timeframe Present	Budget Present	Funding Sources Identified	City Role	Stakeholder/ Community Role
District of Saanich (BC)					X	X	X
Kelowna (BC)	X		X	X		X	
Penticton (BC)	X		X	X		X	
Sunshine Coast (BC)	X	X	X	X	X	X	X
Victoria (BC)	X	X	X			X	X
St. Albert (AB)	X		X	X	X		
Stoney Plain (AB)	X		X	X	X	X	
Caledon (ON)						X	X
Guelph (ON)	X		X	X	X		X
London (ON)	X	X	X			X	X
Newmarket (ON)	X	X	X	X	X	X	
Thunder Bay (ON)							
East Shelburne County (NS)	X		X	X	X	X	
Halifax (NS)	X		X	X	X*		

Table 4. Summary of components in the implementation section or plan. An 'X' denotes the component was included, a blank denotes the component was left out or not identified. Prioritized Action refers to if a plan categorized action items explicitly into high, medium, or low priority; Timeframe Present indicates if action items were given an exact or estimated time for completion; Responsible Authority indicates which group, if any, the plan holds responsible for carrying out action items, for some, it is a mix of both the City and community stakeholders.

*only for previously approved actions, not newly proposed actions.

Monitoring

Monitoring and reporting determines if the implementation plan is followed, if the goals of the plan are being met, and if the plan needs to be adjusted because something is not working or no longer relevant. The plans considered intend to be used until 2020 or 2030. With target years in the distant future, municipalities should consider the plans 'living documents,' where periodical updating is needed to incorporate new knowledge, policy changes, and accomplished targets.

Monitoring and reporting sections generally include a timeframe to report progress on action items, a timeframe to update the plan itself, indicators to determine action item completion, data sources for the indicators, and the party responsible for creating progress reports and plan updates.

Lack of monitoring and reporting makes it difficult to determine if the plan is working and goals are achieved (Wheeler, 2008). If monitoring and reporting does not occur it is less likely plan will come to fruition.

Table 5 illustrates many plans lacked monitoring and reporting components. Most plans provided a timeline for reporting on action item progress, while only nine explicitly mentioned the plan itself would be updated (Table 5). Less than half of the communities listed a responsible party for creating releasing progress reports, and fewer provided information on where they would retrieve indicator data (Table 5). The absence of monitoring and progress components does not demonstrate potential for plan effectiveness; however, London and the Sunshine Coast again appear to have high quality plans as most boxes are checked.

Finding 1: Realistic Plans

British Columbia's Sunshine Coast had a lower GHG emissions reduction goal than other BC communities considered. The Sunshine Coast's plan presented some of the most detailed and thorough sections on implementation and monitoring (Table 5). This may shed light on how realistic GHG emissions reductions plans are. Page 90 of the Sunshine Coast plan stated:

'the approach employed in the current target setting process was designed to ensure that the targets are technically feasible, financially viable and supported by interested parties. Furthermore, to ensure accountability, activity is tied to specific program areas so that progress can be monitored.'

Although the Sunshine Coast had a lower emissions goal than other BC communities, it specifically designed the target and plan to ensure the goal can be met realistically. The Sunshine Coast plan noted if the ambitious target was met (33% reductions from 2007 to 2031), all new development in the area must occur in the centres of two communities, an action the community considered unrealistic.

While the Sunshine Coast's target may be considered less ambitious than other Canadian plans studied, the realistic implementation and monitoring programs to carry out mitigation actions are among the most thorough, and therefore, could lead to greater percent reductions. A community

with an ambitious reduction goal and less thorough implementation and monitoring strategies is more likely to set itself up to fail achieving the goal. When implementation is an afterthought, consequences of ambitious action items are not taken into account, and communities may fail to realize certain mitigation strategies they intended are no longer possible.

