

# ISEMA

PERSPECTIVES ON INNOVATION,  
SCIENCE & ENVIRONMENT



**SCHOOL OF PUBLIC POLICY & ADMINISTRATION**

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# ISEMA: Perspectives on Innovation, Science and Environment

School of Public Policy & Administration  
Carleton University

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# ISEMA

PERSPECTIVES ON INNOVATION,  
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- All of our reviewers, editors and senior editors for volunteering their valuable and (often scarce) time and expertise, as well as their dedication in helping to make this edition of ISEMA a success

## ABOUT ISEMA

ISEMA is a student organized, annually published academic journal. Articles are nominated by professors teaching courses in the Innovation, Science and Environment (ISE) stream of the School of Public Policy and Administration as well as other courses focusing on ISE-related topics. Nominated papers are subjected to a double-blind peer review process by ISE alumni and other specialists in the field. The highest-ranked papers then undergo an editorial process before publication.

For more information, please visit our website at [www.carleton.ca/isema](http://www.carleton.ca/isema)

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## FORWORD

Now in its fifth year, ISEMA is the manifestation of everything that a graduate program in public policy and administration should hope to achieve. It showcases the best work done by students on the topics of innovation, science, and environment; it is the tangible result of vision, initiative, and effort on behalf of students, who took it upon themselves to conceive of, create, and sustain what they believed would be a valuable and meaningful endeavour; and finally, it gives the authors a glimpse into the (sometimes unpleasant) world of peer review, and provides staff a better understanding of the processes behind publication.

As with those in previous editions, these papers were nominated by professors and reviewed both internally by student reviewers, and externally by alumni and professionals in relevant fields. Selected authors were then paired up with student editors to work through the editorial process, resulting in the papers published here.

As always ISEMA couldn't exist without the dedication and volunteered time of a community of individuals: the authors who put countless hours into writing and revising; the student editors who find time between classes and after jobs to provide constructive criticism; the professionals who share their experience and knowledge; and the professors who provide guidance and advice to authors and journal staff, from a paper's conception to the journal's final publication. Thanks to this community, ISEMA is publishing its fifth edition and can look forward to many more successful years of disseminating ideas and ways forward in the areas of innovation, science, and the environment.

The 2010 ISEMA Executive

## ABOUT THIS EDITION

Glancing over the table of contents of this year's edition of ISEMA, it may appear as if we've produced a themed issue; that is to say that the word sustainable appears in the title in three of the five pieces selected. Upon a closer reading of the papers, however, one may discover that the topics covered here are as varied as in any previous iteration.

Wording differently, the five published pieces deal with wildlife management, urban planning, food production, international technology integration, and the state of our highest institutions of learning.

So why is sustainability such an essential aspect of these papers? In one way or another, the concept of sustainability is integral to what the Innovation, Science and Environment (ISE) concentration as part of the broader Public Policy and Administration program is trying to accomplish. It is our attempts to shape the future of our country and our planet in a way that is both prosperous and ongoing.

Sustainability is not a discipline in itself, but rather a lens through which we examine and analyze the issues facing our world. The eight authors of the 5th edition of ISEMA have created five pieces which not only offer insightful and articulate arguments, but also display a masterful grasp of their respective topics.

While most of these papers were written by students in the ISE concentration of the Masters of Arts in Public Administration, the 2010 edition marks a departure from those previous through the inclusion of a piece by a student from Carleton University's Norman Patterson School of International Affairs; an addition that we hope will continue to encourage further cross pollination between the two schools.

We are incredibly excited to be continuing ISEMA's tradition of showcasing excellence through information that is educational, analysis that is critical, and ideas that are inspirational.

*Adam Fryer*

*Editor-in-Chief*

# Are Canadian Universities Taking Sustainability Seriously?

## A case study analysis of sustainability initiatives at three Canadian campuses and the lessons decision-makers can learn from these efforts

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*Daniel Rosenbloom*

THE TRANSITION FROM UNSUSTAINABLE DEVELOPMENT TO sustainable communities is one of the most crucial issues facing our planet today. Increasingly, our capacity to create wealth for all members of society while living within our environmental means is in question (Millennium Ecosystem Assessment Board). Collectively, we look to our political, academic, and business leaders to guide us through this challenging time. For the most part, political and business leaders have reneged on their responsibility as visionaries and environmental stewards in favour of unchecked economic growth. Overwhelmingly, our leaders support this dominant paradigm and repeat the mantra of 'all growth is good growth' rather than consider where we, as a society, would like to be in 10, 20, or 100 years. As growth propels us towards calamity, some have begun to question the wisdom behind this paradigm. Universities across the globe are beginning to answer the call for action and are in the process of re-envisioning our relationship with the natural environment.

Universities play a number of important roles in shaping the future of society and the way we envision the built and natural environment. First, they are societal leaders, problem-solvers, and innovators. Second, they act as research hubs and collaborative networks, both locally and globally. Third, they encourage the formation of partnerships between government, business, and the civil sector. In this fashion, they promote debate and the cross-pollination of ideas. Most importantly, universities are entrusted with guiding the intellectual development of the next generation. As a result of these roles, this institution has a responsibility to address the critical issues facing society and to rethink our current environmental, social, and economic trajectory. This responsibility is complemented and supported by the university's physical characteristics.

In many ways, universities are similar to small cities: they have large governing bodies, make sizeable infrastructure investments, offer a number of services, and have populations in the tens of thousands. This makes them perfect laboratories for researching, developing, and demonstrating sustainable practices. The experience of universities, as urban communities in their own right, reveals the challenges of addressing sustainability in

decision-making, urban development, service provision, and environmental conservation. This information has the potential to inform us about society's path towards sustainability and how we can better achieve results.

This study will attempt to answer the question 'are universities taking sustainability seriously'? Specifically, this paper will examine the extent higher education institutions have institutionalized sustainability into their decision-making processes. It will investigate whether universities have incorporated a comprehensive conception of sustainability into visioning, planning, operations, and administration. It will also attempt to determine how educational institutions have gone about institutionalizing sustainability and glean best practices that may be applied in other institutional settings. In order to answer the above questions, I will present three case studies that examine sustainability policies and efforts at the following Canadian universities: The University of British Columbia, The University of Calgary, and Carleton University. These case studies will examine the plans, actions, and progress at each university to determine if they sufficiently address sustainability considerations. Case studies will also attempt to take stock of campus sustainability efforts and highlight achievements and deficiencies. Afterwards, the experience of universities will be used to uncover and discuss lessons for policymakers and barriers to sustainability. Finally, recommendations will be made for overcoming barriers. Before addressing these issues, it is helpful to examine the historical context and how key events have framed the issue of sustainability for educational institutions.

### ***Historical Context***

The role and responsibility of higher education institutions as important actors in the sustainability discourse has evolved over time. This evolution has occurred, in part, through international conferences. These events have transformed the conceptualization of sustainability in higher education institutions and merit further discussion. This section will review a timeline of important agreements, commitments, and declarations as well as the importance each has had for framing and defining sustainability in the university context.

The Stockholm Declaration of 1972 was one of the first international declarations to address the importance of sustainability in higher education, recognizing the importance of education in reaching a sustainable pathway (Wright, "Definitions and frameworks"). To this effect, the signatories agreed that "[e]ducation in environmental matters, for the younger generation as well as adults... is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension" (Declaration of the United Nations Conference). Essentially, this Declaration introduced the first pillar of campus sustainability: academic

sustainability. Later declarations would expand on this view, deepen the understanding of campus sustainability, and broaden the role of education in addressing the issue.

The Tbilisi Declaration of 1977, which arose from the first intergovernmental conference on environmental education, is considered one of the starting points for environmental education efforts (Wright, “Definitions and frameworks”). This conference addressed the role, objectives, and characteristics of environmental education. It echoed the themes of the Stockholm Declaration and expanded the role of higher education in addressing sustainability. It recognized the necessity of implementing sustainability initiatives on campus as well as the value of integrating a more holistic understanding of the environment into higher education curriculum and operations. As such, the declaration introduced the second pillar of campus sustainability: operational sustainability.

The Talloires Declaration of 1990 was the first official statement made by university administrators of a commitment to environmental sustainability in higher education (Talloires Declaration). Over the last two decades, it has been signed by approximately 350 universities around the globe (33 from Canada). This declaration broadens the responsibility of the university from environmental stewards to advocates. It calls upon educational institutions, high level administrators in particular, to use their resources to respond to environmental challenges. It urges universities to utilize partnerships and networks to raise awareness about sustainability and forward sustainable development principles throughout society. Essentially, the conference recognized the role of universities as agents of change and expanded the responsibilities of universities from sustainability educators and practitioners to sustainability advocates.

International conferences and declarations have significantly contributed to the way universities frame the issue of sustainability. They have encouraged a holistic perspective in addressing sustainability; involving research, education, practice, and advocacy. Declarations have provided a guideline for implementing sustainable campus initiatives and a framework to measure progress. Moreover, they have expanded the conception of sustainability to encompass environmental, social, and economic considerations as well as academics. Before moving on, it is important to tease out the main conceptual elements of campus sustainability, operationalize these elements, and apply this framework to case studies.

### ***Defining & Operationalizing Campus Sustainability***

Sustainability is a multifaceted issue with many possible meanings. It is inherently difficult to define as there is no single all-encompassing and universally agreed upon meaning. According to Portney, sustainability and sustainable development are “best thought of as general concepts whose

precise definitions have yet to be fully explicated”. Nevertheless, I will offer a working definition of campus sustainability which originates from the Campus Sustainability Assessment Framework (Cole, “Campus Sustainability Assessment”).

“A sustainable campus community acts upon its local and global responsibilities to protect and enhance the health and well being of humans and ecosystems. It actively engages the knowledge of the university community to address the ecological and social challenges that we face now and in the future.” (30)

Cole’s definition and the international declarations present a number of key conceptual elements for this discussion. The first is associated with respecting the natural environment. This element recognizes the limited carrying capacity of the planet, the value of ecological services, and our dependence on natural systems. The second is related to meeting economic needs without imperilling the natural environment. Finally, the third aspect is concerned with optimizing quality of life and well-being. These three interconnected elements make up what Paehlke refers to as the “triple bottom-line”. This framework attempts to balance social factors (e.g., community engagement), economic factors (e.g., GDP), and environmental factors (e.g., water quality) without giving any of these factors priority.

This conception of sustainability acknowledges that human well-being is not possible if any factor is ignored or given supremacy. It implies a comprehensive and multidisciplinary approach to sustainability, challenging the traditional vertical organization of most institutions. As stated earlier, this analysis will attempt to determine if, and how, universities have integrated sustainability (as defined by the triple bottom-line framework) into their decision-making processes. The scope of each case study is informed by this framework and the two pillars of campus sustainability: academic sustainability and operational sustainability.

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### **CASE STUDY 1: UNIVERSITY OF BRITISH COLUMBIA**

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The University of British Columbia (UBC) has two main campuses located in two cities. The largest is situated in the City of Vancouver and the smaller campus is located in the City of Kelowna. UBC has a student population of approximately 50,000 (“Sustainability office”). The Vancouver campus shares many characteristics with a small city: It has “over 66,000 students, staff and faculty, 8 million square feet of core buildings, plus five residential neighbourhoods, a working hospital, and other ancillaries” (Sustainability Academic Strategy Working Group 8). This is certainly a fascinating setting to investigate sustainability initiatives in motion.

UBC was one of the first Canadian universities to seriously attempt the institutionalization of sustainability. In 1997, the university adopted

a sustainability policy that initiated a review of planning processes at the university (UBC Sustainability Office). A Sustainability Advisory Committee was founded in 1998, followed by the Sustainability Academic Strategy Working Group (SASWG), and the President's Advisory Council on Sustainability in 2008. These bodies laid the foundation for sustainable development on campus. This early commitment to action has allowed UBC to become a sustainability leader amongst Canadian universities. Despite this early start, there is still much progress that can be achieved. Before looking at specific initiatives, it is important to understand how UBC defines sustainability and to examine their policy framework.

UBC's SASWG considers sustainability to be a "recognition that we must live within the planet's biophysical carrying capacity"(1). The working group adds that, society "must provide systems of governance that propagate the values we want to live by and... an adequate material standard of living for all". These statements highlight the importance of expanding environmental considerations and public engagement in planning and decision-making processes. In addition, this view subsumes issues of social justices and equity. In other words, UBC understands sustainability as "a societal conversation about what kind of world we want to live in, informed by some understanding of the ecological, social and economic consequences of different courses of action" (SASWG 1). Furthermore, there is an understanding that "[u]niversities should be a major locus for discussion and debate on all aspects of sustainability, including resource conservation, habitat preservation, climate change, social equity, and economic resiliency" (SASWG 1). These themes are echoed throughout UBC's policy framework.

### ***Sustainable Campus Policy Framework***

UBC has made, and continues to make, serious commitments to sustainable development. They have taken a holistic approach to sustainability which is outlined in their strategic vision entitled, "Place and Promise". According to this vision, sustainability is an ever-evolving process (UBC, "Place and Promise"). The university has engineered their high level planning documents to mirror this fact by attempting to make the campus master plan and the strategic vision "living documents". These documents are designed to incorporate community feedback and emphasize an ongoing debate about the direction the community would like to go. Through this inclusive approach, UBC has addressed the three aspects of sustainability: social, environmental, and economic capital.

UBC has adopted two main themes that permeate all of their literature on sustainability: 'the campus as a living laboratory' and 'the university as an agent of change'. According to the UBC's Sustainability Academic Strategy (SASWG), the first theme

“...combines campus operations and administration (e.g. energy and water management, land use and ecosystem management, buildings and infrastructure, planning) with the education, research and outreach mandates of the university. Campus as a Living Lab involves students and faculty developing and applying sustainability research and teaching in collaboration with university staff and can also involve industrial or community partners working with academic and operational staff.” (2)

This theme is echoed in many of the initiatives that will be covered in subsequent sections. It is a crucial element of the university’s approach and provides unique opportunities for cooperation between faculty, staff, and students. It attempts to integrate sustainability consideration into every aspect of operations and academics and bridges the two main pillars of campus sustainability.

The second theme, the university as an agent of change, is an equally important element of UBC’s approach to sustainability. As described in SASWG;

“In order to become a catalyst for change in society, a university must promote active dialogue and exchanges of information and ideas. It must assume the role of collaborator and co-learner with the larger community. This means creating meaningful partnerships for new forms of research, education and service.” (2)

In effect, this theme acknowledges the university’s role as a leader in shaping society. It also recognizes opportunities for the cross-pollination of ideas through partnerships with government, industry, and the civil sector. UBC’s sustainability plans extend the role of universities from sustainability leaders to pioneers of sustainable research, development, deployment, and demonstration. To this end, UBC sees sustainability as a wise business decision as well as an environmental and social choice.

### ***Actions and Progress Highlights***

UBC has implemented a vast array of sustainability initiatives covering all areas of campus operations, administration, and academic curriculum. The following list is meant to highlight some of UBC’s most important undertakings and achievements as well as deficiencies that require attention.

#### ***Administration***

According to Institutionalizing Sustainability, a case study carried out by UBC’s Sustainability Office, the university has integrated sustainability into all decision-making processes. As of 2008, the sustainability portfolio was elevated to the President’s Office fulfilling the university’s commitment to integrate sustainability considerations into all high level visioning documents, strategic plans, and policies. Furthermore, the university

employs 12 full-time Sustainability Office staff members dedicated to the development, coordination, and implementation of sustainability initiatives.

### **Key Declarations and Commitments**

- UBC is a signatory of the Talloires Declaration

### **Operations**

In 1998, UBC initiated a large scale redevelopment plan, known as the ECOTrek project, to retrofit and upgrade almost 300 buildings and facilities with energy efficient and low consumption components (UBC). The aim of the project was to reduce the consumption of water and energy across campus. In addition, the project intended to reduce air pollution and the campus' carbon footprint. The project stemmed from the adoption of UBC's first sustainable development policy which also led to the creation of the Campus Sustainability Office. ECOTrek was designed as a partnership between the university's Campus Sustainability Office, Land and Building Services, and a private energy consulting company called MCW.

The ECOTrek project cost approximately \$35 million and took almost three years to complete (UBC). This significant investment required a real commitment to sustainability. However, closer inspection of the project details reveals that ECOTrek was also a sound financial decision. The annual savings of approximately \$2.8 million and long lasting nature of the infrastructure means that the university will save money in the long run. Coupled with rising energy and water costs this investment is likely to yield sizeable dividends.

A notable future initiative involves a \$2.86 million investment in the construction of a geothermal system at the UBC Okanagan campus (Ministry of Advanced Education and Labour Market Development). The project aims to supply campus buildings with heating and cooling. This investment is intended to bring the university closer to its overarching goal of becoming carbon emissions free (Climate Action Plan). Other sustainability actions include the construction of bioswales near parking lots, the recycling of rainwater for irrigation, and the development of accessible utility corridors (UBC, "Master Plan").

### **Transportation**

According to UBC's Transportation Status Report, UBC accounts for approximately 110,000 person trips daily. 39% of these trips are made in single occupancy vehicles. Evidently, transportation to and from campus is a huge challenge for both UBC and the City of Vancouver. In order to address this challenge, UBC partnered with the university's Alma Mater Society and the regional public transportation authority, TransLink, to provide a highly subsidized and mandatory public transit pass to all students

(College Sustainability Report Card 2010). The program, entitled U-Pass, was envisioned as part of UBC's previous strategic plan and gained vast support through extensive student engagement. The pass costs 80% less than a regular public transit pass and has increased ridership by 36% since the program's inception in 2003 (UBC, "Transportation Status Report"). TransLink and UBC are considering extending the U-Pass to all faculty and staff. In addition to this initiative, the university is engaged in a number of transportation demand management programs and actively encourages alternative modes of transportation. These actions include the continued repurposing of existing central parking spaces as locations for infill and recreational spaces (UBC, "Master Plan"). According to the Transportation Status Report, these actions have resulted in a 6% reduction in single occupancy vehicle trips from 1997 levels. That is to say, in 2008, there were 2,900 fewer single occupancy vehicle trips per day.

### ***Academics, Research, and Student Engagement***

UBC's SEEDS (Social, Ecological, Economic, Development Studies) program is the most notable academic sustainability effort. It builds upon the concept of the campus as a living laboratory and bridges educational sustainability with operational sustainability. Using applied learning techniques, the program meshes the expertise of staff and faculty to provide a unique opportunity for students to become involved in real-life campus sustainability issues, develop marketable skills, as well as earn academic credit. According to the SEEDS website, the program has "coordinated almost 500 student projects and engaged over 3,000 participants, saving UBC an estimated \$200,000" (UBC SEEDS Program). Overall, the program has been an overwhelming success in bringing all members of the UBC community together and enriching the sustainability discourse by creating interdisciplinary networks of students, staff, and faculty.

The SASWG envisions the expansion of initiatives like SEEDS. They see a unique opportunity for UBC to build upon the vision of the university as a living laboratory. This sentiment is expressed in the following excerpt from the Strategic Academic Strategy.

"UBC-Vancouver is the size of a small city with a unique regulatory environment. As such, UBC has the opportunity to pilot a municipal-scale energy, water and waste system. A clean energy urban microgrid demonstration project is a highly innovative opportunity to use our campus as a living lab for municipal-scale alternative energy systems. Such learning could potentially then be transferred to the more complex institutional environments off-campus to advance the role of the university as an agent of change in the community." (8)

Some may perceive this statement as overly ambitious; however, there

seems to be a real focus on expanding UBC's role as sustainability leaders. This vision is certainly something to strive for even if it is not achieved in the near future.

### ***Dealing with Growth***

In 2009, undergraduate enrolment grew by 7,400 students. This rise in enrolment resulted in a 14% increase in student population at the Kelowna campus and a 13% increase at the Vancouver campus (UBC Welcomes). This kind of rapid growth requires a delicate balance between development, environmental, social, and academic considerations. However, future growth is expected to be modest and will have less of an impact on campus infrastructure and services (UBC, "Master Plan"). Regardless, many of the initiatives covered by this case study are indirectly or directly aimed at addressing growth through increased efficiency and conservation efforts.

UBC's Master Plan aims to mitigate the impacts of growth through smart land use planning. The plan outlines a number of measures utilized to accommodate growth including: an emphasis on compact high density designs, upgrades and renovations that focus on infill and high density, the creation of mixed-use hubs to reduce the number of off campus trips necessary, and the construction of additional low cost campus housing. Overall, UBC is aware of the challenges that growth necessitates and seems to be addressing them wherever possible.

### ***Reporting***

UBC has initiated a number of reporting systems. The most prominent externally operated systems utilized are the self-reporting assessment frameworks entitled The College Sustainability Report Card (CSRC) and The Sustainability Tracking, Assessment & Rating System (STARS). Both rating systems assess social, environmental, and economic criteria and make their findings available publicly. UBC received a B+ rating from CSRC whereas STARS ratings are unavailable at this stage (College Sustainability Report Card 2010; ASSHE).

### ***Regional Perspective***

UBC has talked much about their commitment to forwarding sustainability both locally and globally. They have acted by creating a number of partnerships and jointly operated sustainability initiatives. The most noteworthy examples are the U-Pass program and the ECOTrek project discussed earlier. Despite a number of collaborations, partnerships, and vision statements there has not been enough action on this front. UBC has the capacity and responsibility to engage in more significant regional sustainability projects. Undoubtedly, in the following years, there will be an increasing effort to take part in local, regional, and global initiatives.