Finding 2: Qualitative Indicators

Most plans considered mention using quantitative indicators to determine if action items and goals are being met (Table 5). Common quantitative indicators include explicit percent reductions to the number of vehicle kilometres travelled, increases to building energy efficiency, and increased amounts of community energy created by renewable sources.

Some communities mentioned qualitative indicators to measure plan success. Stony Plain mentioned 'increased public awareness' as action item indicators (Town of Stony Plain, 2009, pg. 34). Quantitative indicators may be problematic because they cannot be measured and therefore cannot provide clear evidence to whether plan goals are fulfilled. Stony Plain did not indicate how they will determine increased public awareness, nor did the plan mention an explicit goal to increase awareness by a certain amount.

Clear and explicit indicators, paired with data sources are needed to compare the goals and action items of the plan with concrete evidence from the community. If indicators are vague, it is not clear whether goals are being met, suggestive of low plan quality.

Monitoring & Progress Reporting							
	Updates		Indicators		Ensuring Reporting		
City	Progress Report Timeframe	Plan Itself	Qualitative Indicators	Quantitative Indicators	Data Source Identified	Responsible Party	Notes
District of Saanich (BC)	X	X		X			
Kelowna (BC)	X	X				X	
Penticton (BC)	X			X	X	X	Municipalities provide data, Regional District produces monitoring report
Sunshine Coast (BC)	X	X	X	X	X	X	release program report and emissions report
Victoria (BC)	X	X	X	X			
St. Albert (AB)	X			X	X		rationale for indicators and criteria for indicator selection included
Stoney Plain (AB)	X	X	X	X			
Caledon (ON)							website notes currently started and working towards implementation. No monitoring found
Guelph (ON)	X			X			include excel sheet for monitoring progress
London (ON)	X	X		X	X	X	detailed Reporting on Progress document
Newmarket (ON)	X	X		X		X	only metric mentioned is GHG emissions
Thunder Bay (ON)	X	X					implementation and monitoring are lacking
Eastern Shelburne County (NS)	X						
Halifax (NS)		X					

Table 5. Summary of plan components related to monitoring and progress. An 'X' denotes the component was included, a blank denotes the component was left out or not identified. The 'Notes' section indicates interesting findings from the monitoring and follow-up sections of the plans considered. Progress Report Timeframe indicates if there is a plan to release a progress report on the action items, while Document Updates refers to whether the plan itself will be periodically updated when needed.

Provincial Coordination

Robinson and Gore (2005) note Canadian communities are more likely to adopt a climate change mitigation plan when incentivized by the provincial government, or when a provincial government requirement is in place. Therefore, it is assumed communities in provinces with provincial GHG reduction targets, plans, funding, and other incentive programs will have more ambitious targets and higher potential for plan effectiveness.

Only two of the four provinces studied had explicit provincial reduction targets at the time of plan creation. British Columbia set a target of 33% below 2007 by 2020, and Ontario set a target of 15% below 1990 levels by 2020. Alberta did not have a provincial GHG reduction target. Nova Scotia released a reduction target in 2009 that went unmentioned in the plans from Halifax and Eastern Shelburne. The most likely reason is timeliness, as the local plans were adopted in 2007 and 2010, likely too soon to incorporate the provincial target of 10% below 1990 levels by 2020.

While Ontario set an ambitious target by using the year 1990 as a baseline, the province does not provide as many resources as BC. In addition to a fairly ambitious target, British Columbia mandated all municipalities in the province adopt a GHG reduction target, and established programs to aid local governments with creating and implementing climate mitigation plans. Adoption of a provincial target encouraging municipalities to reduce emissions suggests high quality local plans will come out of those provinces. This is somewhat verified by the fact that the plans with the greatest potential for effectiveness appear to be Victoria, the Sunshine Coast, and London.