## CASE STUDY 2: UNIVERSITY OF CALGARY

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The University of Calgary (U of C), located in the City of Calgary, Alberta, is one of the youngest universities in Canada. The campus covers more than 200 hectares, an area larger than Calgary's entire downtown region (About the U of C). As of 2009, enrolment was approximately 30,000 full-time students. Like many Canadian cities and universities, the U of C is currently experiencing rapid growth and has plans to expand full-time enrolment by an additional 7,000 students over the next three to five years (Tong). This rapid growth has implications for service provision, infrastructure, and land use planning. Despite growth related pressures, this institution has endeavoured to incorporate sustainable development practices into decision-making processes.

The U of C's commitment to forwarding sustainability began in 1995 (Office of Sustainability). Originally, the university relied upon ad-hoc groups of staff, faculty, and students to address sustainability. Now, sustainability has a formalized administrative structure and mandate. Throughout this period, the scope of sustainability practices expanded to encompass both pillars of campus sustainability. Before we investigate this university's commitment to sustainability, let us briefly examine how they frame the issue.

The University of Calgary utilizes Janet Moore's conceptualization of sustainability in their sustainability literature. According to Moore ("Seven Recommendations"),

"[s]ustainability is a concept, a goal, and a strategy. The concept speaks to the reconciliation of social justice, ecological integrity and the well being of all living systems on the planet. The goal is to create an ecologically and socially just world within the means of nature without compromising future generations."

This view encompasses all aspects of sustainability while recognizing that sustainable development is an evolving process. This framework has been integrated into the university's overarching policy documents.

### ***Sustainable Campus Policy Framework***

Support for sustainable development has been built into the university's strategic vision entitled, *Academic Foundations: Principles to Guide University Planning* (The University of Calgary). The strategic plan references U of C's Sustainability Policy, which defines and operationalizes many of the broad statements made within the visioning literature. According to the Sustainability Policy, the mandate for sustainability "applies to all activities under the governance of the University of Calgary" (1). The policy further describes the planning, implementation, and reporting process. These elements will be discussed in more detail in later sections.

The U of C envisions a ‘living laboratory’ approach to addressing sustainability on campus. Like UBC, they have adopted a holistic “pan-university approach to sustainability which encompasses curriculum and research, campus operations, as well as co-curricular service and community engagement” (Office of Sustainability). Similarly, the U of C has acknowledged the role of the university as a societal leader and the responsibility this entails; however, they have not articulated the meaning of ‘the campus as a living laboratory’ as clearly as UBC.

### ***Actions and Progress Highlights***

The U of C has engaged in a number of sustainability actions encompassing operations, administration, and academics. The following list of sustainability initiatives is meant to highlight some of the university’s most important undertakings, achievements, and areas that require attention.

#### ***Administration***

Over the last decade, The U of C’s administrative structure has gone through a number of changes (Office of Sustainability). Originally, sustainability was addressed by ad-hoc groups of students, faculty, and staff. In 2003-2004, some of the most prominent ad-hoc groups were brought under the Campus Infrastructure Group which began to act as an advisory committee on campus sustainability issues. Over the next five years, the committee’s mandate broadened from operations to academics and research-related activities. The aim was to incorporate sustainability into all areas of campus life. In 2007, a Director of Sustainability was hired and the Sustainability Working Group was established. This body along with the newly created Sustainability Office direct the activities of the sustainability portfolio and engage in the formulation of long-term planning. In general, this administrative structure is responsible for integrating sustainability into decision-making processes as well as coordinating and implementing sustainability initiatives across campus.

#### ***Key Declarations and Commitments***

- University of Calgary is a signatory of the Talloires Declaration

#### ***Operations***

U of C has engaged in a number of initiatives to increase the sustainability of their campus. A particularly noteworthy project is the integrated stormwater management system. The aim of this project is to eliminate the discharge of untreated stormwater by 2012 (Office of Sustainability). As part of this initiative the university has created a number of bioswales and a dry basin detention area that collects rain water, limits runoff, and recharges groundwater over time. According to the Master Plan,

all parking lots will have bioswales installed nearby with tree plantings to ensure adequate filtration of rain water. This will also increase percolation and take pressure off of the municipal stormwater management system.

Another notable initiative is the construction of a campus co-generation system (Central Heating and Cooling Plant Project Overview). The system, scheduled to come online in 2011, will fuel campus electricity needs as well as satisfy heating requirements. The station's fuel source of natural gas is much cleaner than using energy from Alberta's coal dominated grid. Consequently, the carbon footprint of the university will be 44% below 1990 levels by 2012. The decision to construct a co-generation system is also a sound financial decision as it is estimated to result in cost-savings of \$3.5 million per year and pay for itself in less than 5 years.

### ***Transportation***

U of C's Master Plan attempts to deemphasize the automobile and prioritize other forms of transportation. The plan outlines an ambitious demand management program with the goal of reducing car travel from 67% of total traffic to 50% by 2014, and down to 40% by 2020. The university will attempt to meet these objectives by increasing housing on campus, raising parking rates, introducing a campus shuttle service, and expanding cycling related facilities (bike paths, bike shops, showers, etc...). Moreover, pedestrian networks will be expanded and alternative modes of transportation will be encouraged through information campaigns.

In regards to the number of parking spaces, the U of C's aim is to maintain the current amount of parking through more efficient land use. Evidently, the university is serious about limiting the number of cars on campus. However, it is unfortunate that the university would develop a transportation demand management plan without eliminating some of the parking altogether.

### ***Academics, Research, and Student Engagement***

Sustainability has been integrated into most areas of academic curriculum, research, and student life. Currently, there are over 211 courses that address some aspect of sustainability (Office of sustainability). Although every faculty offers a sustainability-related degree or course, there is no UBC SEEDS equivalent at the U of C. This is disappointing considering the huge strides that the university has made in relation to sustainability and the forgone opportunities for students to learn from these projects. Nevertheless, there are a number of student run organizations that allow students to become engaged in sustainability. These initiatives aim to reduce water and energy consumption, personal carbon footprints, and individual waste production. In contrast to UBC's SEEDS program, involvement in these initiatives is informal and no academic incentive is offered for participation.

### ***Dealing with Growth***

The U of C is expected to undergo rapid growth over the next decade or so. Full-time enrolment is expected to grow from 28,200 students to 40,000 by 2025 (Tong). This unprecedented growth will undoubtedly strain every aspect of the university's built and natural environment. The university has not yet developed a satisfactory plan for this level of growth. The Master Plan (U of C) details some innovative transportation measures, infrastructure, and land use strategies that may ease the brunt of an exploding population but there may still be adverse effects. Compact campus development is important and contained growth will make overcoming this challenge easier but current plans still leave much to be desired.

### ***Reporting***

U of C's internal sustainability reporting system assesses ongoing progress in meeting sustainability objectives. Reporting involves the release of a comprehensive sustainability assessment as well as individual assessments for each initiative (Office of sustainability). The university does not use a standardized assessment framework so results are difficult to compare. Furthermore, the most recent reports available are from 2007. This makes comparison as well accurate data hard to attain. Fortunately, many of the individual initiatives have updated websites which list targets and progress.

The university also partakes in the CSRC. According to CSRC (College Sustainability Report Card 2010), the University of Calgary received a B+ rating. The university received the same mark in 2009.

### ***Regional Perspective***

Many of U of C's sustainability initiatives link up with municipal sustainability policies and programs (Office of sustainability). Initiatives often reference municipal sustainability objectives and regional partnerships. For instance, the university's transportation demand management program and LEED building certification policy were developed in consultation with a number of community partners and institutions (U of C, "Master Plan Framework"). Furthermore, the stormwater management system is intended to take pressure off of municipal infrastructure. Some initiatives are complemented and enveloped by the City of Calgary's long term sustainability plan entitled, *ImagineCalgary*. This plan attempts to create a comprehensive sustainability plan for the region, encouraging action through community partnerships. The plan also provides targets from which partners can gauge progress and develop initiatives. Many of these targets have been integrated into the U of C's sustainability plans.

### **CASE STUDY 3: CARLETON UNIVERSITY**

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Carleton University (CU), located in the City of Ottawa, has a student population of approximately 22,000 individuals and is aiming to accommodate an additional 1000 students per year (CU, “Campus Master Plan”). This growth will put pressure on the built and natural environment on campus and the surrounding region. Nevertheless, the university’s new strategic vision and updated master plan attempt to strengthen CU’s objective of developing a sustainable campus.

CU is a relative newcomer to the sustainable development scene. The university has only recently adopted a formal commitment to sustainability by hiring a sustainability officer (Sustainability at Carleton University). However, since 2003, a number of committees and working groups have come together to forward sustainability on campus. Before examining the university’s policy framework, it is crucial to understand how CU defines sustainability.

CU offers a number of definitions for sustainability in their literature. According to Carleton’s Sustainability Office, sustainability “means to live, learn and grow within our campus community in a manner that protects and strengthens our physical and social environments such that the students, staff and faculty of future generations can continue to build and enjoy the Carleton campus community” (Sustainability at Carleton University). This conception of sustainability considers the importance of the social and environmental facets of campus sustainability. It respects intergenerational equity and acknowledges the need to protect and strengthen the ecological setting in which all other activities take place. This definition is supported by many of the objectives stated in the university’s strategic vision and master plan.

#### ***Sustainable Campus Policy Framework***

CU’s broad strategic goals and objectives incorporate sustainability in a number of ways. The strategic vision, entitled *Defining Dreams* (CU), states that “[t]he university has the responsibility and the intellectual resources to lead our local, regional, national and international communities as stewards not only of community well-being but of healthier, more sustainable communities” (5). This realization acknowledges the university’s role as a societal leader and the environmental responsibility this entails. The university’s policy framework supports this notion by attempting to “include sustainability in all... endeavours” and ensuring that “the facilities necessary for academic programs and research staff support and student life are sufficient, sustainable, [and] environmentally friendly” (CU, “*Defining Dreams*” 10). CU has reiterated its commitment to sustainability in operations and academics by enshrining sustainability as one of Carleton’s four ‘interdisciplinary themes of focus’. These themes are meant to guide the

planning decisions and future course of the university.

### ***Actions and Progress Highlights***

Carleton University has had limited experience implementing sustainability initiatives. They have not yet created a comprehensive sustainability policy. Their commitment to sustainability is still in its early stages and much has yet to be determined. The following list of sustainability actions and progress is meant to highlight some of Carleton University's most important actions and progress as well as deficiencies that require attention.

### ***Administration***

In 2008, CU's Sustainability Task Force offered a number of recommendations to help 'green' the campus (Council of Ontario Universities). The task force recommended hiring a sustainability officer and the creation of a sustainability steering committee. In 2009, the university administration acted upon the first recommendation of the task force and hired a sustainability officer to develop, coordinate, and implement sustainability initiatives across campus. Unfortunately, a steering committee has not yet been established. If created, the committee would be populated by faculty, staff, and student representatives. It would provide the direction for university sustainability initiatives.

### ***Key Declarations and Commitments***

- Carleton University is a signatory of the Talloires Declaration

### ***Operations***

CU has engaged in a number of projects related to 'greening' operations. One of the oldest and most successful initiatives is the waste diversion program. This program entails the recycling of paper, plastic, glass, and electronic waste (Council of Ontario Universities). Extensive composting has also been implemented in food services and residence buildings. Together these actions achieved an overall 40% waste diversion rate in 2008. The university has an overall waste diversion target of 45% for 2010 and is expected to meet or exceed the goal of 60% waste diversion by 2015 (Sustainability at Carleton University). This 60% target is in line with municipal goals.

Increasing percentage rates of waste diversion is admirable but it misses the ultimate goal of reducing the impact of the community on the natural environment. For instance, the campus population is expected to grow and with it the total amount of waste. Although waste diversion rates are expected to rise, overall quantities of waste are expected to increase with campus population. Therefore, other reduction targets should also be incorporated into this effort. Perhaps, a reduction target in per capita waste

or consumption should be adopted and a strategy developed to achieve this goal. It is important to note that this criticism is directed at all waste diversion programs that ignore the consumption side of the equation.

Other noteworthy initiatives include the adoption of the Green Globes building standard in 2008 (Council of Ontario Universities). This standard requires all new buildings to achieve at least three Green Globes, which is roughly equivalent to a LEED silver certification. As part of this initiative the university is in the process of completing energy, waste, and water audits in order to assess future retrofit and cost-saving opportunities.

### ***Transportation***

Alternative modes of transportation are encouraged throughout the master plan (CU, “Carleton University Campus Master Plan”). Future developments on campus will attempt to enhance access for alternative modes of transportation and balance these demands with the automobile. There is also an effort to limit the visible presence of parking spaces by tearing down legacy parking structures in favour of recreational and educational spaces. Parking will instead be diverted underground. However, the plan intends to increase the amount of parking on campus by 18.4% or 918 spaces. Despite the prioritizing of other modes of transportation and an attempt to move parking ‘out of sight’, the increase in parking spaces will almost certainly be met with an increase in automobiles and traffic. Kenworthy supports this argument when he states that, “traffic does not behave like a ‘liquid’ and maintain a constant ‘volume’ but, rather, behaves more like a ‘gas’ that expands and contracts to fill the space provided for it” (81). Therefore, if Carleton is serious about deemphasizing automobiles, parking spaces must necessarily be decreased.

### ***Academics, Research, and Student Engagement***

CU’s Engineering Department and School of Public Policy have collaborated in the creation of a new interdisciplinary program entitled, Sustainable Energy Engineering and Policy. This program, which commences in September 2010, intends to bridge both engineering and policy fields in the hopes of providing students with a foundation in the policy, research, and design of sustainable energy (CU, “Sustainable Energy”). The program focuses on bringing students from both policy and engineering backgrounds together in the hopes of creating understanding and collaboration.

### ***Dealing with Growth***

Carleton’s 2009 Master Plan implicitly addresses growth by planning and designing a more compact campus. This vision entails the destruction of buildings with inefficient footprints, the removal of sprawling parking lots, and an emphasis on vertical construction. New buildings are expected to

use space more wisely by decreasing their footprints and increasing vertical space. Existing buildings may have vertical additions constructed in order to increase the effectiveness of their land use.

The master plan does not explicitly mention growth or the challenges it poses for the campus and surrounding regions. The strategic vision does point out the need to conduct a study to monitor the capacity for growth (CU, “Carleton University Campus Master Plan”). However, this is stated in the context of increasing the student population. It would seem that a comprehensive treatment of growth-related issues is lacking from Carleton’s plans. This oversight is an issue that needs to be rectified if CU is to maintain a commitment to sustainable development.

### **Reporting**

At this stage, CU has not introduced any formal internal reporting systems. In contrast, Carleton has self-reported their sustainability efforts as part of The Sustainable Endowment’s Institute reporting system. They were given a grade of B- in 2010, a vast improvement over a D- in 2009. However, much of this improvement was related to making more information available about the university’s existing sustainability initiatives rather than the implementation of new projects. This raises serious questions about the validity of the report card assessment system. Unfortunately, verifying these results is impossible as no other comprehensive standardized reporting systems have released information about Canadian universities.

### **Regional Perspective**

CU has not engaged in any regional initiatives thus far. For the most part, campus sustainability projects have been concerned with the university’s ecological impact and achieving cost-savings. However, there has been an attempt to link some sustainability targets with municipal targets.

## **DISCUSSION AND CONCLUSION**

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As these case studies demonstrate, Canadian universities are in the throes of change. They are attempting to meet the challenge of sustainability by adopting new modes of thinking and integrating social and environmental considerations into decision-making processes. All three case studies indicate that universities are striving to adopt the triple bottom-line in areas previously dominated by economics. At the same time, the old paradigm of ‘all growth is good growth’ is influencing objectives and causing rapid development through an expansion in full-time enrolment. Although higher education institutions appear to be serious about sustainability, their ultimate goals seem to be at odds. Universities are struggling to become sustainability leaders; they are trying to create holistic sustainability strategies informed by community engagement and integrated into all aspects of campus life. They

are also aiming to rapidly increase their student, staff, and faculty population. Balancing these competing forces is a monumental challenge requiring tremendous resources. Success will inevitably require a comprehensive, coordinated, and integrated approach as well as significant innovation, collaboration, and community involvement. Simply put, universities are not at this stage yet. Currently, these institutions are grappling with the development of a holistic sustainability approach and the horizontal organization it entails. Higher education institutions must recognize that sustainability is not just an accounting exercise, it is a true paradigm shift. Some Canadian universities have begun to initiate this shift with significant progress, while others do not yet have the capacity to balance diametrically opposed objectives. Where progress has been achieved, government and industry could learn from university efforts. The following section will discuss key lessons related to institutionalizing sustainability, barriers to achieving progress, and conclude with recommendations.

### **Key Lessons**

The most essential lesson for decision-makers is that sustainability decisions are often wise business decisions. Case studies suggest that economic efficiency is a key part of sustainability. Efforts at universities demonstrate that environmental and social considerations do not have to be at odds with financial considerations. For instance, UBC's ECOTrek project, U of C's co-generation project, and CU's waste diversion program have all reaped substantial cost-savings as well as environmental benefits. In this era of fiscal prudence, additional efficiencies merit a thorough investigation.

The case studies illustrate that municipalities can benefit from adopting and advocating for sustainable development principles. Encouraging residents, businesses, and institutions to reduce waste, water, and energy can reap rewards for both the actor and the city. Smart land use can optimize economic efficiency as well as social and environmental benefits. Sustainable transportation plans can reduce congestion and take pressure off of municipal infrastructure. In effect, the triple bottom-line framework and sustainability in general create win-win situations for all parties through smart planning and development. However, integrating this framework into decision-making processes is a significant challenge which requires a commitment from leaders within government and industry.

The case studies indicate that incremental change is all that is possible until high level administration become involved in championing the issue. Findings reveal that early sustainability efforts at universities were often initiated by ad-hoc groups of community members. These groups achieved incremental progress but lacked the comprehensive vision required to move towards campus-wide sustainability. They often managed to raise the level of awareness about sustainability on campus and alter specific practices,

however only after the President, Chancellor, or Vice-Presidents became involved did real institutional change begin. This is an important lesson for policymakers in all institutional settings. Ad-hoc community groups are valuable but they do not have the resources to implement institutional paradigm shifts.

Another key lesson for policymakers is that an engagement with sustainability does not end after the visioning process is complete. Even after strategic visions have been developed and integrated into decision-making processes, a body must be created to oversee the future evolution of sustainability goals as well as the coordination and implementation of initiatives. Universities that achieved the most success hired staff early on to direct and oversee the development, institutionalization, and implementation of sustainability policies. A sustainability office with a broad mandate and real authority is of central importance for creating lasting change and attaining results.

The understanding that sustainability is a process not an ultimate goal is also necessary. Unfortunately, some may have the impression that once a sustainability strategy is complete and a few initiatives have been implemented that the work is done. Sustainability is an iterative process and strategic visions must constantly be updated to incorporate new information and preferences. As stated earlier, sustainability is about considering the future of a community and making the necessary decisions to achieve a long-term vision. A thorough and adaptive vision is a necessary part of sustainability planning. However, even the best plans are often met with significant challenges and barriers.

### **Barriers**

One of the main barriers preventing further progress towards sustainability is rapid growth. The situation at CU and U of C illustrate that universities are expected to grow substantially over the next decade. According to Statistics Canada, demand for higher education is growing and will likely lead to increased full-time enrolment at most universities (Education, training and learning). The case studies suggest that universities are struggling to balance this growth with sustainability considerations. This raises a number of critical questions. Will universities abandon their sustainability goals in favour of the economic incentives they receive for raising full-time enrolment? How can universities truly create sustainable communities while faced with massive growth in student, staff, and faculty populations? If sustainability goals are maintained, how will the research, development, demonstration, practice, and pedagogy of sustainability be affected by a constantly growing campus? With constant growth comes a constant demand for new buildings, resources, and services. This situation mirrors that of many cities in Canada and abroad. Universities and cities

have attempted to address these demands through compact and mixed-use development, conservation and efficiency programs, as well as sustainable transportation plans. It is unclear if these efforts will address growth and allow for harmony between the built and natural environment. This challenge is ubiquitous and is certainly one of the most critical issues faced by humanity.

A lack of funds brought about by an era of fiscal restraint may act as a barrier to sustainability. Attaining funding for large sustainability projects can be difficult under any circumstance. Even when projects are expected to result in cost-savings, short-term budgetary demands often prevent investment in large scale capital projects. A case study of universities in British Columbia concurs with this finding, indicating that funding challenges are one of the largest barriers to sustainability objectives (Owens and Moore). This barrier is likely to become an even greater hindrance for sustainability as governments tighten purse strings and cut special projects. Universities and cities may forgo opportunities to become more sustainable in fear of impending funding cuts. As a result, large scale sustainability initiatives (e.g. investment in alternative energies, green buildings, co-generation projects, etc.) may grind to halt.

Other barriers uncovered by this study include organizational issues which prevent a multidisciplinary and coordinated approach to sustainability, path dependency and an entrenchment in the status quo, and a lack of involvement by the community. These barriers are present at universities in addition to public, private, and civil institutions. The case studies suggest that some of these barriers can be overcome by innovative planning and sufficient resources. However, many are situational factors and a 'one size fits all' approach cannot be applied. There are no easy solutions to meeting the challenges presented by sustainability efforts and communities will often have to learn by doing. Even so, some best practices exist to inform the development of sustainability policy and planning.