Finding 1: Presence of Provincial Target

British Columbia adopted a legislated target in 2007 to reduce total provincial GHG emissions 33% below 2007 levels by 2020, and 80% below 2007 levels by 2050 (City of Penticton, 2011, pg. 4). The presence of a provincial goal indicates why three of the five communities considered from BC adopted the same target for their community emissions reductions plans. The Sunshine Coast's less ambitious target reflects what the community thought can realistically be achieved. The Sunshine Coast's plan also noted the province's target to achieve 80% reductions by 2050 is 'inspirational' (Sunshine Coast Regional District, 2010, pg. 95). In contrast, the Sunshine Coast created a target based on what could actually be achieved. Page 90 stated '…the approach employed in the current target-setting process was designed to ensure that the targets developed are technically feasible, financially viable, and supportable by interested parties.'

Penticton listed an overall percent reduction target, but focused on per capita reductions. Penticton's GHG reduction target likely does not meet the provincial target of 33% below 2007 levels by 2020 because of the large population growth expected. Penticton set its per capita goal as 35% emissions reduction from 2007 to 2030 (Table 2).

Stony Plain's plan from 2009 did not mention provincial targets from the Alberta government or any programs to assist local communities with climate mitigation. St. Albert's plan listed the province of Alberta's contributions to GHG emissions reductions, but no provincial target was present at the time of plan writing in 2012 (City of St. Albert, 2012, pg. 10-11). St. Albert instead referred to the federal target of 17% below 2006 levels by 2020, and reducing GHG by 80% by 2050.

The lack of provincial direction in terms of a GHG emissions reduction target is likely why the two communities from Alberta have less ambitious goals than the other three provinces.

London's plan stated the GHG emissions reduction targets are consistent with the Province of Ontario: 6% below 1990 levels by 2014, 15% below 1990 levels by 2020, and 80% below 1990 levels by 2050 (City of London, 2014, pg. 6). London is the only community from Ontario that explicitly referenced, and aligned targets with, the provincial target. Ontario first released a Climate Change Action Plan in 2007 and a Climate Change Strategy with updated targets in 2015. Of the five plans from Ontario considered, only London referenced these targets (Government of Ontario, 2016). London's goal is ambitious due to the large gap in time and relatively high percent reduction. All other communities from Ontario considered presented targets with shorter gaps between the baseline and target years, while Newmarket used per capita reductions, and Guelph used tonnes of CO_2 per capita. It is unclear why communities from Ontario did not align targets with the province.

Eastern Shelburne's plan referenced the Province of Nova Scotia's Electricity Act which targets 40% of the province's energy coming from renewable sources by 2020. Though Nova Scotia released a provincial Climate Change Action Plan in 2009 with the goal of reducing GHG emissions at least 10% below 1990 levels by 2020, no reference to a provincial GHG emissions reduction target is made in plans from Halifax or Eastern Shelburne (Government of Nova Scotia, 2009).

Though no provincial GHG reduction target is referred to, the two communities considered from Nova Scotia have targets slightly more ambitious than those from Alberta.

Finding 2: Provincial Mandates & Support

Ambitious targets from communities in British Columbia reflect the large amount of provincial support and encouragement compared to the other three provinces considered. In 2008, BC passed Bill 27, The Local Government (Green Communities) Act. This bill requires local governments in the province to establish GHG reduction targets, policies, and actions within their Official Community Plans. The Province of BC has been a leader in climate change mitigation by also releasing a BC Energy Plan, Climate Action Plan, and Community Energy Planning Best Practices document by BC Hydro.

In contrast, the Alberta government only announced in 2015 they will begin work on

their Climate Change Strategy, when the NDP government gained office. Ontario released their updated Climate Change Strategy the same year.

Discrepancies in provincial mandates, targets and plans help explain the difference among community reduction targets. Though every plan mentioned some support provided by the provincial government in terms of updating building codes, providing funding and taking some action on climate change, it is clear British Columbia is leading in the support they provide to communities to mitigate emissions, and the targets, implementation plans, and monitoring strategies reflect.