### ***Conclusion and Recommendations***

In answer to this paper's original question, these case studies illustrate that Canadian universities are indeed taking sustainability seriously. They have institutionalized sustainability principles into their decision-making processes and have incorporated a comprehensive conceptualization of sustainability into planning, operations, research, and academics. Overall, university plans have been ambitious and sufficiently visionary to address this issue. Actions and progress have been admirable, but efforts will need to be redoubled if challenges are to be overcome. The most innovative approach envisioned by universities is the creation of a municipal-scale 'living laboratory'. This vision, and the substantial initiatives it encompasses, has the potential to raise the bar for the pursuit of sustainability. This vision entails the creation of an "overarching 'office of planning and sustainability'

that could bring the academic curriculum together with groundskeeping, the physicist with the philosopher, the imaginative planning with operational practicality” (Owens and Moore). Merging sustainability education and research with campus operations is the future of campus sustainability and may help to inform sustainability programs across society. These efforts may produce the necessary momentum to realize an intellectual revolution in the public, private, and civil sector. A revolution brought about by an influx of new ideas and the knowledge that sustainability goals are achievable.

### **Recommendations**

The following recommendations are based upon the case study findings as well as the literature and document review conducted as part of this analysis. Recommendations are meant as general guidelines for institutionalizing sustainability and should not be considered complete.

- Sustainability should be championed at the highest levels. Successfully institutionalizing sustainability requires the authority and resources only available at the top levels of government and industry.
- Think big. Sustainable solutions to complex issues call for innovation and visionary thinking. Sustainability is a process and not an end-result.
- Progress hinges on comprehensive, coordinated, and integrated sustainability efforts. This approach requires staff, resources, and authority.
- Community engagement, awareness, and education are essential to the long-term success of sustainability efforts. Whenever possible, bring representatives from the community onboard and encourage ‘buy in’.
- Capitalize on partnerships and collaborations both locally and globally. Encourage the sharing of knowledge and the cross-pollination of ideas.
- The benefits of working towards sustainability are not isolated to the local level. Adopt a regional perspective and attempt to link initiatives to regional goals and targets.
- Advocate for the decoupling of growth from wealth. Lobby for the reversal of perverse incentives that support the dominant paradigm of ‘all growth is good growth’.
- Sustainability efforts should be linked with education, career development, and research. Wherever possible, encourage learning and the continuous influx of new ideas.

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# Getting Ottawa on Track: An Analysis of Two Light-Rail Proposals

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*Alex Carr*

THIS POLICY RESEARCH PAPER WILL ANALYZE LIGHT-RAIL transit in Ottawa and more specifically whether two proposed light-rail transportation (LRT) projects could successfully address the city's need for faster, safer, more reliable mass transit. As the nation's capital, Ottawa's setting is unique and demands particular attention. Like other major cities, Ottawa struggles with public transportation, road congestion, urban planning, and is gradually coming to grips with the need for greenhouse gas reductions in the face of climate change. Currently, Ottawa is a world leader in bus rapid transit (BRT), and besides a small foray into rail technology with the O-Train, the city relies exclusively on its buses. However, in light of future population and employment growth and the limitations of bus transportation, the City of Ottawa must develop an alternate transit plan to address these growing needs. After a lengthy civic debate, there is a widespread belief that light-rail technology is the best solution. The dialogue has now progressed to the location, size, scope, and other such details of an LRT system. This paper will begin with a brief overview of Ottawa's contextual setting and carefully define the specific public transit dilemma facing the city. After establishing a set of parameters for a successful Ottawa LRT system, both proposed LRT projects will be systematically evaluated based on these criteria. With this evaluation in mind, final thoughts on each plan will be laid out in order to identify whether these projects would suit Ottawa's needs. To close, several related municipal policies will be briefly discussed to ensure that Ottawa's transportation system fits well with broader city goals.

## **OTTAWA'S SETTING**

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Public transportation in Ottawa presents a unique challenge to policy makers because of several important contextual elements. First and foremost is the city's physical size, population dispersion, and employment geography. Since amalgamation in 2001, Ottawa's population and area have increased dramatically. The City of Ottawa's population forecast calls for 30% population growth by 2031, 68% of which will occur outside the 'greenbelt' (City of Ottawa, *Beyond Ottawa 2020* 5). The rapid expansion of Ottawa's suburban communities has put particular strain on public transportation. East-west travel is by far the dominant traffic flow in Ottawa (City of Ottawa, *Beyond Ottawa 2020* 9). Although most citizens commute using the automobile, Ottawa's relatively small downtown core has already reached capacity in terms of accommodating buses. Another key factor

in Ottawa's geography is its proximity to the City of Gatineau. Separated by a provincial boundary and the Ottawa River, these municipalities are connected by several bridges that have become major thoroughfares for automobile, commercial, and public transit traffic. Regional transit is a mounting concern. Changes to the current system are necessary given the looming crisis in transportation, a city-wide goal to increase usage of public transit, and serious environmental concerns.

While Ottawa and OC Transpo may be a world leader in BRT, due to the dedicated 'Transitway' network, other components have become financially, environmentally, and operationally unsustainable. Buses consume vast quantities of increasingly costly diesel fuel and require constant maintenance. Furthermore, there are important quality of life and operational concerns, such as safety and air pollution. There is also peak hour bus congestion in the downtown core that can make rush hour commuting an aggravating experience. Faced with similar problems, many other cities around the world have pursued light-rail as a viable solution.

Public transit policy in Ottawa, however, occurs in a noteworthy historical and governance context. Recently, the City of Ottawa has experienced several major setbacks in terms of light-rail policy. The fallout from the 2006 municipal election saw the cancellation of the proposed North-South light-rail project. In renegeing on the project, city council was overturning 55 prior votes, and the decision cost taxpayers \$1.6 million in legal fees, \$800,000 for experts, and \$36.7 million to settle with a lawsuit from Siemens, the company who had won the bid to build and maintain the project. These expenses were on top of the \$73 million dollars already incurred through land acquisitions, engineering, and planning (Hilton & Stoney). Furthermore, the controversial decision resulted in division and tension in city council. This highlights a larger issue in Ottawa municipal politics, where agreement on city-wide issues like transit is difficult to secure given the huge divergence between rural, suburban and inner-city interests. The lack of cohesion among city wards, combined with the inter-play with other important players like the National Capital Commission (NCC), the City of Gatineau, and both levels of higher government, make for a tricky governance context. As Stoney, Hilton & Krawchenko explain:

While its traditional governance structure is typical of many mid-large size cities in Canada, Ottawa also faces a number of specific challenges in respect of regional governance. The National Capital Region encompasses an area that includes two provinces (Ontario and Quebec) and two cities (Ottawa and Gatineau). The federal government has some role in planning and infrastructure investments, adding further to the jurisdictional fragmentation of the metro-region (7).

## PARAMETERS FOR SUCCESSFUL LRT

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There are seven broad criteria upon which light-rail proposals in Ottawa should be evaluated. These parameters have been compiled based on a review of relevant literature, including urban planning and transportation literature, official City of Ottawa documents, and professional experience in the transit planning field. While not exhaustive or mutually exclusive, the parameters outline the most important aspects of a successful LRT system. This predominantly qualitative exercise is more useful than quantitative methods such as cost-benefit analysis, given that technique's difficulty with measuring key outcomes such as improved transit times, quality of life benefits, aesthetics, environmental effects, and urban vibrancy (Wachs 143).

### **1. Financial Cost**

Financial concerns are a key factor in a successful light-rail project. This parameter includes construction, operational, and maintenance costs, utilizing existing infrastructure, the securing of financial aid from federal and provincial governments, as well as disruption during construction of the project. Skyrocketing expected costs can doom a project from the outset by jeopardizing financing, as well as by negatively affecting public perception of the project.

### **2. Increase Transit Ridership and Mobility**

Any future LRT project in Ottawa must improve the current transit system and plan for future growth. The key factors for this parameter are improved East-West travel, increased system efficiency (particularly downtown), and ability to accommodate 2031 ridership numbers predicted by the City of Ottawa.

### **3. Enhance Economic and Environmental Vitality**

The key factors in this parameter are increased efficiency and productivity, improved access to employment, recreation, and commercial locations, 'smart growth' stimulation, connection to redevelopment lands, and reduction in congestion, air, and noise pollution (Lane 281). Higher density, mixed use development, combined with replacing buses with light-rail vehicles will help Ottawa achieve its stated goals of reducing greenhouse gases and improving the environment.

### **4. Encourage Inter-Modal Transportation**

Integration of other forms of transportation is a key factor in the success of LRT systems (Pucher 223). Ottawa's project must be designed for smooth transition between bus and LRT, address the need for Park and Ride facilities, and encourage sustainable modes of transportation such as cycling and walking.

### **5. Address Ottawa's Regional Transit Needs**

Due to Ottawa's geographically spread-out population and close interconnectivity with surrounding communities, it is important that any LRT system improve transit within the entire National Capital Region. The key factors in this parameter are improving cross-bridge transit between Ottawa and Gatineau, and transit between the inner city and outlying communities such as Kanata, Barrhaven and Orleans.

### **6. Passenger Requirements**

Perhaps the most important factor for a successful LRT system is meeting passengers' specific needs. Key variables are speed, reliability, safety, user cost, convenience, stop amenities, aesthetics, and accessibility for the disabled and elderly. Meeting these requirements is crucial to ensuring ridership.

### **7. Address Tourism**

Finally, in light of Ottawa's unique position as the nation's capital and the importance of our tourism sector, any new LRT project should specifically address tourism by connecting key landmarks, museums, events, and neighborhoods. As witnessed in other capital cities around the world, particularly in Europe, an efficient light-rail system can exponentially increase a city's tourism appeal.

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## **CITY OF OTTAWA LRT AND DOWNTOWN OTTAWA TRANSIT TUNNEL**

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### ***Project Overview***

The City of Ottawa is currently pursuing a new LRT project that runs from Tunney's Pasture in the West to Blair Station in the East. The venture is the first phase of a city-wide public transportation strategy that will last until 2029. The second and third phases would extend light-rail to Riverside South and Baseline Station with an extension of the Transitway to the suburbs of Orléans, Kanata, Stittsville, and Barrhaven. The scope of this analysis is limited to the first phase of the LRT plan. With the exception of a 3.2 km tunnel under downtown, the LRT will run exclusively along existing Transitway, which will be converted from a bus way to rail corridor. Because the City of Ottawa LRT is still in the planning and design stage, many aspects of the plan have yet to be determined. As a result, evaluation of the project using the seven broad parameters involves careful research and inferences based on available information.

## **Evaluation**

### **1. Financial Cost**

Construction costs for the City of Ottawa’s LRT is becoming a major stumbling block. Recently, anticipated costs were revised upwards from \$1.4 billion to \$2.1 billion (Dare, “Watson worried by rising cost of LRT plan”). This is primarily due to the 3.2 km Downtown Ottawa Transit Tunnel (DOTT), which will require an estimated \$743 million (Greenberg & Dare). Tunneling is notoriously expensive and risky and can wreak havoc with overall budgets. The Province of Ontario, which is expected to contribute one third of total expenses, and several mayoral and city council candidates, have already expressed concern over rising costs for Ottawa’s LRT. There are examples, however, of successful and on-budget transit tunnel construction projects, notably Seattle’s 2.1 km downtown bus tunnel, which cost \$450 million (Black 153). Despite this, the rest of the LRT project is relatively inexpensive because it utilizes the existing Transitway corridor between Tunney’s Pasture and Blair station. Besides the cost of converting the bus way to a rail corridor—which mainly involves track-laying and installation of an overhead, single-wire electrified catenary (City of Ottawa, *LRT Technology Forum* 24)—modifications to existing transit stations will be required to accommodate LRT. Taking advantage of existing infrastructure keeps construction costs down and is environmentally efficient.

The new LRT is supposed to save \$100 million in operational costs by 2019 (“Downtown Ottawa Transit Tunnel”). In terms of maintenance, this particular project has unique expenses because of the tunnel. The DOTT will entail costs in terms of tunnel upkeep and other such outlay associated with underground transit. Furthermore, there are significant operational costs for an underground system resulting from elevator and escalator service, and the heating, lighting, and ventilation of platform areas.

### **2. Increase Transit Ridership and Mobility**

The City of Ottawa LRT follows an East-West alignment, by far the most prominent flow of commuters, and is expected to improve efficiency significantly. According to the City of Ottawa, travel times will be reduced by 15 to 30 minutes depending on where you begin your trip (“Downtown Ottawa Transit Tunnel”). There are concerns, however, that because of the depth of the tunnel, travel-time savings will be diminished downtown because of the time spent reaching deep underground station platforms. Nevertheless, Transitway passengers will benefit from this system. Unfortunately, because the LRT only reaches Tunney’s Pasture, western residents will experience less improvement. The LRT project has been designed to accommodate 2031 ridership numbers. This was the driving force behind the DOTT, as it was decided that above ground transit would not be operationally feasible

given expected ridership increases and the amount of congestion already experienced downtown during peak hours.

### **3. Enhance Economic and Environmental Vitality**

As mentioned, public transit ventures can have positive impacts on a city's economy and environment. Given the increased system efficiency, Ottawa's LRT project will have a positive impact on the movement of workers, shoppers, and event-goers. While the project does not connect directly to certain areas, such as downtown Gatineau, Lansdowne Park, or anywhere South of Hurdman station, it does reach key employment districts along Ottawa's BRT system, including Tunney's Pasture, downtown Ottawa, St-Laurent Boulevard., and Blair Road. The alignment also reaches major institutional and commercial destinations, such as the University of Ottawa, the Rideau Centre, the government conference centre, and the National Arts Center. This LRT project also encourages 'smart growth' by making inner city living more attractive, and thus potentially increasing intensification and mixed-use development. LRT systems provide real incentives for businesses to locate themselves downtown (Hass-Klau and Crampton 252). Similarly, this light-rail system passes through sites of major revitalization at Bayview Yards and Lebreton Flats. 'Transit-oriented development' is expected to occur in several other locations along LRT system, in particular the areas around Lees, Hurdman, Cyrville, and Blair stations (City of Ottawa, *Downtown Ottawa Transit Tunnel* 50). The Rideau Centre LRT station will connect to the future convention centre. Furthermore, the system's construction will provide a veritable economic stimulus—it is expected to generate 16,000 jobs directly and indirectly ("Downtown Ottawa Transit Tunnel"). In terms of direct environmental benefits, the City of Ottawa's LRT system will reduce congestion downtown by removing thousands of buses from Albert and Slater Street every day. It could also decrease congestion across the city if system-wide transit ridership increases. The elimination of buses will also reduce noise and air pollution, diesel fuel consumption, and other resources involved in the operation and maintenance of bus transit. There are, however, two important environmental downsides to the proposal. First, the construction of the DOTT will be energy and carbon-intensive. Second, as is the case for any LRT, train operation will require significant amounts of electricity, which has its own environmental footprint. Nevertheless, according to the City of Ottawa, once in operation the LRT will entail a net greenhouse gas emissions reduction of 27 million tonnes per year ("Downtown Ottawa Transit Tunnel").

### **4. Encourage Inter-Modal Transportation**

The proposed City of Ottawa LRT project is designed to minimize conflicts between buses and light-rail and provide an easy transition between

the two modes of transit. Furthermore, at Bayview station, where the O-Train meets the Transitway, city staff have recommended a 'direct to downtown' alignment that would see seamless transition into the East-West corridor. While the station configuration details have yet to be decided, it appears that the proposed system will have adequate intermodal configurations at the two major transfer stations: Hurdman and Blair. As part of the City's long-term transit strategy, OC Transpo has committed to building several new park and rides in suburban communities, to further encourage transit use. As for encouragement of sustainable modes of transportation such as cycling and walking, the DOTT will remove buses from the downtown core, decreasing intermodal conflicts. It seems likely, however, that once buses are removed from the surface, there will be an increase in automobile traffic downtown. Additionally, the City of Ottawa's transit committee has decided to pursue low-floor LRT vehicles that would be amenable to carrying bicycles (Cockburn).

### **5. Address Ottawa's Regional Transit Needs**

While the City of Ottawa's LRT does facilitate travel from the suburbs, especially from Orleans and Cumberland, where Blair station provides nearby entry into the LRT system, it does not address the crucial need for improved regional transit between Ottawa and Gatineau. Even with the new LRT, La Société de Transport de l'Outaouais (STO) buses would still clog up the downtown core. This project also ignores the Rapibus, STO's own Transitway, when considering the route design of the LRT. Ottawa is merely the biggest player in the larger National Capital Region, and interprovincial transit suffers from congestion and lack of planning.

### **6. Passenger Requirements**

It is important that the LRT system prioritize the needs of passengers. Certainly with reduced travel times, the City of Ottawa's LRT addresses the issue of speed and efficiency. Furthermore, underground loading areas allow for timelier boarding and alighting. Weather is a significant factor in influencing transit use (Kuby et al. 235), therefore underground stations may encourage ridership given Ottawa's extreme climate. The underground platforms, however, while providing protection from the climate and motorized vehicles, also run the risk of becoming deserted spaces outside of peak hours. Additionally, some passengers might find the underground stations inconvenient because of their depth and the time needed to reach them. Ottawa's severe climate can also inhibit the reliability of the LRT, as ice and snow can result in service disruption along the corridor. In order to mitigate this, the City can look to cities such as Moscow and Calgary for solutions. Regarding stop amenities, the City plans to integrate the downtown tunnel stations with surrounding offices, institutions, and

commercial locations. This process, however, requires collaboration with businesses and investments on their part. Finally, the mobility concerns of the elderly and disabled will be addressed by low-floor LRT vehicles, which will provide easier boarding and alighting. OC Transpo, however, already experiences daily problems with elevator service in Transitway stations (“Live Transit Updates: Elevators”). In the DOTT stations, elderly and disabled passengers must rely exclusively on elevator and escalators. Problems may arise given the tendency of these services to break down or become soiled.

### **7. Address Tourism**

The City of Ottawa LRT, while connecting people to major tourist destinations along the Transitway such as the National Arts Center, Rideau Centre, ByWard Market, Train Station, and Parliament, fails to reach several key locations on the Quebec side and other Ottawa south locations such as Lansdowne Park. The East-West LRT is primarily a commuter corridor. While it will bring about economic development in many ways, it does not significantly improve Ottawa’s tourism appeal.

## **TRANSIT OTTAWA OUTAOUAIS LRT**

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### ***Project Overview***

The Transit Ottawa Outaouais (TOO) LRT tackles transit in Ottawa differently. This system has been proposed by Professor Rob Hilton of Carleton University’s School of Public Policy and Administration. Details of the project come from discussions with Professor Hilton. This proposal acknowledges the close economic, social, and physical ties between the City of Ottawa and the City of Gatineau, and addresses the need for a more sustainable and efficient regional system. Every day, thousands of people and goods cross the numerous bridges between Gatineau and Ottawa, but interprovincial transit suffers from congestion and lack of planning. The TOO LRT is a regional LRT that would see the existing O-Train line extended into a transit loop connecting Ottawa and Gatineau via the Alexandra and Prince of Wales bridges. More importantly the TOO LRT does not preclude the construction of an East-West LRT system—in fact it would complement an East-West project well—but is rather aimed at addressing inter-city transit.

The TOO project involves constructing a tunnel under the Rideau Canal using the ‘cut and cover’ technique, which is relatively inexpensive when compared with the boring method planned for the DOTT. The LRT would travel under the Rideau Canal until it reaches the locks at the Ottawa River. At this point the alignment proceeds through a bored tunnel under NCC land, arriving at grade near the National Art Gallery. The LRT would then cross the Ottawa River via the Alexandria Bridge, which was initially designed to carry trains, and enter the City of Gatineau. The route continues

northwest along Boulevard des Allumetières until it reaches Autoroute 50, at which point the LRT would link into an existing rail corridor that runs southwest through Gatineau. Traveling along this corridor, the LRT would then cross the Ottawa River via the Prince of Wales train bridge and connect with the existing O-Train corridor at Bayview station. The TOO LRT could also eventually be extended south to the Ottawa International Airport via the existing O-Train and C.P. rail corridor.

### **Governance Overview**

Before evaluating the TOO LRT project, a detailed look at its governance framework is required. The TOO proposal addresses the need for a regional transit strategy and cooperation among all levels of government. Specifically, it involves the creation of a distinct regional transit authority, a public company or a public-private partnership (PPP). Regional transit authorities are not uncommon in Canada. In 1998, Vancouver created Translink, a regional authority to oversee all forms of transportation (“About Translink”), and recently in Toronto, GO Transit merged with Metrolinx to create a regional entity. These authorities are responsible for planning, financing, and managing transit across entire regions, and this type of framework produces economic and practical efficiency.

Currently, there is a widespread belief that interprovincial transit suffers from a lack of coordination between OC Transpo and Gatineau’s STO. Politically and jurisdictionally, however, a regional authority or the other two options are only possible if both respective Provincial governments assume a leading role in negotiating with the other levels of government and the NCC. Legally and practically, the Provinces are solely capable of creating a regional transit authority. Both Vancouver’s and Toronto’s experience demonstrates this. Provincial leadership is also vital, because local politics and squabbles over finances and jurisdictions within both municipalities present a significant barrier to forming a cohesive policy such as a regional LRT. It is highly likely that municipal officials on both sides of the border would be reluctant to pursue this proposal and relinquish responsibilities without significant pressure from the provincial and federal governments. On the other hand, the need for creating a regional body overseeing interprovincial transit is a key finding of the ‘Interprovincial Transit Strategy’ (PACE Public Affairs & Community Engagement 13), an organization established by the City of Ottawa, the City of Gatineau, and the NCC.