Prominent Themes

Motivation behind creating a climate mitigation plan often reveals potential for effectiveness as communities express a commitment towards reducing emissions. Challenges to emissions reductions illuminate reasons why some communities may have lower quality plans than others.

Most communities considered were motivated by senior government mandates (e.g. British Columbia), and the prospect of a cleaner environment. This motivation reflects a common trend in mitigation planning also noted by Anguelovski and Carmin (2011). The biggest challenge to reducing emissions, as identified in the plans, was fostering behavioral change.

Finding 1: Motivation

Most communities considered for this study stated a motivating reason for creating their plan, or the reason for plan creation was explicit in the plan's content. Though some communities were required to create a plan while others were created by choice, main drivers for creation appeared to be similar across plans considered.

Some communities were required to create GHG reduction plans. Communities from BC were partly motivated by provincial mandate to adopt a climate change mitigation plan, while Newmarket was required by the York Region Official Plan to develop a municipal Community Energy Plan for the municipal centre.

Reducing the effects of climate change and minimizing environmental harm were identified as main motivating themes in every plan considered. For example, St. Albert explicitly states the desire to reduce their contribution to climate change and contribute towards their reputation as 'environmental stewards' (City of St. Albert, 2012 pg. 9). All communities seek to be leaders in the climate change movement.

The desire for energy security and energy efficiency motivated several communities. Penticton, St. Albert, Halifax, Newmarket, Guelph, and Eastern Shelburne explicitly state the need for a secure and efficient energy supply. The communities that mentioned energy security provided detailed information regarding rising energy costs, and were motivated by the potential to reduce energy prices in the community. The economic benefits of mitigating climate change were also mentioned.

Plan creation was highly motivated by the idea of a sustainable future. Saanich's plan explicitly states the desire to create a better

world for present and future Saanich residents.

Finding 2: Challenges

Anguelovski and Carmin (2011) note cities often lack political support to pursue mitigation, and challenges arise when climate action extends beyond their boundaries. Citizen behavioral change is difficult as many do not connect to the issue and become confused with the scientific complexity and uncertain nature of the topic of climate change (Anguelovski & Carmin, 2011). Challenges limit the ability for cities to create high quality plans, therefore removing barriers increases probability of effectiveness.

The main challenges each community faced in mitigating climate change were similar, despite differences in geography, population and provincial support. Communities identified fostering behavioral change as a common challenge. Victoria's plan notes behavioral change may be particularly hard to achieve in practice (City of Victoria, 2012 pg. 93). Thunder Bay echoes this by stating the community must become ecologically literate (City of Thunder Bay, 2008, pg. 75). Similarly, Eastern Shelburne notes success depends on the municipality's ability to inspire the community at large, business and industry.

Some municipalities list challenges beyond their control. Penticton identified the current urban form as problematic to reducing GHG emissions (City of Penticton, 2011 pg. 16). Residents are accustomed to driving because the regional district is made of small, rural areas. Reducing emissions from transportation in Penticton is more difficult than in denser communities. Similarly, St. Albert notes the provincial government must reduce fossil fuel use in electricity generation, because their energy comes from the provincial grid (City of St. Albert, 2012 pg. 27). St. Albert also notes how low-density cul-de-sac development and a majority of residents commuting to Edmonton for work result in higher emissions from transportation that are difficult to shift (City of St. Albert, 2012 pg. 27).

Challenges identified by the communities shed light on a greater issue. Though municipalities contribute most of the world's GHG emissions, only a fraction of emissions are under municipal control. Municipalities rely on senior governments and their citizens for action on climate change (Robinson & Gore, 2005).

Limitations

Limitations are inevitable in any research project, and existed in this study. It is not possible to gain access to every CCAP and CEP in Canada. Some plans may not be available online, or have different names making them unidentifiable as climate change plans (for example, Integrated Community Sustainability Plans (ICSPs) have recently been adopted in many Canadian communities and contain some energy policy). The study was limited in scope to plans available on the internet. Not having access to all plans may have caused bias when comparing plans.