### **Evaluation**

#### **1. Financial Cost**

The TOO LRT’s construction costs are relatively small given its effectiveness at linking Ottawa and Gatineau. There are a few significant

investments, however. Trenching the Rideau Canal and constructing the LRT tunnel underneath will no doubt be the most expensive aspect of the project. The prefabricated sections and cut-and-cover tunneling technique, however, will be remarkably inexpensive compared with the DOTT boring method. Additionally, this construction will provide an excellent opportunity to finally rehabilitate the Rideau Canal infrastructure, which would eliminate the need for annual repairs carried out in piecemeal fashion. The short tunnel linking the Canal to the National Art Gallery will be another significant outlay, although it travels through NCC property, facilitating land acquisition. As the Alexandra Bridge was built for rail, the only significant costs will be creating a single lane of rail traffic. On the Gatineau side, capital costs will be minimal. The middle of Boulevard des Allumetières will be converted to accommodate the LRT and intermodal bus connection. Once it reaches Autoroute 50, the LRT will use an existing rail corridor that will require upgrading to accommodate light-rail. The Prince of Wales train bridge requires rehabilitation, but it is already owned by the City of Ottawa. The TOO LRT's use of existing infrastructure, in the way of rail bridges, corridors, and Canal route, makes it more economically and environmentally efficient. This project will also require construction of many new transit stations and will put additional pressure on the existing rail yards at Walkley Road, which currently services the O-Train.

The operational and maintenance costs for the TOO LRT will be similar to that of the City of Ottawa's system, although the underground stations along the Rideau Canal will have lower operational costs because of their proximity to the surface.

Given the inherent intergovernmental nature of the project, provincial and federal government financing is promising. The TOO LRT could follow the lead of Vancouver's 'Canada line'—a joint venture between the federal government, the Province of B.C., various municipalities, the airport authority, Translink, and a private construction firm—that saw rail linking Vancouver's downtown with the airport. Another benefit of this project is that it minimizes disruption during construction, given that the bulk of work will be occurring under the Rideau Canal.

## **2. Increase Transit Ridership & Mobility**

While the TOO LRT does not improve East-West travel across Ottawa, it does facilitate passenger travel in many other ways. Commuters traveling from the East and West of Ottawa heading towards Gatineau will benefit dramatically from the TOO system. Every morning 60,000 commuters travel across the bridges linking the two cities (City of Ottawa, *Beyond Ottawa 2020* 9). Furthermore, linking Gatineau and Ottawa with light-rail will remove STO and OC Transpo buses from bridge congestion and reduce traffic in both city's downtown cores, particularly on Rideau Street, Wellington Street,

and King Edward Avenue in Ottawa. Outside of peak hours, the TOO LRT may initially suffer from relatively low ridership. Economic renewal in the downtown cores, however, will lead to exponentially higher demand along the system.

### **3. Enhance Economic and Environmental Vitality**

The TOO proposal will link the downtown cores of both Ottawa and Gatineau and stimulate economic growth in both cities. Improved interprovincial transit and decreased cross-bridge congestion will facilitate the movement of people and goods. The TOO project reaches significant areas of employment, recreation, and commercial activity including government offices in downtown Gatineau, St. Joseph Boulevard., the Museum of Civilization, Université de Québec, Carleton University, Lansdowne Park, Ottawa University, the Rideau Center, the Byward Market, and the National Gallery. The project would promote intensification in the inner city, as called for by the City of Ottawa Official Plan. The TOO proposal's alignment also connects both cities to areas of significant redevelopment, most notably Lebreton Flats, Bayview Yards, Lansdowne Park, and future redevelopment in downtown Gatineau, particularly along the Canal near Rue Montcalm. Both Ottawa and Gatineau are targeting increased density in these areas and the TOO LRT is poised to further accelerate this urban renewal process. This system also passes through Ottawa's Golden Triangle neighborhood, another area poised for higher density and mixed-use development in the long-term. Further south, Lansdowne Park provides a good example of how the TOO could enhance Ottawa's economy. If implemented, it would solve the transit dilemma presented by large-scale events at Lansdowne. Event-goers from all over the National Capital Regional, including Gatineau, could reach the facility quickly and cheaply, avoiding traffic congestion and parking. Increased connectivity will enhance the economic vibrancy of both cities. Improved transit times, system efficiency, and convenience will encourage more Ottawa and Gatineau residents to use mass transit. Reduction in automobile use, bus traffic, and greenhouse gas emissions will benefit Ottawa's environment.

### **4. Encourage Inter-Modal Transportation**

The TOO LRT concentrates on linking the downtown cores of Ottawa and Gatineau, and provides an efficient loop system that other modes of transit can link into. It encourages intermodal transportation in several ways. The wide Boulevard des Allumetières will function as a transfer point between STO buses and the LRT, removing STO busses from downtown Ottawa. Similarly, transfer stations at Bayview and Rideau Centre would provide transfer points to the existing OC Transpo bus system (or an East-West LRT). The TOO LRT would also stimulate demand for park and ride service

from Quebec residents living in outlying communities, as well as residents in Ottawa’s growing Riverside South area. It is also likely that the TOO LRT would encourage cycling and walking. Given a low floor vehicle, passengers could bring their bicycle on the LRT and alight in Quebec near the southern entrance of Gatineau Park, a popular hiking, cycling, and skiing destination. The TOO LRT also connects to the many NCC pathways. Finally, the TOO LRT stations along the Rideau Canal tunnel allow for passage under the canal for walkers, cyclists, and skaters, linking neighborhoods and eliminating the need to build more pedestrian bridges, such as the Corkstown footbridge.

### **5. Address Ottawa’s Regional Transit Needs**

The TOO LRT addresses regional transit between Ottawa and Gatineau specifically. It would dramatically improve interprovincial transit and alleviate congestion. While it does little to improve transit from Ottawa’s eastern and western communities, it would benefit suburban residents—in Orleans for example—who work in Gatineau. Additionally, the TOO LRT facilitates transit from areas south of downtown Ottawa.

### **6. Passenger Requirements**

The TOO LRT provides a relatively fast route through Gatineau’s downtown into Ottawa. One concern is that the alignment skirts some of Gatineau’s central employment areas. Depending on their exact location, some commuters might have to walk five to ten minutes to reach the LRT. Nevertheless, during peak hours it would still draw high ridership. This system entails similar safety, aesthetic, and accessibility factors as the City of Ottawa’s LRT with several exceptions. The TOO LRT must navigate across mixed traffic in several locations, most notably as it approaches the Alexandra Bridge near the National Gallery and along Boulevard des Allumetières. This will need to be carefully choreographed in order to ensure safety. Stations along the TOO LRT tunnel section will be closer to the surface and more accessible than stations in the DOTT. Also, the reliability of the TOO LRT during winter will benefit from over one third of the route traveling underground, protected from snow and ice.

### **7. Address Tourism**

The TOO LRT reaches many of the NCR’s important tourist destinations. First and foremost, this proposal improves transit along the historic Rideau Canal. Station entrances to the tunnel system will be set back so as not to interfere with sightlines and the Canal’s UNESCO heritage status. The LRT also passes by museums and attractions, including Lansdowne Park, the Museum of Civilization, the National Arts Centre, the National Art Gallery, and Parliament. The proposal would also see light-rail reach a host of commercial districts, including the ByWard market, parts of downtown Hull,

Elgin Street, Bank Street, and Rideau Centre. Finally, if the TOO LRT were extended to the airport, Ottawa would become only the second Canadian city after Vancouver to link their airport to the downtown core by light-rail.

## FINAL THOUGHTS ON EACH PROPOSAL

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This paper has evaluated the City of Ottawa's LRT project, which would dramatically improve key East-West travel across the city. While the project meets many of the criteria for a successful light-rail system, there are serious concerns surrounding the construction of the Downtown Ottawa Transit Tunnel. Before embarking on such a costly venture, the City may want to rethink the DOTT and pursue a surface option downtown. The City of Ottawa rejected a surface option because of operational concerns—the biggest issue being decreased reliability and speed due to intermodal conflicts—and physical constraints downtown arising from the long platform lengths required to accommodate forecasted peak-hour ridership (McCormick Rankin Corporation 39). There are, however, creative solutions that would overcome these barriers. One possible solution would be transforming Albert and Slater Streets into transit-only corridors with two lanes for public transit, wide sidewalks, and dedicated cycling lanes. Not only would this save millions of dollars, but the construction of this promenade would also result in more vigorous downtown revitalization. Analyses of other LRT systems around the world suggest that economic spin-offs are higher when light-rail is located above ground (Hass-Klau & Crampton 255). This type of urban planning is directly in line with adopted City of Ottawa policies, as it prioritizes public transit, walking, and cycling, and fosters a livelier urban core.

The TOO LRT acknowledges Ottawa and Gatineau's shared future. It ameliorates interprovincial transit, fosters economic development between and within Ottawa and Gatineau's downtown cores, and compliments an East-West commuter system. The Interprovincial Transit Strategy's Consultation Report details the main problems facing transit between Ottawa and Gatineau. Remarkably, the TOO LRT speaks directly to the key findings regarding governance, user experience, operations, and planning (PACE Public Affairs & Community Engagement 9), and proposes a creative and effective solution. The proposal meets much of the evaluation criteria and would no doubt dramatically improve the NCR's transit situation, especially if implemented in tandem with an East-West LRT. The major difficulty in implementing the TOO LRT will be the tricky political negotiations involved in establishing a regional transit authority. Despite the findings of the Interprovincial Transit Strategy, local actors may be reluctant, and successful negotiations would depend on the leadership at the Provincial level and the NCC. Conflicts with Parks Canada over the Rideau Canal's UNESCO World

Heritage designation are also likely. The TOO LRT project's 'trenching and tunneling' of the Canal might face strong opposition.

## CONCLUSION

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No matter which light-rail transit policy the City of Ottawa pursues, there are four crucial policy matters to consider. First, investments in LRT must be complimented with targeted urban planning policy. This entails the promotion of transit-oriented development, intensification, and curbing urban sprawl. Second, once the city has invested in an effective LRT system, it must consider serious action to diminish automobile usage. The benefits of automobile reduction are far-ranging and well-documented (Thynell). Specific policies range from the vague 'disincentives' stipulated in municipal policy (City of Ottawa, *Beyond Ottawa 2020* 22), to more concrete schemes of parking reduction or congestion-charging. Cost-benefit analysis of such policies has proven their merit in Western Europe (Eliasson 43). Third, a key aspect to ensuring a successful LRT system is a strategic marketing policy. European transit systems have successfully increased ridership through a number of creative campaigns, including exhortation through advertisements, outreach to institutions, simplified fare structures, and even transit sweepstakes (Pucher 221). Finally, officials must be diligent in the planning and presentation of the LRT system. Learning from the mistakes of Ottawa's failed North-South LRT, politicians should avoid the pitfall of 'mono-issue' presentation, which is antagonistic and results in opposition (De Bruijn and Veeneman 355). Instead, officials must frame the LRT from a 'multi-issue' approach, portraying the project as a way of tackling various urban problems, be it congestion, economic development, environmental decay, tourism, or prestige. This practice builds consensus and unites. Including citizens and stakeholders in a meaningful way throughout the process will also accomplish this and legitimize the final outcome.

Given expected population growth in the National Capital Region, and the need to foster sustainable development in the context of climate change, an effective light-rail system is key to Ottawa's future. As Canada's fourth largest city, the site of federal Parliament, an important destination for tourism, and a growing urban center, Ottawa's new LRT system must stand out as a shining example of successful public policy.

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# Mandating Green: Why Canada is Lagging Behind Europe in the Widespread Application of Sustainable Building Technology.

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*Tessa Jackson*

## INTRODUCTION

IN RECENT DECADES, GREEN OR SUSTAINABLE BUILDINGS HAVE gained popularity globally. Despite huge progress in the past 15 years in Canadian green building practices and technology, Western European architects, engineers and builders are still far ahead in the widespread use of innovative sustainable technologies and techniques (Yudelson XIX). This analysis focuses on sustainable building practices related to energy efficiency as I attempt to discover why the Europeans have embraced sustainable design more quickly and extensively than Canadians. My analysis suggests that Canada is lagging behind because, unlike Europe, it does not require builders to construct energy efficient homes. I argue that the adoption of greener building practices in Europe is the result of stricter building codes and standards, which in turn have been influenced by higher energy prices, and differing attitudes towards building construction, the environment and energy use. The regulatory environment including building codes, have acted as a barrier to the widespread use of innovative sustainable technologies in Canada, while in Europe they have been used to promote green building practices. The broad scope of this study means it is impossible to conduct an in-depth analysis of each of the variables that affect acceptance and use of green building techniques. However, it has identified opportunities for further research into the key variables that affect Canadian policy decisions.

Through a comparative case study, I examine barriers to the use of green building practices in Canada and analyze factors that may have contributed to the more widespread use of such practices in Europe. I chose to compare Europe and Canada because despite their similar histories of industrialization, green buildings are much more prevalent in Europe than in Canada. To examine Western Europe, I focused on European Union (EU) regulation and legislation, as it represents a Europe-wide standard. Where EU examples were unavailable or not specific, I looked to examples from EU member states. I often refer to the German example because it is considered a world leader in energy efficient housing. Wherever possible I used Canadian data; however, in some cases I relied on North American data for information on the Canadian context.

To begin, I discuss the importance of building design to the creation of sustainable communities, define elements of green design, and review methods to improve a buildings' energy efficiency. Then, I compare common certification programs for sustainable buildings, and I provide an overview of the state of green building in the EU and Canada. Moving on to the central arguments of the paper, I discuss the climatic, economic, cultural and political factors that could explain Europe's successful shift to green buildings, and Canada's relative shortfall. Finally, I compare the regulatory environments in Canada and the EU, and analyze barriers that have prohibited Canada's building codes from developing stronger minimum standards.

## **BACKGROUND**

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The definition of green building can be difficult to pinpoint; organizations and certification bodies use a diverse range of definitions, and focus on different aspects of sustainable design. A broad framework defining sustainable design emerged from the 1992 United Nations Earth Summit's Agenda 21, which made twelve recommendations focusing on improved standards for buildings, materials, and energy efficiency. The Agenda recommends the use of clean technologies, local materials, indigenous building supplies and traditional building techniques, and advocates increased education, training, and awareness of these techniques in the building sector. This framework forms the foundation for many sustainable design guidelines and green building practices (Bunz, Henze, and Tiller 33). Despite this paper's focus on sustainable building practices related to energy efficiency, it is important to recognize that this is only one aspect of green design.

In its fourth assessment report, the Intergovernmental Panel on Climate Change found that buildings represent the greatest opportunity for considerable reductions in greenhouse gas emissions with net economic benefits. The report contends that there is the potential to cost-effectively reduce 29% of global projected baseline emissions by 2020 solely through improvements in the building sector (Mez et al.1). Encouraging green building practices and energy efficient homes will improve the sustainability of Canadian communities (Kenworthy 71, 75; Stoney and Hilton 53, 54).

Buildings can be made more energy efficient through upgrades to their thermal envelope, lighting and climate control systems. Improvements to the thermal envelope to limit the transfer of heat between the interior and exterior of the building can be achieved through improvements in wall insulation and upgrading doors and windows. Substantial energy savings can be achieved by exploiting daylight more effectively, using energy efficient lights and sensors to turn off unused lights, and installing more efficient

heating and cooling (Ries, Jenkins, and Wise 4). The following section discusses two green building rating systems used to encourage reductions in household energy use.

**Green Building Rating Systems:**

Globally, there are more than 100 different rating systems used to measure green construction practices (Fosket and Mamo 9). This paper examines two of the most influential rating systems: the Leadership in Energy and Environmental Design (LEED), and the Building and Research Establishment’s Environmental Assessment Method (BREEAM).

The most successful and widespread certification system in North America is LEED. LEED’s strength is that it mandates performance over process (Kubba xxiii, xxiv). As of June 2009, there were 159 LEED certified projects in Canada (Kibert 55; Chilboyko 54). LEED is a third party certification program that uses a market-based approach, based on the assumption that certified buildings will have a higher resale value (“What is LEED?”). The LEED system promotes a holistic approach to sustainability and awards points in five categories of human and environmental health: sustainable site development, water efficiency, energy efficiency, materials selection, and indoor environmental quality. Buildings can earn one of four different levels of certification based on the total points obtained (certified, silver, gold or platinum) (Fosket and Mamo 8; “What is LEED?”).

The Building and Research Establishment developed its environmental assessment method (BRE Global) in 1988 (Kibert 83). It was the first rating system to be widely adopted, and it currently has “over 110,000 buildings certified and over half a million registered for certification” (BRE Global). Similar to LEED, BREEAM is a voluntary evaluation program that uses a market based certification approach to encourage sustainable building practices. However, it uses UK Building Regulations as a benchmark to rate the level of performance improvement (Roderick et al. 1168). BREEAM assesses a building’s performance based on the following areas: “management, energy use, health and well being, pollution, transport, land use, ecology, materials and water” (Bunz, Henze, and Tiller 37). Licensed BREEAM assessors evaluate the buildings and award credits in performance areas that meet or exceed good practice, and weight them to consider each issue’s importance in the overall environmental impact of the building. The overall score determines the building’s performance rating as pass, good, very good or excellent (Bunz, Henze, and Tiller 37).

Eszter Gulacsy, a sustainability consultant from MTT/Sustain, a London based energy and sustainability consultancy, believes that “LEED is simpler in its approach, while BREEAM is more academic and more rigorous” (“BREEAM or LEED”). U.S. standards and practices impact LEED, while European and UK legislation influence BREEAM (“BREEAM or LEED”).

Credits are also calculated differently. LEED requires buildings improve energy efficiency savings by 15-60 % over a base case, while BREEAM mandates maximum energy usage targets of about 70 kWh/ m<sup>2</sup> per year. Since LEED's credits are measured in savings linked to the US dollar, ratings could fluctuate with the exchange rate. Both of these differences make BREEAM more adaptable and easier to export to different regions of the world (Bunz, Henze, and Tiller 40).

### ***The State of Green Building in Western Europe***

European architects and engineers are pushing the envelope to find new solutions to sustainability. In a 2007 article, New York Times architecture critic Nicolai Ouroussoff declared, "after more than a decade of tightening guidelines, Europe has made green architecture an everyday reality." Matthias Sauerbruch is architect and the director of Sauerbruch Hutton, a Berlin design firm that is known for its use of sustainable design. He suggests that green technologies, such as green roofs and solar panels, while novel in Canada, are the norm for many Europeans (Ouroussoff). For example, Germany was the world's top photovoltaic installer in 2006, with over a half of all new solar panels located in Germany (Harris).

In its 2005 Green Paper on Energy Efficiency, the European Commission (EC) identified the building sector as an area in which huge improvements in energy efficiency were possible. The Green Paper argued that the building sector is responsible for over 40% of total energy demands in Europe. To take advantage of potential energy savings in buildings and homes, in 2005 the EU established the voluntary GreenBuilding Programme. Its purpose was to create awareness about potential cost-effective energy efficient changes to non-residential buildings, and provide information and support for companies who wish to improve the energy efficiency of their buildings ("The GreenBuilding Programme").

Green building concepts such as the super low energy Passive House have gained traction in Europe. Since the early 1990s, more than 17,000 passive houses have been built in Europe. These homes must meet rigorous standards requiring annual energy consumption for heating and cooling to be less than 15 kWh/m<sup>2</sup> per year. That is 90% less energy than a typical Canadian home uses (Armstrong; Jochem 105; "Information on Passive Houses").

Passive Houses achieve a comfortable interior climate without a furnace or separate heating and cooling device. They minimize the loss of heat and maximize heat gains. Passive Houses use high performance windows, tight construction, super-insulation, and a high-throughput ventilation system that keeps indoor air fresh without the need for re-heating or re-cooling. Sunlight, heat from appliances, and people keep these houses warm on all but the coldest days. Shading, insulation and the ventilation

system keep out hot air in the summer (Jochem 105, 106; Kroppe and Goricanec 24, 25).

The passive house approach and materials are gaining a place in standard building procedures in Europe. Recent (2009) estimates suggest that by 2015 there will be 260,000 passive house projects (including new homes, apartments and retrofits) in the 10 European countries that are actively promoting passive house projects (Austria, Belgium, Croatia, Czech Republic, Germany, Romania, Slovakia, Slovenia, Sweden, United Kingdom) (Lang 6,7). The 2008 European Parliament resolution, "Action Plan for Energy Efficiency" called on the Commission to propose "a binding requirement that all new buildings needing to be heated and/or cooled be constructed to passive house or equivalent non-residential standards from 2011 onwards." Many consider the passive house to be the most energy efficient building standard that is economically viable (Kroppe and Goricanec 25), and its prevalence in Europe is indicative of their commitment to green building.

### ***The State of Green Building in Canada***

In Canada, the green building movement has been spearheaded by efforts to certify and label buildings that use innovative sustainable technologies. According to a Council of Energy Ministers Report, from 2002 to 2006 there were four times as many high efficiency new homes certified in Canada (Government of Canada, *Moving Forward*). Between 1990 and 2004 Canada's energy efficiency improved by about 14% (Government of Canada, *Energy Efficiency Trends* 1). Despite these improvements, residential energy use still represents a significant amount of total energy consumption. In Canada, the residential sector accounts for 17% of national energy use. Most of that consumption is used to heat space and water (Cuddihy, Kennedy, and Byer 3, 6).

Programs such as Natural Resources Canada's ecoENERGY Efficiency Initiative promise to encourage more investment in residential energy efficiency. Between 2007 and 2011, the initiative is was to invest more than \$675 million to promote "smarter energy use by Canadians" ("The ecoENERGY Efficiency Initiative"). Of that, \$60 million was to be spent on encouraging the building and retrofitting of more energy-efficient buildings and houses, and \$520 million was available for creating incentives for homeowners, small businesses and organizations to retrofit their homes and buildings ("The ecoENERGY Efficiency Initiative"). Unfortunately, the program's retrofit portion was discontinued in March of 2010, and the initiative will no longer be receiving new applications for retrofit evaluations ("ecoENERGY Retrofit Homes Grant").

The Canadian Green building Council has been influential in promoting green building techniques in Canada. Established in 2003, it imported and

modified the US Green Building Council's model for the Canadian context. The council focuses on encouraging the use of certification programs such as LEED, and its mission is to "lead and accelerate the transformation to high performing, healthy green buildings, homes and communities throughout Canada" ("Our Mission").

Many initiatives to promote green building practices that exist in Europe also exist in Canada. Both use green building certification programs and labelling to promote energy efficient buildings, and support programs and initiatives to encourage more energy efficient building. Yet, despite recognition of the need for greater residential energy efficiency and the development of these promising initiatives, sustainable building techniques and designs are not as widely used in North America as they are in Western Europe. The following section will explore the variables that could have influenced Europeans to more readily accept green building techniques and more completely embrace energy efficient practices in their daily lives.

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## DISCUSSION: POSSIBLE EXPLANATIONS

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### ***Situational Factors, Energy Costs, and Climate***

Situational factors such as energy costs and climate may have influenced Europeans to adopt green building techniques. Energy prices are typically much higher in Europe than Canada. According to Canada's National Energy Board, in 2007, Irish and German consumers paid among the highest prices for energy in the world at about 0.25\$US/kWh and 0.21\$US/kWh respectively. That same year, Canadian households paid approximately 0.075 \$US/kWh for electricity, less than half what the Europeans paid. Of the ten countries with the most expensive household energy prices, all but one were European (Government of Canada, *Industry and Household*).

There are at least two reasons for this difference in price: European governments place more tax on fuel, and there are few sources of oil and gas in the region, requiring them to rely more heavily on imports (Yudelson XXIII; International Energy Agency). These higher energy prices have meant that thrifty Europeans have gravitated towards cost-cutting energy saving building practices. Conversely, energy prices in Canada do not fully reflect social and environmental costs, making energy efficient improvements less attractive and cost effective, and discouraging investment in energy efficient improvements (Ries, Jenkins, and Wise 5). A 2010 report by the Canadian Senate Standing Committee on Energy, the Environment and Natural Resources agreed that raising the price of energy would be an effective way to reduce energy consumption (Government of Canada, *Attention Canada!* 32).

Other market failures represent further barriers to the widespread use of energy efficient technologies. In Canada, the incentive to conserve is lost

because consumers pay the average cost of power instead of the actual cost at the time of use (Government of Canada, *Attention Canada!* 33). During periods of peak production, costs increase exponentially, yet electricity rates remain unchanged. Furthermore, property owners have little incentive to invest in energy efficient projects because their tenants typically reap the payoff of lower energy bills. Conversely, tenants are often unwilling to invest in rental properties (Government of Canada, *Moving Forward* 9). Also, if energy costs are included in monthly rent payments regardless of energy use, there is little incentive for tenants to conserve energy. In Europe, there is the potential for these same market failures; however, their more regulatory approach requires higher minimum standards, resulting in more energy efficient buildings.

Situational factors such as energy prices, and climate, are an important part of the story, but while behaviours, cultural attitudes, and norms are influenced by geography, and the abundance of resources, they do not determine how behaviours, and norms, develop. Many regions of Canada have similar climates to Northern Europe, and both regions focus on heating in the winter. In January, Toronto's average daily high temperature is -1.3 Celsius and their low is -7.9; this is very similar to Oslo's high of -2 and low of -7 for the same month ("Average Conditions, Oslo Norway"; "Toronto's Climate"). Thus, climatic differences should not significantly affect the outcome. Furthermore, the prevalence of green building practices in hot climates such as Australia would seem to refute the hypothesis that only temperate climates support green building practices (Ries, Jenkins, and Wise 5). Examining energy costs, the relative abundance of cheap energy in Canada could influence cultural attitudes towards energy conservation, but it is these attitudes that affect energy use behaviours, not simply the existence of the resource. This variable will be examined in more depth in the following section.

### ***Attitudes, Traditional Building Techniques, Education, and Political Culture***

In Europe, cultural attitudes towards access to natural light, and fluctuations in building temperature vary widely from North American standards. Canadians expect to control the climate in their homes and workplaces. According to a Natural Resources Canada report, in 2005, over 98% of commercial and institutional establishments were at least partially space heated, and 86% of them were at least partially air-conditioned (Government of Canada, *Commercial and Institutional Consumption*). Moreover, from 1990 to 2007 energy use for residential central cooling increased by 195.2% (Government of Canada, *Energy Use Data* 35). Europeans do not have these same attitudes about indoor climate control. People open windows rather than use air conditioners to regulate temperature in the summer (LaFranchi). Attitudes towards access to natural light also

differ. In Germany, the legal right to fresh air requires all workers to be within 5 meters of a window (Yudelson 137). This regulation results in buildings that are well suited to take advantage of energy efficient improvements such as the use of daylight or opening windows to control indoor climate.

Europeans build new houses less frequently than North Americans, and they often build them to higher quality standards. (Yudelson XX). The mentality that new houses should be built to last for future generations is not common in North America, resulting in a much younger housing stock. Fifty-nine percent of all occupied Canadian dwellings were built from 1971 until 2006, and just 13% of all homes were built before 1945 (“Dwelling Condition by Tenure and Period of Construction”). In contrast, over half of England’s homes are over 50 years old and about 20% were built before 1918 (“Table 110”). Construction that prioritizes low costs and quick project completion results in poorly constructed new homes. Alan Mooney, president of Criterium Engineers, a U.S. based consulting- engineering firm “estimates that seriously defective new homes account for 15 percent of all new-home construction, or 150,000 new homes a year... [he doesn’t think] many of these houses will last for 50 years” (McQueen).

In Canada, neither builders nor homeowners have enough information about energy efficient options, and contractors often lack the skills and experience to use green techniques. Traditional building practices are entrenched and conventional building design and procurement processes are difficult to change (Kibert 17). This is a major barrier to the adoption of green technologies in the residential building sector (Ries, Jenkins, and Wise 5). When builders do not have the necessary skills and training to use these new technologies, they are unlikely to suggest them to their clients.

According to Peter Vana, Associate Commissioner of Infrastructure and Planning Services for Strathcona County, Alberta, one of the main challenges to using a sustainable building approach in a recent development project was educating bureaucrats and builders about green building techniques and materials. A lack of awareness of green building practices slowed down the zoning and development approval process. Sam Kubba, Ph.D. and LEED A.P. agree, suggesting that LEED is making inroads into mainstream design and construction, but to become more widespread, green building techniques need to be better understood by contractors and builders. He contends that builders who do not understand green building practices are reluctant to embrace them (Kubba 5). Developers may be aware of energy efficient options, but they may not realize exactly how much energy will be saved, and how cost effective these options can be. Additional education and training for builders about green building techniques can help to foster their more widespread use.

Kubba and others suggest that perhaps the main obstacle preventing a broad based acceptance of sustainable design in Canada is the perception

that the initial outlay of funds will be large compared to the long-term benefits (Kubba 38; Government of Canada, *Attention Canada!* 31). “Too often, consumers, including governments in their own operations, overlook the operating cost reduction that offsets the upfront capital costs associated with making an investment in energy efficiency” (Government of Canada, *Moving Forward* 5). There is also a lack of data on construction costs for green buildings and often builders and homeowners are unaware of how much time it will take to recoup the initial costs. To solve these problems more education is needed about the benefits of green buildings within both the public and the building sector (Kubba 380; Government of Canada, *Attention Canada!* 31).

Political culture in Europe has fostered a much more aggressive regulatory approach to promoting sustainable building practices than exists in Canada. Their reaction to climate change has been faster, and has led to sweeping reforms to lower greenhouse gas emissions to meet Kyoto Protocol targets. For example, the 2002 European Union adopted its Energy Performance of Buildings Directive (EPBD), which requires member states to reduce energy use in buildings to meet the Kyoto Protocol targets. The most stringent changes are occurring in Germany where the government plans to reduce greenhouse gas emissions to 40% below 1990 levels by 2020 (Yudelson XXII). Canada’s current targets, to reduce emissions to 17% below 2005 levels by 2020, are much less aggressive. However, they could change to remain in line with American emissions targets (Government of Canada, *Attention Canada!* 15).

In Europe, it is common to shift the tax burden to activities that pollute, and use the revenue to fund green initiatives (Leibovici). As of 2000, eight European countries had introduced some form of environmental tax reform, and Sweden began taxing emissions of CO<sub>2</sub> and SO<sub>2</sub> as early as 1990. A 2000 study by Benoit Bosquet found that these tax shifts were significantly reducing carbon emissions at the same time as encouraging employment (21, 29). In Canada, 2008 Carbon tax proposal put forward by then Liberal Party leader Stéphane Dion received little public support, and some party members even suggest that it may have cost him the election (Whittington). This shows Canadians’ unwillingness to engage in reduction efforts that will require a change in lifestyle.

Differences in political structure and funding for municipalities could also be partly to blame for Europe’s greater use of sustainable building practices. Jonathan Westside, a managing partner and CEO of Windmill Development Group has been involved in several LEED certified projects across Canada, including the award winning Dockside Green urban redevelopment in Victoria B.C. Westside reports that Sweden’s lack of provincial level government empowers municipalities and gives them access to tax incentives and better funding to support green development.

More municipal funding enables cities to pursue environmental initiatives. Councillor Karen Leibovici of the City of Edmonton indicated that Europe sees municipalities as the key agents to meet Kyoto targets and provides them with the tools and funding that they need, while in Canada that is not the case.

Cultural differences, traditional attitudes, building practices and the resulting differences in political culture and structure have made it easier for green building techniques to take hold in Europe. Higher quality standards for building construction in Europe means that Europeans have greater tolerance for higher upfront costs if they lead to long-term payoffs. These attitudes make the switch to higher quality building techniques more marketable in Europe. In Canada, the lack of trained building professionals familiar with green building practices is a barrier to their increased acceptance and contributes to their limited popularity. The prevalence of green buildings in Europe has meant that builders and contractors are knowledgeable about the techniques, and comfortable with their use. Differences in political culture and the political will to tackle environmental problems are a product of the public's attitude towards these issues. In Europe, the electorate has demanded action on climate change, and this has translated into action from their politicians, while in Canada this has not occurred. As discussed in the following section, regulatory changes have been particularly influential in encouraging the widespread application of building codes that mandate energy efficiency, but these changes are not possible without the political will to support and implement them.

### ***Regulation and Building Codes***

Building regulations set the minimum guidelines for construction in a country. Historically, governments developed them to protect citizen's health, safety, welfare and private property (Eisenberg and Yost 9, 10). Throughout the twentieth century, building codes in the West were predominantly prescriptive; setting the minimum standards for building and specifying which materials and techniques the contractor should use to meet the requirements (Gann, Wang, and Hawkins 281). Prescriptive building codes and zoning regulations can constrain innovative design and green building practices (Slone 46; Eisenberg and Yost 8, 9). To remedy this, there has been a shift towards performance based building codes, which do not tell contractors exactly how to comply, but specify the final regulatory goal and leave open how it is achieved (Eisenberg and Yost 10). Studies show that regulations involving performance-based standards have the potential to stimulate the innovation of green building techniques (Gann, Wang, and Hawkins 281).

### **European Regulation and Building Codes**

The EU's Eurocodes are a set of common standards and building approaches for civil engineering and construction projects that member states must implement. They are designed to bring existing national standards in line with one another, and as of January 25, 2010, 83% of the Eurocodes had been published as national standards. Full compliance is expected by 2011 ("Progress of national implementation of the Eurocodes"). Despite the current limited range of the Eurocodes, initiatives exist to expand their scope to encourage the integration of sustainable design and energy efficient technologies in standard construction across Europe (Bundesamt 12). The Eurocodes focus primarily on technical specifications and the safety of buildings, and the 2002 European Energy Performance of Buildings Directive (EPBD) focuses on energy efficiency.

The EPBD outlines basic requirements for energy efficiency in buildings, and its performance-based targets leave the details of implementation up to the EU member states (Lausten 40). Two of the Directive's goals are to reduce emissions, decrease dependency on external energy sources, and help fulfill Europe's commitments under the Kyoto Protocol, and the Green Paper on security of supply ("Energy efficiency: energy performance of buildings"). The directive requires states to enhance their building regulations, introduce energy certification schemes for buildings, regularly inspect buildings' heating and cooling systems, and rate the energy efficiency of all new or existing homes before sale (Maldonado). Compliance rates are high, and as of January 2009, 22 of the 27 EU member states had adopted the EPBD into their national legislation (Ries, Jenkins, and Wise 8). The EPBD has had a profound influence on the spread of green buildings in Europe. According to Robert H. Donkers, Counsellor for Environmental Affairs at the European Commission Delegation in Washington D.C., the EPBD is the most important of many legislative initiatives that have influenced the spread of green buildings in Europe (quoted in Strohmer).

Germany and Sweden are leaders in the use of regulation to encourage green building. The German *Energieeinsparverordnung für Gebäude 2009*, abbreviated to *EnEV 2009*, ('Energy Savings Regulations for Buildings'), sets the standards for thermal retention which must be achieved in new building design and construction. The *EnEV 2009* is one of the most stringent performance based codes in the world; it sets standards for insulation, windows, building envelope, heating, ventilation, and air conditioning, and for the first time prescribes the use of renewable energy ("Explained"). The German government has developed these building standards to meet its emission reduction targets; however, they are careful to make sure new housing construction remains economically viable. New codes are developed in consideration of the construction sector's current and future capabilities, so that the most energy efficient buildings can be constructed at

reasonable costs (Galvin 3). Since the 1970s, Sweden has instituted energy efficiency requirements for new buildings. Adapted over time, they are still among the highest energy efficiency requirements in the world. The Swedish building code is based on energy performance, and is comparable with the standards for passive houses (Lausten 40, 61).

The Eurocodes and the EPBD have been successful at standardizing energy efficiency requirements across Europe. By 2009, most member states had green building certification schemes in place and were working to create benchmark criteria for various building types (Maldonado 4, 7). The performance based nature of the EPBD means that national level requirements vary; making comparison of national requirements across jurisdictions difficult, a problem the EU is working to remedy (Maldonado 19). Germany and Sweden have used legislation and building codes to encourage the use of green technology and energy efficient practices, and this has been successful in encouraging the widespread use of green building practices.

### **Canadian Building Codes**

In Canada, the National Research Council (NRC) develops a national model code, which the provinces interpret, modify to suit local conditions, and make into law (“Building Codes”). Two model codes developed jointly by the NRC and the provinces deal with energy efficiency. The Model National Building Code sets out the standards for building, which the provinces interpret, modify, and make into law (“Building Codes”). Currently, it does not address energy conservation, but four provincial building codes that are based on the Model National Codes contain guidelines for energy efficiency (Chown). The Model National Energy Codes for Buildings and Houses contains minimum requirements for energy efficiency (“2005 National Model Construction Codes”).

Provincial consensus in adopting the model national codes can be a barrier to introducing stricter countrywide guidelines. Canada’s constitution gives the provinces jurisdiction over construction, they decide whether to adopt or adapt the model codes; therefore, their support for the codes is necessary effective codes (Canadian Commission on Building and Fire Codes). To foster acceptance, the provinces are partners in writing the national model codes, and approval from all provinces is needed to introduce changes (Gibbon).

In 2005, Canada’s model building code was changed from a prescriptive-based code to an objective-based code. The objective code allows for more flexibility, as builders can follow either the prescriptive “acceptable solutions” described by the code or alternative solutions that are evaluated to ensure they perform at least as well as the acceptable solutions (National Research Council, *Seminar*). According to the NRC’s Anne

Gibbon, one of the reasons for this change was to remove barriers to the use of innovative design. However, in practice it can be prohibitively expensive for builders to obtain the approval required to use alternative designs. Gibbon maintains that, in general, houses tend not to follow objective based codes because of the extra costs: “If you build beyond the code, you will need approval, and may need to hire an architect or engineer to get it.” This is a barrier for the use of innovative design for smaller developers focused on inexpensive homes. Conversely, once a design is approved it can be used repeatedly, making it less costly for larger developers. Gibbon suggests that the market for higher-end homes that use green building techniques is big enough to support the additional cost of approval.

Interestingly, Gibbon contends that the reason for the prescriptive focus in the residential building code is that “the building code needs to allow low cost housing. Costs are definitely an element that is looked at when designing codes... they must allow for inexpensive home construction.” This attitude suggests a narrow definition of costs, focusing on the initial cost of the energy efficient technologies, rather than considering the savings for homeowners over the life of the home.

An updated version of the 1997 National Energy Codes is expected to be released by 2012. Many considered the 1997 energy codes to be a failure because they were never fully adopted by any Canadian jurisdiction (Gibbon). These codes became obsolete almost as soon as they were published because they were based on energy costs not energy consumption. These economic based targets meant that differing levels of insulation would be mandated depending on the source of power. For example, where coal is used to generate electricity, houses would be required to be more energy efficient than where hydro electricity is used (National Research Council, *Model*). The Council of Energy Ministers (CEM) indicates that if all provinces adopt the updated code, it would result in significant energy and pollution savings and support improvements in energy efficiency (Government of Canada, *Moving Forward* 18, 19).

British Columbia (BC) is an example of a jurisdiction that is taking the initiative and encouraging green building through building codes and regulation. BC’s 2007 Energy Plan demonstrates how effective combinations of policy tools including building code minimum performance standards can promote energy efficiency. The Province has led by example, and improved energy efficiency in BC’s own operations. It has also organized outreach activities to shift attitudes and influence consumer behaviour (Government of Canada, *Moving Forward* 12). As a result of the 2007 Energy Plan, as of 2009 there were new green provisions implemented under the B.C. Building Code and new standards set under the Energy Efficiency Act. The government has committed to developing new building standards for 2010 and 2011, and they are pursuing policies requiring buildings and houses to

carry labels indicating their energy efficiency at the time of transfer or sale (British Columbia Provincial Government).

In Canada, building codes and regulations remain largely prescriptive. Despite changes to the code to allow objective-based “acceptable solutions” it remains much easier and less expensive for contractors to follow the prescriptive options. Future Model National Building Codes may include energy efficiency requirements in their prescriptive option, but this has not happened to date. Furthermore, the provinces’ lack of enthusiasm for the 1997 Model National Energy Codes suggests that many provinces are unwilling to include energy efficiency requirements in their building codes and regulation. Despite this, four jurisdictions in Canada have included energy efficiency requirements into their building codes, and this has increased the energy efficiency of new homes in these jurisdictions.

## CONCLUSIONS

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This paper provided an overview of the important issues and variables that have affected the widespread application of green building techniques in Western Europe that has not occurred in Canada. Europe, and especially Germany, has used a regulatory approach that seems to have more effectively promoted the use of green building techniques. The European example shows how building codes have the potential to increase the widespread use of green building techniques in Canada. Anne Gibbon, secretary to the Canadian Commission on Building and Fire Codes, suggested that the National Research Council was considering including energy efficiency guidelines in their model codes. However, the model code system makes it difficult to implement a stringent Canada-wide energy code without the support of all provinces (Canadian Commission on Building and Fire Codes). Despite these procedural and jurisdictional difficulties, if Canada wants to change the status quo and catch up to Europe in the widespread use of green building techniques it should adopt building codes with stricter energy efficiency guidelines.

Cultural differences such as traditional building practices, expectations about housing stock quality and longevity help to explain Europeans’ greater willingness to implement regulations that mandate green building practices. Additionally, perceptions of economic risks do not appear to have hampered decisive action on environmental issues in Europe to the extent that they have in Canada. Many European countries have instituted a carbon tax, while Canadians perceived a similar tax shift as too politically and economically risky (Whittington).

This analysis suggests that more education is needed of both the public, so that they can demand higher quality construction that utilizes energy efficient technologies, and the building sector, so that they are aware

of these options. To foster greater awareness of green building practices, education and training programs in Canada must incorporate sustainable building practices into their curriculum. Furthermore, opportunities for retraining should be offered to already accredited trades people to keep their skills up to date with new techniques. For the widespread use of green building practices to eventually become a reality in Canada, attitudes must shift so that energy efficiency is recognized as an investment with huge payoffs in terms of both the environment and individual monthly expenses.

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# The Coyote Dilemma: A Policy Discussion of Human-Coyote Conflicts and Conflict Management in Ontario

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Over the last decade, coyotes have earned prominent status in news feeds across Canada. In Ontario in particular: they have been implicated in at least one attack on a human (Jackson); farmers have lost livestock (Kenny); and sightings of these animals in suburban areas have increased (“Coyotes wander Ottawa streets”). Ontarians are justifiably concerned and they are calling upon the government to act. Coyotes are “abundant” in Ontario (Environmental Commissioner’s Office (ECO) 203) and, as such, some institutions are promoting coyote culls as an intuitively obvious solution to this human-wildlife conflict (“Ottawa coyote hunting”; Halpin; Crosby).