Previous studies evaluating climate change plans used double-coding to remove bias (Tang et al. 2010; Baynham 2011). Double-coding (having two researchers code all plans to minimize bias) was not possible due to limited resources. The coding framework may also have introduced bias.

Opportunities for Future Research

This study aimed to provide insight into the content and quality of a select sample of energy and climate change mitigation plans from Canadian communities, but good content does not equal good execution. Interviewing practicing planners from the 14 communities could help determine whether implementation and monitoring strategies are occurring, and goals are being met.

This study revealed community climate mitigation plans emphasize behavioral change and citizen action, while also noting the difficulty in creating education and outreach programs. Further research could identify the most effective ways to foster behavioral change in the community.

The research touches on the role of the province in effective community climate change mitigation plans. Further research could examine provincial strategies and their effect on municipal plan quality, especially with provinces releasing plans recently.

Conclusion

Dodman (2009) argues because cities have one of the lowest per capita GHG emissions, urbanization actually is not linked with high emissions. Properly managed cities play a large role in mitigating climate change by bringing to light issues of urban form (Dodman, 2009; Anguelovski & Carmin, 2011).

While adopting a GHG emissions reduction target and plan is a good first step, plans must be robust with proper policy, implementation, and monitoring. The sample of 14 plans from Canadian communities revealed we have a ways to go in using municipal policy and planning to achieve GHG reduction targets. Communities considering creating a climate change mitigation plan should take into account actions that are possible when formulating a target, rather than throwing out an inspirational target impossible to achieve. Implementation and monitoring sections should provide enough detail to accurately track emissions reduction progress and edit the plan as needed.

Provincial governments in Canada are responsible for encouraging or mandating their jurisdictions to adopt GHG reduction plans. The results of this study suggest provinces that adopt their own GHG reduction plans and provide tools for municipalities to use contain more ambitious and higher quality community plans.

Climate change mitigation actions, motivation for plan creation, and challenges to plan implementation were similar amongst the 14 plans considered. Provincial and municipal governments should cooperate and share knowledge to achieve mitigation actions and remove barriers to implementation, since they are motivated by similar goals.

Canadian municipalities are making strides to reduce GHG emissions by creating and adopting energy and climate change mitigation plans that fit their local context. However, as this study reveals, work is still needed to refine implementation and monitoring strategies, and to create realistic reduction targets. Local communities are poised to lead the effort to mitigate climate change, with increased support from senior levels of government, the goals may likely be achieved (St. Denis & Parker, 2009). With an issue as pressing as climate change, municipalities and provinces must act now.

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Appendix A: Sample Data Bank

CITY NAME & PLAN NAME							
Indicator	**Description**	**Mitigation Category**					
		GENERAL	Energy	Transportation	Waste	Buildings	Land-Use
Fact Basis	background information, emissions inventory broken down by category, several emission trends forecasted based on business as usual and alternate scenarios, background information relevant to local context						
background information							
emisions inventory by category							
several emissions trends forecasted (business as ususal and alternate scenarios)							
background information related to local context							
Goals	clear emissions reduction target set, short and long term goals present, community goals, goals explcitly related to mitigation						
clear emissions reduction target set for category							
short and long term goals present							
goals are fo community emissions							
goals are related to mitigation (i.e. GHG reduction)							
Policy	binding policy, clear language in policy, policy is specific, not left to interpretation						
policy is binding							
clear language							
policy is specific (left to little interpretation)							
Implementation	programs and regulations to support policy, funding opportunities, delegation of roles and responsibilities, detailed						
Intergovernmental Coordination	reference to provincial and/or federal programs, initiatives or plans						
plan coordination							
Monitoring Progress	goals and objectives are measureable, progress is trackable and there is a plan to follow-up on initiatives regularly						
NOTES:	miscellaneous, interesting findings						
OTHER:	stakeholder engagement strategies?						