Unfortunately, this issue is not as simple as it appears at face value. Those favouring unselective lethal methods to deal with coyotes have fallen into the cognitive trap discussed by Rittel & Webber; they have assumed that the problem is a technical issue for which a single, comprehensive remedy can be defined. In reality, human-coyote conflict is a social issue, as much as it is an issue of science. Social and physical factors must be addressed. Any response is more likely to achieve temporary resolution than it is to present a permanent solution. An integrated, adaptive strategy must be implemented (Wilson and Clark).

Although human-coyote conflicts occur across Canada, this paper focuses on conflicts and management in Ontario. Coyote management politics and programs vary from one province to another. One province was chosen as the focus of this paper to enable its circumstances to be discussed in adequate depth, while adhering to the length constraints of this publication. Ontario was selected as the province of interest because it has witnessed recent debates on coyote management.

This paper will address five questions: (1) What factors are contributing to human-coyote conflicts in Ontario? (2) What has been done to address this conflict? (3) Is an integrated, adaptive approach being used? In other words, does the approach being used address both the human and animal causes of the problem? And, does this approach demonstrate qualities that will allow it to evolve and be improved with experience? (4) What improvements can be made to the Province’s current approach? (5) What lessons can be learned from it?

## METHODOLOGY

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The contents of this paper are based on a review of documents and literature about human-wildlife conflict, coyote behaviour and physiology, integrated management, adaptive management, and natural resource management. Media and web sources were consulted to provide information about the current circumstances of coyote management in Ontario. E-mail exchanges with the Ministry of Natural Resources (MNR), the Ministry of Agriculture, Food, and Rural Affairs' (OMAFRA), and the Ontario Sheep Marketing Agency (OSMA) yielded additional information. Any errors or omissions in this text are my own.

## BACKGROUND: HUMAN-COYOTE CONFLICT IN ONTARIO

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Coyotes migrated to Ontario from Western Canada and the United States, in the early 1900s. Their population increased as settlers cleared the land; adopted land use practices amenable to coyotes' survival; and drove coyotes competitors, wolves and bears, to more remote regions. Competing canines also faded in prevalence through interbreeding (Wilson et al. S80 - S81). Ontario's coyotes are technically Eastern Coyotes (*Canis latrans*), Tweed type, a hybrid of Eastern Wolf (*Canis lycaon*), Grey Wolf (*Canis lupus*), and Western Coyote (*Canis latrans*) (Smithers 5; Patterson and Brown 2 - 5).

Hybridization has been an evolutionary advantage. Eastern Coyotes are more adaptive to diverse foods and fragmented landscapes than their wolf cousins. They are also larger than their Western Coyote counterparts, roughly 30 to 45 lbs instead of 25 to 30 lbs, because of their wolf genes (Patterson and Brown 10). This can enable them to take down larger game, if they have the opportunity to do so.

While coyotes have been maligned as carnivores, their diet is more accurately omnivorous, consisting of rodents, fruits, berries, and, on occasion, deer. Coyotes scavenge as well (Bennet and Tiner 154 - 156). Even as they kill, coyotes often provide a valuable ecological service by preventing overpopulation of their prey (e.g., feral cats) (ECO 202). When a predator disappears from an ecosystem, the consequences can be disastrous. For example, as wolves have been pushed to more northern regions of the Province, deer populations have increased to a point that the Government has had to introduce culls of deer in some parks to prevent overgrazing. Coyotes are less effective at hunting large animals like deer so they have been unable to fill the wolves' niche in the food chain (ECO 198 - 199).

Coyotes have earned their reputation in part because the behaviour of individual nuisance coyotes has been unreasonably generalized to the population as a whole. Some coyotes do develop problematic habits. For example they will identify livestock as a food source (Johnston, "Why Coyotes Become Predators") or they will prey on pets. This said, within the

population as a whole, food from anthropogenic sources is only a very small portion of coyotes' diets (Smithers 11). Even coyotes that scavenge livestock carcasses do not necessarily attack living livestock (Eden). Managing coyotes on the assumption that all coyotes engage in nuisance behaviour is analogous to managing crime on the assumption that all people are criminals: it is illogical and likely to generate perverse outcomes.

Coyotes are hunters and scavengers who respond to reinforcement. When they become a nuisance to humans, it is often because people have provided them with inappropriate feedback. For example when coyotes begin to rely heavily on humans for food, it is often because they are being fed, deliberately or otherwise (Smithers 14). Humans selectively breed livestock to suppress speed, aggression, and other traits that make a species difficult to manage. Often these traits are also natural defences so suppressing them invites predation (Bekoff xvii - xx). Some coyotes learn that livestock provide a lot of food energy while requiring less energy to track and kill than wild animals of comparable size (Patterson and Brown 31). Improper disposal of dead livestock can also be a problem (Smithers 12).

[It] functions to artificially inflate coyote populations by providing a source of food and potentially attracts coyotes into closer proximity to agricultural operations. Additionally, the improper disposal of livestock functions to potentially transmit pathogens and parasites to wild populations of animals such as coyotes that feed on dead, infected animals. For example, sheep measles (a very troublesome tapeworm infection) is problematic and rampant in some areas because of illegal livestock disposal (dumping dead, infected animals in the 'back-40' for wildlife to clean up). Coyotes ingest meat from the infected animals, contract the parasite and then spread the parasite back to domestic sheep populations through their feces. It is difficult to say if improper disposal of farm animals actually functions to create 'a taste' for livestock in coyotes, but it is possible. (Smithers, personal communication)

Coyote nuisances in residential communities can also often be traced to human behaviour. For example, in February 2010, a young lady in New Brunswick was attacked by a coyote in her yard. Shortly afterward, it was revealed that her neighbours may have been recently feeding the canine ("Coyotes coming closer"). Residential garbage and compost also become a tempting attractor for coyotes when they are left uncovered or unlocked (Smithers 11). In short, nuisance habits in coyotes often stem from moments of human carelessness.

Whether they are the true culprits or not, coyotes tend to be targeted as a usual suspect when other animals are attacked. In 2007, the City of Ottawa hired trappers to kill coyotes because pets were going missing in the City's south end. One of the hired trappers noted that in actuality any number of animals (e.g., hawks, dogs) were probably partially responsible

for the disappearances (“Ottawa hires trappers”). The scenario played out in Ottawa is common elsewhere as well. In some areas, stray dogs are a more significant threat to livestock than coyotes (Andrews and Boggess 249 - 266). Unfortunately, investigators often have to rely on evidence collected after an attack to determine the animal responsible. It can be difficult to distinguish the signs of a dog attack from those of a coyote attack (Tapscott, “How to Differentiate”). Also, people have an attachment to their dogs and few would suspect them of committing atrocities.

Additionally, there are legal incentives, notably within the *Livestock, Poultry and Honey Bee Protection Act*, that may encourage some people to blame coyotes for attacks committed by dogs. First, the government will not compensate a farmer if their livestock are killed or injured by dogs the farmer owns or keeps on their property on a regular basis, but owners can apply for compensation for coyote attacks (ss. 4(3)). Second, within forty-eight hours of hearing that their dog has killed or injured poultry or livestock, the dog’s owner must have their canine destroyed (ss. 8(1)). Third, in some regions, the dog’s owner may be held financially liable for their animal’s actions (ss. 9(1)). In sum, the law may provide incentive for people to use coyotes as a scapegoat to avoid the repercussions that a dog attack could have for them or for a good neighbour who happens to own an offending animal.

It is a common myth that coyotes are ‘losing their fear of humans’ because they are mating with domestic dogs and, in so doing, producing “coydogs” that have coyotes’ presumed aggressive nature, but a domestic species’ affinity for people. It would be convenient to attribute coyotes’ problem behaviour to their lineage. The challenge of addressing other factors could be avoided. Unfortunately, the coydog hypothesis is likely invalid. True coyotes survive because males and older offspring protect and feed new litters (Patterson and Messier 469; Smithers 9). They also tend to mate in winter so pups are born in the spring when food is abundant (Bennet and Tiner 155 - 156). “[The] ‘coydog’ strain doesn’t persist in the wild because hybrid males lack the instinct to help feed the young. Coydog females also usually mate in late fall and give birth in midwinter, when chances of pup survival are lowest” (Bennet and Tiner 156). Recent genetic tests in Ontario found limited evidence of hybridization (Patterson and Brown 11). Conclusively, some coyotes may have “lost their fear of humans” (Smithers 13), but their habituation to human-altered environments is likely a more important driving factor than their genes. This said, as climate change occurs, winters will be less harsh and it is conceivable that multigenerational hybridization will increase.

Human settlement in Ontario is developing in a way that will increase the potential for human-coyote conflicts. “The number of people in southern Ontario has increased from 8.5 million in 1980 to 12.4 million in 2004” and urban growth is encroaching into wildlife habitat (MNR, “Strategy for

Preventing and Managing Human Wildlife Conflicts” 3). Coyotes have settled park systems, utility corridors, and urban territories like “industrial parks, fenced compounds, [and] shipping yards” (Smithers 6). In short, humans are settling areas that bring them closer to coyotes, while coyotes are settling areas that bring them closer to humans. As their interaction increases, the quantity and quality of conflict that occurs will depend on how humans perceive the interaction.

Human perceptions are evolving in a direction that will likely incite greater adversity to coyotes’ presence. First, the perceived threat posed by wild predators often increases as a result of the media (Gore and Knuth 1408) and the Canadian media seem eager to portray the coyote as a menace. CBC News (“Coyotes Wander Ottawa Streets”; “Ottawa coyote hunting”) has run several stories headed by a photo in which the photographer has startled a coyote. It is snarling and its eyes glow yellow in the light of the flash. The photo is eye catching, but it does nothing to manage public fears. Second, many people are developing an idealized impression of nature (Knezevic 14). Nature is beautiful and so we are drawn to recreate outdoors and to build our homes in nature-like environments. Nature is also imagined as being peaceful and harmonious, so when animals violate this idealistic, unnatural image, many react with revulsion. The author of this paper encountered chat rooms in which contributors favoured a coyote cull because they found a dead “Bambi” while walking on local trails. To succeed in managing human-coyote conflicts, wildlife managers will have to understand and address these values and beliefs.

This is not to detract from the real consequences of human-coyote conflict. Livestock predation is financially damaging to farmers, losing any animal to a predator can be heartbreaking, and no one deserves to live in fear in their community. It is however important to define human-coyote conflicts appropriately, to understand what is occurring and why, so that effective management approaches can be developed.

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## **THEORIES ON HUMAN-COYOTE CONFLICT MANAGEMENT**

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Traditional coyote management strategies can be divided into two categories: lethal and non-lethal. Lethal methods typically include selective or indiscriminate trapping, hunting, and poisoning. Non-lethal methods would include such approaches as sterilization, relocation, or deterrence. Other authors have written extensively on the specifics of these methods (Sterner and Shumake), so their work will not be revisited here.

Over time, managers have come to recognize that human-predator conflicts are best addressed through an integrated, adaptive approach: “integrated” in that human and animal elements of the problem are addressed, multiple stakeholders are involved, and options are developed

through collaboration (Wilson and Clark 139); “adaptive” in that attempts to address the issue are studied like experiments so that over time the significance of different variables can be identified and modifications can be made to the management approach (Argent 11).

## **FINDINGS: COYOTE MANAGEMENT IN ONTARIO**

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Coyote management in Ontario has covered a spectrum of strategies. Early in Canada’s colonial history, predators were regarded as a threat to safety and to economic development. Killing them was applauded. Ontario, Upper Canada at the time, introduced a bounty for wolves in 1792. It was the first province to do so (Canadian Wildlife Service (CWS) and Canadian Wildlife Federation (CWF)). Difficulties in, and lack of concern with, distinguishing between wolves and coyotes resulted in both species being pursued. Other species (e.g., birds) were also unintentionally harmed by traps and poison intended for coyotes (Wynn 255).

Coyotes are still treated as “vermin” in much of Ontario and the Environmental Commissioner believes the provincial government still views them at best as a resource to be exploited (ECO 202). This said, more recent messaging from the Province, including the *Strategy for Preventing and Managing Human Wildlife Conflicts* (MNR), appears to emphasize the need to live with these animals, to collaborate with property owners, and to use lethal methods only when absolutely necessary.

Ontario’s provincial bounty was discontinued in 1973 (Smithers 18), but some financial incentives for coyote hunting in local communities still remain, for example, \$50 bounties in Bruce, Grey, and Huron counties (Halpin), a proposed \$100 bounty in Prince Edward County (McVicar), and prizes in the privately-run “Great Coyote Cull Contest” in Osgoode (Morrison).

The *Fish and Wildlife Conservation Act*, 1997 and its regulations restrict coyote hunting in Ontario. Their main prescriptions are two-fold. First, hunting coyotes is permitted with a license September to March, year round, or not at all, depending on the region of Ontario in question (Government of Ontario, *O. Reg. 670/98* Table 6); however, at any time, a person can kill a coyote, if they believe that their property or safety is threatened (Government of Ontario, *Fish and Wildlife* ss. 31(1)). Second, those paying or receiving compensation for hunting or trapping coyotes must get permission from the MNR to do so (ss. 11(1)).

“Although there is significant variability between years, up to 3,400 coyotes have been trapped and 1,200 hunted annually [in Ontario] in recent years” (ECO 203). However, by and large, hunting and trapping currently have a relatively minor influence on coyote mortality rates. Their primary threats are disease and automobile collisions (ECO 193, 203).

In some instances, relocation has been recommended as a non-lethal method for dealing with nuisance coyotes. This is illegal in Ontario without a special permit (Government of Ontario, *Fish and Wildlife* ss. 40(1)).

Since repealing its bounty, the Province has provided compensation to farmers who lose livestock due to predation (CWS and CWF). This program was established under the *Livestock, Poultry and Honey Bee Protection Act* and accompanying *Ontario Regulation 731*. As outlined in the Act, when livestock or poultry are injured or killed by wolves or coyotes, the owner is required to contact their local municipal valuer, if known, or the clerk of their municipality. The municipality is responsible for arranging that all claims for compensation be investigated by its municipal valuers and that reports for each claim be prepared. Owners of livestock or poultry are expected to attest and provide evidence of any attacks for which they seek compensation. The local municipality will provide compensation to owners for all eligible claims and apply to the Province for reimbursement. In areas without municipal organization, most of which are located in northern Ontario, OMAFRA staff are directly responsible for investigating claims and providing compensation to eligible cases. Compensation payments are based on the amounts awarded by valuers and must be less than or equal to maximum amounts prescribed in provincial regulations (e.g., head of cattle (\$1,000), sheep (\$200), rabbit (\$20 to a maximum of \$1,000 for all rabbits lost by an owner in one year) (Government of Ontario, *Ontario Regulation 731* s. 2)). Payments cannot exceed the “market value” of the animal and they are reduced by any amount compensated for by an owner’s insurance (Government of Ontario, *Livestock, Poultry and Honey Bee* s. 18 - 19).

From 2006-2007 to 2008-2009, the number of livestock and poultry injuries and deaths reported annually for compensation increased from 4563 to 5964. Total compensation paid increased from \$950,775.10 to \$1,292,921.48 (Table 1).

In addition to compensation, the Province provides guidance to prevent and manage conflicts between people and coyotes. *Coyotes in the Community* (MNR), *How to Differentiate Between Coyote and Dog Predation on Sheep* (Tapscott) and *Guidelines for Using Donkeys as Guard Animals with Sheep* (Tapscott) are some notable examples. The MNR and OMAFRA also assist municipalities in developing local management strategies.

**Table 1: Number of Poultry or Livestock Reported Injured or Killed By Coyotes or Wolves**

	FY 2006-2007	FY 2007-2008	FY 2008-2009
Cattle	949	1065	1408
Horse	7	8	11
Goat	91	111	141
Poultry	442	642	882
Sheep	3073	3004	3522
Swine	1	0	0
Total	4563	4830	5964
Total compensation paid (\$)	950,775.10	1,038,510.54	1,292,921.48

**Data Sources: OMAFRA (2010; 2009; 2008)**

**Note: FY = Fiscal year**

## **ANALYSIS AND DISCUSSION: COYOTE MANAGEMENT IN ONTARIO**

Despite the Environmental Commissioner's criticisms, it appears the Government of Ontario has adopted a reasonable approach to coyote management. Notably, Ontario is doing well, by not enacting policies that encourage blanket reductions of coyote populations. Upon hearing of coyotes' nuisance behaviour, many people's first reaction is to believe that killing more coyotes will reduce the frequency of conflicts with humans. Unfortunately, as often occurs in wildlife management, cognitive biases are misleading. Culls and bounties simply do not have a long-term impact on coyote populations (Sabeau; Smithers 18-19) and they do not effectively eliminate nuisance behaviour (Patterson and Anderson 36). The paragraphs that follow help to explain why this is the case.

Hunting coyotes decreases their population density and reduces their competition for food (Bennet and Tiner 154-156). In response, coyotes' behavioural and biological instincts cause their reproduction to increase (Voigt and Berg 349). Remaining coyotes tend to have more pups (Bennet and Tiner 154 - 156) and tend to mate in their first year, rather than their second as is more common (Kennelly 73 - 93). Typical litters range from 3 to 9 pups (Patterson and Brown 24), but where hunting campaigns have been aggressive, litter sizes have been reported as large as 19 pups (Bennet and Tiner 156). In the terminology of natural resource economics, the growth rate of coyote populations is not constant. Instead, it is affected by a non-linear growth function, along which the population can move depending on environmental factors such as food availability, coyote mortality rates, and the coyote population's spatial distribution. Scientists "have found that it

would require removing nearly 70 percent of the [coyote] population every year to achieve sustained population reduction [in Eastern North America]" (Chambers).

Problem coyotes are often in poor health (Gehrt et al. 1045). In contrast, "humans typically hunt large, healthy 'trophy' animals" (ECO 199). Consequently, non-problematic animals tend to be the most likely individuals to be targeted in hunting competitions, culls, and bounty programs. Coyotes are also territorial; indiscriminately removing healthy animals opens their ranges to occupation by nuisance individuals (Smithers 19). Poorly designed or inappropriately placed traps can injure a healthy animal without killing it (Farry et al. 15), thereby turning an unproblematic animal into a potential nuisance. Using bait to deliver chemicals to coyotes requires considerable skill as well. Improper dosages or delivery can have undesired effects or can target unintended species (Farry et al. 14).

Localized bounties may not accomplish much with regard to reducing nuisance behaviour either. As aforementioned, coyotes sometimes take the blame for problems caused by other species; killing coyotes does nothing to stop the other species. As well, approximately 8 to 20 percent of coyotes in Ontario are migrants (Bennet and Tiner 154-156). If these individuals are responsible for the problems that have prompted a local bounty, they may have left the area before a control program is introduced. A study of Chicago's urban coyotes found that in many cases, nuisances not caused by ill or weak coyotes were caused by transient coyotes (Gehrt et al. 1051). Further research would have to be conducted to see if this holds elsewhere.

Ontarians are congregating in urban areas. This is where future human-coyote conflicts are likely to occur. Employing lethal methods in these areas is risky and, thus, in some communities, illegal. Traps can injure people, pets, and other animals, if they are disturbed. For instance, in Casselman, in February 2010, a young woman and her dog were injured when they stumbled upon a series of traps set near a hiking trail. There are suspicions the traps were intended for coyotes (Nease). One of the traps was of an illegal design and all of the traps may have been placed illegally (Lahaie). Previous studies have shown that illegal hunting does not decrease as opportunities for legal hunting are increased (Treves 1350). As well, in rural areas, less abundant animals (e.g., wolves) can be confused with coyotes and harmed as a consequence. More collateral damage will emerge if lethal methods predominate in coyote management.

Many Ontarians probably would not support a blanket cull of coyotes. First, many citizens are concerned about the dangers of hunting. Although Sibley reports on demands for a cull, after a town meeting on human-coyote conflicts near Osgoode, a reader responding to the article said she and others attended the event to oppose increased coyote hunting because they were concerned about the danger that a hunt would pose to their community. The

injury to the woman in Casselman, another rural community near Ottawa, was reported the next day. Second, many people question the ethics of hunting. As fewer citizens witness the killing of animals for food, the population is becoming less tolerant of hunting and trapping (Knezevic 14).

Most importantly, although non-selective culls have been attempted for over 200 years, they have not been effective in bringing coyote populations under control (Smithers 18) or in reducing livestock predation (Treves 1353; Bartel and Brunson 736). Even if these programs did reduce coyote populations, the frequency of human-coyote conflicts correlates poorly with coyotes' abundance in a region (Patterson and Anderson 36).

Relocation is often viewed as a more palatable alternative to hunting. Unfortunately, it is affected by similar problems that make lethal methods ineffective (e.g., increased coyote birth rates) and it adds its own. Relocation can spread disease (Slate et al. 72-73) and may serve no purpose as the coyotes that have learned undesirable behaviour will likely continue to exhibit this behaviour wherever they are located. Rural communities oppose becoming the recipients of nuisance urban coyotes, because of their potential threat to the local community ("Don't dump coyote problem on rural Ontario"). Lastly, coyotes may travel great distances, making it impossible to relocate a nuisance coyote anywhere that he or she will never come into contact with another community (Smithers 20). The Province's decision to restrict the relocation of animals in Ontario is rational and based on a sound understanding of the biology and behaviour of coyotes.

The Province has taken an appropriate adaptive approach adjusting its policies to favour compensation programs. Studies have proven repeatedly that compensation programs are more cost-effective than bounties in mitigating coyote damage to livestock (Patterson and Brown 43). Through the MNR and OMAFRA, the Government has taken appropriate steps in integrated management by attempting to mitigate coyote damage to poultry and livestock through education programs for landowners. There are however areas of coyote management policy and programming in which further integrative and adaptive improvements could be made.

In order to be adaptive, resource managers need to have sufficient monitoring programs in place to understand what impact management strategies are having on the issue they hope to address. In the case of coyote management, substantial literature is available on the topic, however, in-depth information on coyotes, coyote impacts, and coyote management in Ontario is far more sparse. The ECO took issue with the Province being unable to identify an exact figure on coyote populations. While this would be useful information, it may be infeasible to maintain this record. Coyote reproduction and mortality rates fluctuate dramatically from year to year. In the Yukon, for example, a local population increased 600% in 3 years (Patterson and Messier 473). Furthermore, some coyotes are highly mobile

(Bennet and Tiner 154-156). Coordinating counts across regions would be extremely challenging.

The Province would likely benefit more by eliminating factors that contribute more significantly to human-coyote conflicts than does coyote population size. In regions where confrontations have occurred, governments, in collaboration with academics, community associations, and livestock marketing associations, should focus on mapping sites where nuisance behaviour has been observed. This has been proposed in some municipalities (Smithers 21). Another layer to the map could be added identifying sites that could be contributing to problem behaviours. From this data, managers would have an appropriate baseline against which to compare the effectiveness of management programs. Wilson and Clark (137-163) applied a similar approach to reduce human-grizzly bear conflicts in Montana.

The money spent on local bounties, and even some allocations to compensation would likely be more effective if they were spent increasing public awareness, providing incentives, and improving enforcement of legislation to increase coyote deterrents and to remove coyote attractants (e.g., roaming pets, unlocked garbage, carcass dumps). Delaying these interventions could prove costly. In Saskatchewan, the Province has not pursued preventative strategies with sufficient intensity. Unaddressed in the early stages of development, nuisance behaviour has become so prevalent in coyotes there that the Government has reintroduced an indiscriminate bounty, \$20 per coyote to a maximum of \$50,000 annually per applicant, plus whatever money can be earned in selling the coyote pelts (Government of Saskatchewan).

Accurate, comprehensive attribution of the sources of all livestock predation is unlikely. Doug Johnston, a former predation advisor to the Ontario Sheep Marketing Agency, claims “only between 20 and 30 per cent of animals lost [to coyotes] are being compensated for because the remainder of the kills can’t be proven” (Kenny). As well, some farmers are concerned that current payments only cover the meat value of livestock and poultry lost or injured due to predation; they advocate for greater accounting for lost breeding value, for unconfirmed losses (Eden), and for costs borne in seeking compensation (e.g., time spent searching for carcasses) (OSMA 26). The Province may need to revisit the formulas and regulations that currently govern predation compensation payments.

The media in Ontario have been helpful in raising awareness of coyote management as a policy issue. Unfortunately, many of their reports also perpetuate myths about coyotes. More often than not, authors appear interested in generating shock, awe, and sales, through dramatic photos and text. Messages about sound conflict management are being crowded out in favour of stories of attacks, coyote hunts, and the assumed incompetence

of government. For example, after a presentation by the MNR on coyote behaviour and reasonable conflict management, Sibley reported very little on the presentation and instead emphasized demands for the government to just “do something.” Little information was provided on why there are no easy solutions in coyote management. He or his editor also chose the sub-title “Residents call for fix, not biology lesson,” which inaccurately suggests the Province is not interested in addressing this issue and baselessly undermines public trust in government. Roberts reported that the most important things for Torontonians to know about coyotes were as follows: “1. The sightings are too close for comfort. ... 2. They’re here to stay. ... 3. They cannot be caught. ... 4. They may think Fido is a tasty treat. ... 5. They can be dangerous and people should not befriend them. ... 6. They are healthier than before and more noticeable now.” Nathalie Karvonen, an expert from the Toronto Wildlife Centre who was interviewed for the article, responded appropriately on the source’s website:

I spoke with the reporter doing this story at length, twice, yet my comments were still misrepresented. Some of my words were twisted to suggest a different meaning, and some quotes are just wrong ... Although coyotes have the potential to be dangerous, they are typically not dangerous at all. Incidents of coyotes injuring people are extremely, extremely rare. ... It is important to learn about coyotes if you live near them, but I really worry when articles like this appear that only serve to inflame situations and create unnecessary fears.

Agricultural marketing groups tend to favour lethal coyote control in their public messaging, using rates of livestock predation in their supporting arguments. “[Doug] Johnston, a predation expert for the Ontario Sheep Marketing Agency and of the Ontario Cattlemen’s Association ... , says an estimated 6,000 sheep and lambs are killed [by coyotes] on Ontario farms every year” (Kenny). These organizations’ general aim is to advocate for their members’ demands and interests, in the process they circulate information that supports their arguments. It is often difficult to find statistics from other sources to judge the appropriate weight to give to the information they provide.

Non-government sources are a valuable asset in discussions of coyote management (e.g., Johnston, “Why Coyotes Become Predators”; “Preventing Predation”; “Predation”), but governments must also develop sound communication strategies to encourage a broad discussion of human-coyote conflict management. At a basic level, the Province’s websites need to be updated; at present, their websites are largely text-based and are geared toward one-way communication from the Government to the public. While this format is often useful for academics and policy professionals, average citizens demand more of their internet experiences today. In order to remain

relevant and enticing in today's internet environment, the Province's web media need to evolve and embody qualities that many users expect of high-quality internet sources: informative videos, audio clips, and public forums. Without these improvements, these websites will not achieve their full potential as a medium for increasing public knowledge, encouraging public involvement in policy development, and improving policy outcomes. At worst, they risk being discarded as primitive and out-of-date.

As currently drafted, Ontario's public education materials focus primarily on human-coyote conflicts in rural areas. Far less material discusses human-coyote interactions in urbanized areas; this is despite MNR's (2 - 3) admission that many of the confrontations between people and wildlife in future are likely to take place in urban communities. This information gap needs to be filled.

Systematically gathered information on public knowledge of coyotes and their management is limited, but it appears Ontarians' uptake of findings from government and academia on these topics has been incomplete. A survey by the Ontario Sheep Marketing Agency of its members indicates coyotes are a primary predator of concern to livestock owners. Owners are focused on the over-abundance of coyotes as the root cause of losses due to predation and some of the most adamant voices favour greater use of unselective lethal controls as a solution. Unfortunately, there appears to be limited consideration of the negative influences that human behaviours can have on coyote behaviour or of possible measures to remove these influences. This said, many livestock owners have a wealth of experiential knowledge of the costs, benefits, advantages, and disadvantages of different approaches to predation compensation and coyote deterrence that would be valuable to incorporate in future programs. Having lived in different municipalities across Ontario and discussed drafts of this paper with other urbanites, I can attest that average urban Ontarians know little to nothing about coyotes outside of what they see in the news or hear through rumours in the community. Citizens need to be made aware of how to prevent and react to negative encounters with a coyote.

If wildlife issues, including human-coyote conflicts, are to be managed effectively in the future, education, investment, and recruitment for wildlife biology and ecology programs will have to persist. Secondary and post-secondary institutions are currently putting greater emphasis on microbiology in their curricula. This is in part based on a false presumption that Canada has evolved into a post-industrial economy, where macro-biological research is no longer useful. As approaches to wildlife management continue to evolve, specialized social scientists will also need to be involved in research, policy design, and program delivery (Baruch-Mordo et al. 219 - 220).

## CONCLUSIONS AND LESSONS LEARNED

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Overall, it is evident that human-coyote conflict management will likely remain a key issue for Ontario in years to come. Thus far, the Government has performed relatively well, using experiential evidence as justification to redirect resources from lethal methods to a compensation-based approach. This said, although the Ontario Government has adapted over time, current data gathering on coyotes, and their management, is too limited to label the Province's programs as "adaptive" as the term is used by Argent (11).

If the Government intends to continue to manage human-wildlife conflicts, it must provide funding to programs training population biologists, landscape ecologists, behavioural psychologists, and social scientists trained in wildlife management. Furthermore, municipalities, assisted by the province and academia, would benefit from additional mapping and remediation of sites that have the potential to incite problem behaviour in coyotes. Local coyote populations also have to be studied to determine what characteristics could predispose individual animals to problem behaviour (e.g., transience) and to adjust management programs accordingly. The validity of the coy-dog hypothesis will also have to continue to be tested over time.

Lethal interventions should not be ruled out for coping with sick coyotes, or coyotes that appear to have developed incurable, problematic habits, but these programs should be weighed honestly against other options, and tailored to target problem individuals, not the coyote population as a whole. Using lethal methods sparingly is particularly important in urban coyote management.

Integrated management approaches will generally produce better outcomes than those focused solely on coyotes as the source of conflicts with humans. Predation compensation programs are an excellent policy tool, but reforming their accounting methods may be worthwhile. Also, in order for integrated approaches to be effective, developing creative ways to communicate and collaborate with citizens will be important.

Experiences in human-coyote conflict management show that intuitively obvious answers can be horribly misguided and can even generate outcomes polar opposite to intended objectives. Human-coyote conflict management is predominantly a social policy issue. "[Social problems] rely upon elusive political judgment for resolution. (Not "solution." Social problems are never solved. At best they are only re-solved--over and over again.)" (Rittel and Webber 160). Past experiences are quickly forgotten and, as such, governments will have to revise and communicate lessons learned over and over again, if they are to manage this issue well into the future.

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# Sustainable Food Production: Transitioning from Industrial to Local

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*Vicki Fleury, Mike Reddick, and Sumeet Tandon*

THE WORLD'S FOOD SYSTEMS HAVE UNDERGONE DRAMATIC transformation in the past century. These changes are predominantly the result of yield-enhancing breakthroughs of the green revolution, as well as the globalization of food production and distribution. "Green revolution" style agriculture and trade means that our food system has evolved with a heavy dependence on fossil energy for mechanized agriculture, fertilizer and pesticide production, processing, and transportation. Traditional agricultural practices, unable to compete, have largely been abandoned. Globalization, free markets, and the commoditisation of food have had a positive feedback effect on the industrial food system by promoting export-oriented monoculture through the free-trade model of comparative advantage. Fossil energy and agri-inputs have replaced human farm labour, and labour market integration has resulted in the decline of subsistence agriculture. Economies of scale have facilitated the consolidation and privatization of rural lands. Globally, this has resulted in massive population flight from rural to urban areas. In 1800, 3% of the world's population lived in urban areas; today urban populations exceed 50% ("Human Population: Urbanization"). In addition to environmental degradation from agricultural practices, peak oil and climate change imply that industrial agriculture is an unstable platform upon which the world's population teeters.

Agricultural products that support humans have been subject to increasing mobility. From 1961 to 2003, the value of global trade in agricultural, fish, and forestry products rose by 1500% (Food & Agr. Org.). In 2008, nearly one-third of the value of global agricultural output was bound for export. The same year, Canada exported US \$54.48 billion and imported US \$31.24 billion in agricultural products; making Canada the world's 4<sup>th</sup> largest exporter and 6<sup>th</sup> largest importer of agricultural products (WTO 46-49).

Sustainability needs an environmental, social, and economic approach (the three pillars), however governments and industries tend to focus on the economic pillar. Industry, in turn, resists the internalization of environmental and social factors in the cost of their products due to the nature of global competition (Clark 2). While improvement is possible, it is incremental, and often results only in "efficiency improvements". Many believe moving to localized agriculture is necessary to achieve sustainability and to insulate from future energy crises.

This paper will examine the destructive elements of industrial agriculture and the barriers and opportunities to reduce the impact from this sector. We will also investigate the potential of local agriculture, and examine its environmental and social benefits, as well as policies to facilitate its expansion. Special emphasis is given to Canada.

## **PROBLEMS WITH INDUSTRIAL AGRICULTURE**

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### ***Ecosystem Effects***

Though seemingly diverse, problems relating to soil and water quality, irrigation, and pesticide/fertilizer use are in fact interrelated.

Single crop fields are highly pest susceptible, necessitating the use of chemical pesticides. As pests build resistance to these chemicals, pesticide use has increased over time to keep pace. These pesticides then enter the environment where they can decompose, be absorbed into the soil, run-off, or volatilize into the atmosphere to be deposited elsewhere. While the acute toxicities of these pesticides are often known, chronic exposures to low levels, and the cumulative effects of various chemicals, remains uncertain. Many chemical pesticides have toxic, carcinogenic, and endocrine-disrupting properties. Many are also persistent in the environment, and can undergo long-range atmospheric transport by a process known as global distillation. This is the gradual volatilizing of chemicals in warm areas and condensing of chemicals in cool areas, resulting in the accumulation of volatile chemical compounds at the poles of the earth (Simonich and Hites 1851-1854).

In the US, pesticide use has increased 33 fold from 1985 to 2005, but each year a higher percentage of crops are lost due to pests developing resistance to the chemicals (Pfeiffer, 2006 22). Though intended for agricultural pests, these pesticides can have effects on non-target species as well. It was recently discovered that Atrazine, a widely used pesticide, causes the feminization of male frogs allowing them to breed with male frogs, producing all male offspring. This phenomenon was observed at Atrazine levels well within Canada's drinking water standards (CBC News).

Monocultures drain the soil of vital nutrients, which is compensated by the use of readily available, synthetic, non-organic fertilizers. Modern agriculture is highly input-intensive and relies primarily on three key nutrients: nitrogen, phosphorous, and to a lesser extent potassium. While nitrogen can be fixed from the atmosphere, phosphorous only cycles geologically. When the soil becomes devoid of this nutrient, it must be mined elsewhere, shipped, and applied to the land. Global production of phosphorous has peaked, and few high quality reserves remain (Ulrich, Malley, and Voora). Mining and shipping rock phosphorous to agricultural lands around the world requires increasing use of another dwindling resource: oil.

Widespread practices of soil tilling, summer fallowing, and crop waste removal leave the soil barren and exposed to the elements (wind and water), resulting in erosion and a gradual reduction in topsoil. Soil tilling also moves soil from high elevations to lower elevations; specifically, towards areas that are more vulnerable to water erosion. Globally, 75 billion tonnes of topsoil are lost to erosion each year. Farm machinery also compacts the soil, preventing root penetration and water infiltration. In the US, economic losses from soil compaction are estimated to be US \$100 million per year (Mann 106). Degraded soils have poor water and nutrient retention, requiring evermore fertilizer and irrigation. As a result, a positive feedback loop is created (Brown 10). Irrigation increases the salinity of the soil, which can be toxic to plants. To compensate for this, more water is required to flush out the salts, leading to more run-off and contamination (Abrol, Yadav, and Massoud).

Globally, water use for irrigation comprises 66% of total freshwater withdrawals. Sixty percent of this is sourced from surface water, and the remaining 40% from ground water. Only 10% of groundwater withdrawal is replaced, implying that the world is mining its water (Pfeiffer, 2006 16). In Canada, these figures are less alarming. Canada uses only 9% of its water for agriculture; however regions like Western Canada often face water deficits (Nat. Res. Can.).

Water quality is affected by soil erosion, which moves soil and its contaminants (fertilizers, animal wastes, pesticides, and other contaminants) into streams and lakes, affecting wildlife, contaminating human drinking water, and adding silts to infrastructure. Nitrogen and phosphorous that end up in lakes and streams create ideal conditions for potentially toxic algal growth, which deprives the water body of oxygen, creating a dead zone.

In regards to air quality, the ammonia from nitrogen fertilizers and animal wastes (manure and urine) can volatilize, resulting in local air pollution. These emissions are toxic to vegetation, increase eutrophication when they are deposited, and also contribute to acid rain and smog (Lefebvre, Eilers, and Chunn). In Alberta, where there are significant beef production operations, over 70% of anthropogenic ammonia originates from these intensive livestock operations (Morin 27).

### ***Monoculture, Biodiversity, and Our Health***

The growing use and reliance on mechanization for large scale agriculture placed limits on the ability of diverse crops to be planted side-by-side, favouring single-crop fields over intercropping, and reinforcing economies of scale. Monocultures are risk-prone operations. By growing large monocultures of plants or genetically similar animals (via feedlots), pests and disease have the perfect opportunity to proliferate. The continuous planting of a single crop on the same field drains the soil of key nutrients and

planting monocultures require the application of large amounts of pesticides and fertilizers. For example, corn can completely deplete soil in as little as 10 years (Bushell).

In less than a century, we have replaced on-farm diversity with vast monocultures of only a small group of plants. As a result, our modern diets have simplified. Today, 75% of the vegetable oil in our diet comes from soy (20% of our daily caloric intake) and more than 50% of the sweeteners come from corn in the form of high fructose corn syrup (representing 10% of our caloric intake). The change in our diets can be directly related to the business model of agriculture. This model has become a matter of “adding value” to inexpensive raw materials. Processed corn and soy (the two most efficient transformers of sunlight to carbohydrate energy) as well as rice and wheat, now make up two-thirds of the calories we consume. Humans require between 50-100 different compounds and elements to be healthy, not all obtainable from just four plants (Pollan, *Defense of Food* 117-118).

The Western Diet has changed in the last century in ways that are making us ill. Heart disease, diabetes, stroke, and cancer all have well-established links to our diet. Even if we adjust for age (longer lifetimes), many of these “diseases of civilization” were not as common a century ago. These negative health trends are reinforced by policies put forward in the US Farm Bill, which focuses support on the production of five commodity crops: corn, soy, wheat, rice, and cotton. In places where people do not eat the way North Americans do, diseases such as these are less common (Pollan, *Defense of Food* 9-10). Consider, for example, what many Americans call the French paradox: the French, despite a diet that is higher in saturated fats as compared with Americans, suffer comparatively low incidences of heart disease and obesity.

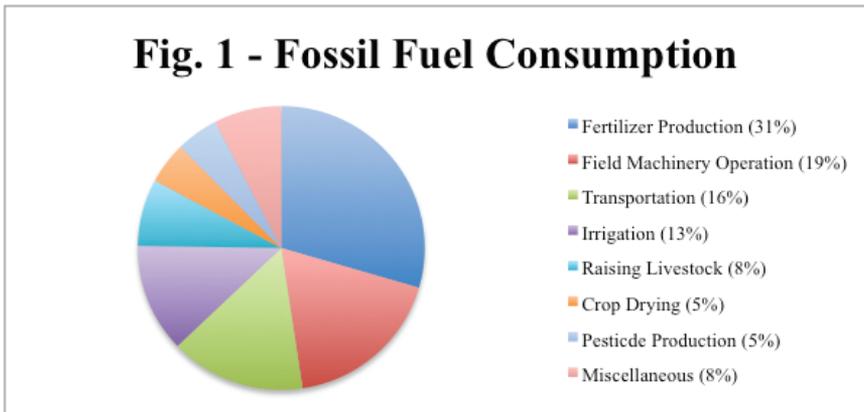
The most predictable indicator of obesity in the US today is a person’s wealth. For those on low incomes, it is often more rational to purchase energy dense foods because they contain more calories per dollar. For example, \$1 can purchase 1200 calories of cookies, but only 250 calories of carrots. These calories are the least healthy in the supermarket, and the largest contributor to obesity (Pollan, *What You Grow* 132-133). In addition, as industrial scale production has concentrated on standardization and maximizing production, the nutritional value of our food has actually decreased. We now have to eat more to get the same amount of essential nutrients. This is due both to the way we grow food and the kind of food we choose to grow (Pollan, *Defense of Food* 119).

Pesticide and fertilizer residue are now present in the environment at levels that are dangerous to humans. Pesticides are generally composed of, or derived from, hydrocarbons that do not break down and are easily absorbed by our tissues. The pesticides can cause cancer, birth defects, immune system effects, and neurological damage. Many of these chemicals,

such as Atrazine, are also endocrine disruptors, interfering with fetal or childhood development. These chemicals have an even greater impact on farm workers, who are directly exposed to these chemicals (Paxton 54).

### **Energy and Fossil Fuel Depletion**

According to Fatih Birol, chief economist of the International Energy Agency (IEA), if no significant discoveries are made, “the output of conventional oil will peak in 2020 if oil demand grows on a business-as-usual basis” (“The Peak-Oil Debate: 20-20 Vision”). In the United States, 400 gallons of oil equivalents are expended annually to feed each American (as of data provided in 1994). Another way of looking at this is 1,514 litres of oil consumed per year to feed the average North American, the equivalent of 10 barrels of oil (Elton 13). Agricultural energy consumption is broken down as shown in Figure 1. This does not include energy costs for packaging, refrigeration, transportation or home cooking.



**Figure 1 – Agricultural Fossil Fuel Consumption (Pfeiffer, 2003)**

### **Greenhouse Gas (GHG) Emissions**

Though it only accounts for 6% of global GDP, agriculture contributes to a larger share of global GHG emissions than any other sector of the world economy. The Stern Review found that non-CO<sub>2</sub> emissions from agriculture amount to 14% of total GHG emissions. Only deforestation accounts for a larger share of global GHG emissions (18%); transport and industry account for 14%, like agriculture (Stern 197). This figure for global agricultural emissions does not take into account emissions “indirectly” caused by agriculture and counted in other industries, including: deforestation for agricultural land; transport of agricultural inputs and outputs; operation of agricultural equipment; and production of fertilizer (Stern 1). Though these “indirect” emissions caused by agriculture are certainly significant, GHG

emissions from the central agricultural process are still greater.

A 2007 lifecycle analysis, published by Christopher Weber and Scott Matthews of Carnegie Mellon University, found that 83% of the GHG emissions that result from all American food consumption occur on-farm during the production process. Like the Stern Review, Weber and Matthews found that on-farm emissions from fertilizers and livestock accounted for the majority of agricultural GHGs (Weber and Matthews 3508-3511). Weber and Matthews also found that transportation only accounts for 11% of the lifecycle emissions of food consumed in the US, somewhat undermining the credibility of the popular “food miles” paradigm.

## **HOW DID WE GET HERE?**

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In the 1970s, a group of environmentalists called “The Club of Rome” predicted that the planet would soon reach its population limits with respect to available natural resources (Meadows). With global population predicted to reach 9-12 billion by 2050, it is widely argued that greater agricultural intensification and the use of genetically modified (GM) crops is necessary to feed and nourish a growing planet. This assertion is not completely accurate (Prince Charles 27).

Today, we grow enough food to feed anywhere between 8-12 billion people. With only 6.5 billion people on the planet, this is should be more than enough. However, despite this huge surplus, approximately one billion people are malnourished and another one billion live at or below subsistence, while another one billion are over nourished or overweight. Industrial agriculture needs to show that it has made a meaningful difference before governments allow their agenda to continue unquestioned. We will now evaluate the mechanisms by which government and industry have facilitated these problems.

### **Government Subsidies**

Western governments have helped to entrench the economic feasibility of industrial agriculture by heavily subsidizing the industry for decades. Even after rounds of multilateral subsidy cuts in the 1990s, global agricultural subsidies still totaled \$318 billion in 2002; about one-tenth of the value of total agricultural production. David Pearce, an environmental economist who authored many studies for the OECD, argued that most financial support for agriculture comes in the form of “environmentally harmful subsidies” (27-37).

In a 2005 publication, Pearce showed that 75% of OECD agricultural subsidies were directed to market price support and output-based subsidies, the most environmentally harmful types of financial assistance. Market-price support ensures a minimum market price for agricultural products regardless of supply, and output-based subsidies are weighted to encourage

greater production levels. When coupled together, these subsidies indirectly provide perverse incentives for overproduction. Overproduction leads to expansion into marginal or environmentally sensitive lands, greater use of monoculture, and the more intense use of fertilizers and pesticides to maximize yields (Pearce 38-39).

### ***Trade Constraints and the Export Lobby***

There is an active agricultural export lobby in Canada that promotes overproduction despite these environmental impacts. Wheat production is a prime example, as the Canadian Wheat Board (CWB) provides a price guarantee for Canadian wheat farmers. As a result of domestic production consistently outstripping domestic demand, a great deal of production is ultimately directed to the export market. In 2008, the CWB exported 18.5 million tonnes of wheat at a value of CAD \$7.2 billion (Can. Wheat Brd.).

The market opportunities abroad lead industrial agricultural forces in Canada to push for greater trade liberalization. According to a trade policy official from Agriculture and Agri-Food Canada (AAFC), liberalization has generally been achieved in major Canadian export staples like wheat and oilseeds. However, the Canadian agricultural lobby continues to push ahead for greater trade liberalization and increased market access (Anonymous policy analyst). The downside to this liberalization is that Canada's trade commitments prevent it from raising import tariffs to promote domestic production, or to prevent the import of environmentally unfriendly products.

### ***Economies of Scale and Comparative Advantage***

Export-oriented industrial agriculture is often justified on the grounds of achieving comparative advantage and economies of scale. Pierre Desrochers at the University of Toronto argues that harnessing regionalized strengths of diverse growing climates is the best way for the global food system to be organized. This is a convincing idea, and should not be dismissed outright. It is efficient to organize the global agricultural system so that crops are raised in the best growing climates where there are the greatest abundances of renewable natural inputs (sunlight, water, etc.). However, economies of scale and comparative advantage should not be lionized if these ideas inherently support larger farm acreages and monoculture. As established, these practices have led to expansion into marginal or environmentally sensitive lands, exacerbating existing problems of fossil fuel overuse, overproduction, and environmental degradation. These risks mean that economies of scale and comparative advantage need to be approached with a nuanced view instead of dogmatic praise.

### ***The Growth of Agri-Foods***

AAFC actively promotes agri-food production, especially as value-

added foods account for one of the fastest growing areas in the agricultural sector (Anonymous policy analyst). Agri-food, which AAFC is strangely reluctant to define, generally refers to foods that are produced through large, industrial-scale production techniques. This can refer to industrially produced produce like bananas, or value-added processed foods like frozen pizza. There has been an incredible growth in the agri-food sector, not only because industry is overproducing as they achieve economies of scale, but also because producers have sought new profit opportunities in this value-added sector. Processed foods are particularly lucrative for producers because easy-to-prepare instant products command a much higher retail price than basic inputs.

There are some outstanding problems with agri-foods, and especially processed foods. These foods are generally less nutritious, more energy intensive to produce and preserve, and are more heavily-packaged than their sustainably produced substitutes. Consumers demand and buy these products, and are often unable to properly educate themselves about their food choices. Together, government, industry, and consumers can all share the blame; but they can all play a crucial role in fixing industrial agriculture.

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## IMPROVING INDUSTRIAL AGRICULTURE

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Innovations in industrial agriculture are typically more incremental than revolutionary, and thus take on an eco-efficient approach. However, there are actions that can and should be undertaken to mitigate the negative impacts of this industry, as outlined in this section.

### ***Agricultural Best Practices***

Best practices are not new to agriculture, however, what it means has evolved over time. Currently, due to the many inefficiencies of this sector, many best practices take the form of “low hanging fruit”: economically sensible actions that are easy to achieve.

Soil erosion can be reduced through the use of no-till farming and limiting summer fallow fields. Though not necessary, Canadian farmers have begun using herbicides and GM crop varieties to make no-till farming easier, representing a trade-off between erosion and pesticide use. Planting perennial instead of annual crops can also serve to provide improved soil quality and nutrient cycling. It is also important to avoid the use of marginal or steep land for crop production, because this land is most prone to erosion (Brown 93-94).

To reduce fertilizer use, frequent soil testing can be conducted to avoid over application, which can also save the farmer money on input costs. Rotating legume crops and non-legume crops can provide organic sources of nitrogen. Fertilizer application methods can also be improved by “cutting-in” or injecting fertilizer into the soil where it is needed, reducing

volatilization and run-off. Pesticide reduction can be achieved through increases in “integrated pest management” through the use of bio-controls, and targeted pesticide application. Water use can be made more efficient by enhancing soil quality (to retain more water). Evaporation can be reduced by covering, shading, or lining irrigation canals, using appropriate time-of-day watering, soil moisture monitoring, drip irrigation, or micro-sprinklers.

In 2005, AAFC published a report of performance indices which measured improvements in on-the-farm sustainability in twelve key areas between 1981 and 2001. They found improvement in eight areas. Soil management practices have reduced the rates of erosion, and soils have transitioned from a net source of emissions to a net sink. However, fertilizer use has become increasingly inefficient, and fertilizer volatilization and methane emissions from livestock have increased (Lefebvre, Eilers, and Chunn).

### ***Innovations***

There are many innovations that can increase the sustainability of industrial agriculture by taking advantage of the concentrated waste streams and the many overlooked inefficiencies generated by this sector.

Biogas digesters offer an economic solution to multiple problems. They can capture methane emissions from animal wastes, produce fuel or electricity for on- or off-farm use, and provide cogeneration capabilities. Furthermore, the pathogens in animal waste can be reduced in the process, and can then be used more safely as an organic fertilizer. Facilities with biogas digesters can also accept organic wastes from other sources. The Ontario Green Energy Act has spawned biogas projects throughout the province; however, these projects are most economical in large-scale centralized livestock or dairy operations (Northy).

Ostara, a Vancouver-based company, has developed a process that can capture valuable phosphorous from waste treatment plants and manufacture fertilizer on-site. This system is currently in operation in Portland, Oregon, and is being expanded to other locations. If this system was incorporated into all waste treatment plants in Canada, it could meet 30% of Canada’s phosphorous needs (Ulrich, Malley, and Voora).

### ***Government Actions***

Federal and provincial governments have a role to play in improving industrial agriculture. One option is increased regulation. While there are many regulations for food safety, there are no mandatory environmental regulations for agricultural production in Canada. Greater regulation would likely face fierce opposition from large-scale and small-scale farmers alike; therefore, it may not be a practical political option. A different approach, which could also yield significant improvements, entails the expansion of existing

voluntary environmental programs. Currently, the federal and provincial governments fund a voluntary Environmental Farm Planning (EFP) program, where farmers attend workshops to learn how to conduct environmental risk assessments of their farms. Plans are then submitted for confidential peer review by a local committee, and once approved, farmers can apply for financial assistance to implement beneficial management practices as identified in their EFP. The program currently has a 75% participation rate in Ontario, and is offered across the country (Government of Canada, *Making Progress Together* 21). EFP programs have more political feasibility than regulation and could be expanded. The requirements of the risk assessments could be increased in future years, and peer-review inspection of farmers' lands could be integrated into the program. Furthermore, governments could make voluntary EFP a prerequisite for additional financial assistance offered by the provincial and federal governments.

Another initiative that government could embark on is market-based incentive schemes to encourage farmers to preserve or restore their local environment. The Government of Ontario is currently supporting an Alternative Land Use Service program in Norfolk County, where farmers are paid to preserve features of the local ecosystem like wetlands and wildlife habitats ("About the Alternative Land Use Services Concept"). If agriculture is currently threatening specific ecosystems which society highly values, direct instruments like these will be effective.

Additionally, governments could implement stronger regulations for farm equipment. Much of the machinery currently in use are very inefficient in terms of fuel use, and contribute significantly to GHG and nitrous oxide emission levels. Governments have been slow to introduce regulations on farm equipment, and it will be several years or decades before such regulations are as advanced as regulations for automobiles (Crupi).

### **Pricing Carbon**

Putting a price on carbon would certainly provide the proper economic incentives to reduce GHG emissions in agricultural production. Though there are some concerns about how to measure and verify the emissions from agricultural practices, these are technical obstacles that can be addressed along the way. A more difficult barrier is political opposition to including agriculture in emission pricing schemes. The strong agricultural lobby in the US managed to keep agricultural emissions out of cap-and-trade legislation, and the EU also has no plans to incorporate agriculture into its emissions trading scheme (Pew Ctr. on Climate Chg. 1).

Developed countries may have to eventually follow the lead of New Zealand, which will bring agriculture into its emission trading scheme (ETS) in 2015. However, agriculture will only be included in the scheme on the condition that farmers are initially allocated permits for 90% of their previous

year's emissions for free ("Agriculture in the New Zealand Emissions Trading Scheme").

### **Reduce Subsidies**

With 75% of OECD subsidies labeled as environmentally harmful, there is a strong case for elimination. Some subsidies have even been found to be illegal under the GATT. For example, a 2004 ruling by the WTO decreed that US cotton subsidies were in violation of previous agreements, and many believe that similar subsidies for corn, soy, wheat, and rice may also be found to be illegal in future WTO rulings (Pollan, *What You Grow*). Reducing these subsidies now will help the agriculture sector take a step back from its most inefficient endeavours.

### **Third Sector Involvement**

Many organizations exist that can promote agricultural practices focussed on sustainability. Ducks Unlimited is a wetland conservation organization engaged with farmers to provide both educational and incentive programs. Their Conservation Easement program is used to purchase a bundle of rights on a landowner's property which prevents them from breaking or draining wetland. The program is expensive and reserved for only the most critical habitat. Ducks Unlimited is also currently promoting the adoption of winter wheat to provide improved nesting habitat, presenting an economic case to farmers for making the switch from conventional wheat (Edwards).

Third party certifiers can play an important role in providing visible differentiation of products based on environmental or social standards. Labels like "Fair Trade" and "Organic" provide a value added incentive for producers to employ higher environmental and social standards. The organic sector has seen enormous growth in Canada, with sales increasing by 20% per year (Murdoch). Environmental Non-governmental Organizations (ENGOS) and interest groups like the National Farmers Union can provide additional education and pressure on consumers, industry, and government to engage in sustainable food production.

## **CAN A GLOBAL FOOD SYSTEM BE SUSTAINABLE?**

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It is clear that the current global food system is not sustainable. It has also been illustrated that incremental improvements can be achieved within the current agricultural system. But can this system be eco-effective? Can it be sustainable?

For the global food system *to become* truly sustainable, the following outcomes would have to be achieved:

- Global harmonization of strict environmental standards
- The implementation of true fair trade

- Discovery of substitutes for fossil fuels to enable sustainable transport
- A stabilization of climate change to preserve arable conditions globally

These are immense challenges, beyond the scope and abilities of Canadian policymakers. Even if these challenges were achieved, they would only be the start of a long, but valuable, process. Therefore, this study will move ahead by taking a narrower scope, examining if local food systems can achieve sustainability on their own. Local food sustainability does not require complex international cooperation, and can be achieved by a much smaller group of determined actors. There is significant literature about sustainable local agriculture, and it is an emerging social movement. We will now examine the benefits of local food sustainability, the barriers to local food production, and the policy instruments that can help facilitate local food solutions.

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### **SUSTAINABLE LOCAL FOOD PRODUCTION: A (SMALL) WORLD OF BENEFITS**

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It is necessary to establish that sustainability needs to be the primary focus of food production. Neither local products nor organic products are enough on their own. If local or organic foods are grown in an unsustainable fashion that undermines our economic, environmental and social needs, this can create a new set of veiled problems. However, the inherent closed loop processes that are possible within local and organic agriculture make it inherently more sustainable than the modern industrial agriculture model we have previously described.

#### ***Decreased Fossil Fuel Use***

Local and organic agriculture can require less fossil fuel. To qualify as organic, no chemical pesticides or fertilizers are permitted. By making food production local, we remove the need to transport over long distances. This has immediately removed three of the biggest contributors to fuel consumption. Because animal feeds require fossil fuel in their production, livestock may be switched to grazing or foraging instead of grain feeds so the fossil fuels used to produce feed have been removed. Smaller scale farming also implies human labour replaces machinery; so farm use of diesel for planting and harvesting are further reduced.

#### ***Greater Food Yields, Nutrition, and Diversity***

Sustainable production can lead to greater food yields—small farms can actually produce as much as 1000% more output per unit area than large ones (Halweil 75). These figures compare the “polyculture” of small complex farms, with the monocrops of large industrial farms, whereas a small, more complex farm produces a variety of products per acre. “Polyculture”

becomes the small farm's productivity advantage, allowing it to net approx \$3000 per acre (two hectares), whereas a large farm (15,000 hectares) nets \$52 per hectare (Halweil 75). Prince Charles, citing an OECD study, noted that the increase in yields can be significant. For example, in Bolivia, potato yields increase from 4 to 15 tonnes per hectare, in Ethiopia, potato yields went from 6 to 30 tonnes per hectare, and in Pakistan, mango yields went from 7.5 to 22 tons per hectare, all after switching to organic practices (27).

Diversity is the strength and foundation of a local food system. Less contiguous land, less machinery, and more farmers allows a great diversity of crops to flourish, and since it is not nutritionally possible for us to subsist on one or two crops, this diversity adds to the nutritional security of area. It is also important economically, as it reduces dependence on expensive agrochemicals and "exclusive" seed, and keeps the dollar in the local economy in a real way. The same applies for diversity within a single crop. Until the 1960s Britain was relatively self-sufficient in dessert apple production, growing a wide variety of seasonality and flavour. As cheaper imported apples have flooded in, 60% of Britain's orchards have been replaced with other crops, and this diversity has dwindled (Halweil 82-85).

### ***Local Ecosystems and Urban Agriculture***

There are significant benefits gained from reducing the distance from the producer to the consumer, and even more gains when the consumer becomes the producer. Stewards of local sustainable agriculture can take advantage of cyclical versus linear nutrient flows. Simply capturing rainwater for use in gardens enhances water infiltration, replenishes ground water, and reduces run-off. During heavy rains, this can reduce flooding and prevent wastewater treatment systems from becoming overwhelmed. Locally accessible gardens also provide a means for dealing with food waste and plant debris through composting. A community garden that can accept ten tonnes of household compost can save a city \$500 per year in waste collection costs (Roberts 32). Urban gardening provides exciting opportunities to achieve these benefits within a populated setting.

Cuba is a prime example of the possibility of food self-sufficiency within an urban setting. Cuba's current situation is the product of the collapse of the Soviet Union, a key trading partner; as well as the strengthened US embargo that attempted to put Cuba into submission. These events created a "peak oil" scenario, where significant amounts of agricultural inputs were cut-off in a short period of time. Faced with crisis, the Cuban government supported a massive agricultural transition through local extension networks, helping citizens to obtain land, seeds, and gardening assistance. This transition, known as "the special period," created 160,000 jobs. Today, 90% of the produce consumed in Havana is produced in the city. Most gardens are crammed into tight spaces between buildings and back lots, but are the

equivalent of 3,595 hectares.

In today's western cities, it can be difficult to find growing spaces due to shade cast by buildings, limited space, and ease of theft. An easy and innovative way to overcome this hurdle was to move farming to rooftops, taking advantage of available sun and space. Rooftop gardens are an amazing innovation that can further urban agriculture. A currently underutilized space, rooftops have direct exposure to the sun and a reduced number of city pests (raccoons and skunks, but cats and dogs as well). This can be a great place to collect water and reuse it, instead of flushing it through city sewers. They also contribute to the energy efficiency of the building beneath by acting as a layer of insulation.

### ***Climate Change: Building Adaptive Capacity***

As seen in the Cuban example, local agriculture has an additional benefit of building adaptive capacity through food security and enhanced social capital. Climate change and rising fuel costs can result in unanticipated shocks in the global agricultural supply chain. Infrastructure and expertise that supports sustainable local food production can provide insulation against external shocks, thus providing a mechanism for resiliency. Ten years prior to the "the special period," Cuba began researching heavily into biodynamic and organic agricultural practices in hopes of eventually weaning itself off of agri-inputs. This stresses that significant initiative and effort is needed to build adaptive capacity prior to crises. Citizens and governments must act now in building this capacity.

### ***Social Benefits: Responding to Industrialization's Neglect of the Third Pillar***

Community gardens improve the social determinants of health, such as the beauty and safety of neighbourhoods and the strengthening of community ties. Jamey Lionette notes that, "one of the best ways to ruin a neighborhood is by shopping at chain supermarkets." Chain supermarkets put us out of touch with the struggle that many face in even being able to afford the cheaply priced food that we do have. By sustaining local farms, local food remains affordable and does not become an affectation of the privileged few (115-116).

As a new form of social engagement and with the response to food scarcity and safety issues, consumers are increasingly choosing to buy from the farmer they know instead of the grocer they do not. In a Community Supported Agriculture (CSA) initiative, at the beginning of a growing season the customer commits to purchasing a share of the season's output from the farm and pays in advance for the receipt of the food. This way the farmer has a guaranteed income, reducing risks. The customer also has guaranteed fresh produce for the entire growing season while contributing to a local investment. It is projected that we may see a tripling or quadrupling of

the number of CSA groups in the next few years as its popularity increases (Darby et al. 476).

Another reason that consumers prefer CSAs is that they give decision-making power back to the local community. If you wanted to find, for example, grass-raised beef, then you have a good chance of finding a farmer nearby that has it. This direct feedback to the farmer means that he can immediately respond to the personal preference of the consumer (Halweil 163).

A unique social perspective on local food is “just food”, the right to fresh, healthy food. One of the best examples of “food for all” comes from Belo Horizonte, the fourth largest city in Brazil, known as the city that ended hunger. Making food security a right of citizenship, they established a local market system, provided farmers with stalls, and created a network of 26 warehouse stores around the city that sell local produce at fixed prices. The program ensures that children are fed nutritionally adequate fresh food in schools, and connects hospitals and municipal buildings to the food chain. In addition, vendors are obligated to make weekend deliveries to low-income neighbourhoods outside the city centre that do not have ready access to fresh produce (Halweil 103-104).

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## **BARRIERS TO SUSTAINABLE LOCAL FOOD PRODUCTION**

### ***Costs and Consumer Expectations***

One of the central barriers to sustainable local food production is the retail pricing of these products. Typically, agri-foods are cheaper because they are produced at economies of scale. They internalize the de facto subsidy of unsustainable agricultural production, while externalizing environmental damages. Agri-foods sell below their true value, while sustainable local food sells at a higher price (reflective of the costs of fair labour and environmental stewardship).

However, consumers have been socialized to expect and demand cheap food. Unsustainably produced “cheap” organics, now commonly found in supermarkets, reinforce the attitude that food should be cheap, even if it is organic. These marketing practices undermine the credibility of sustainable local producers, leading many consumers to think these farmers are inefficient, or greedy to ask for more (Lionette 120-121). Though these allegations are untrue, the reluctance to pay more for food is a significant barrier to local food production. Especially worrying is that the most vulnerable members of our society are often dependent on cheap food. It is uncertain if many would be able to afford to pay the full, true costs of food, which are currently associated with local food. Local food production will have to address this social issue to achieve sustainability.

### ***Perverse Subsidies and Industry Opposition***

Existing agricultural subsidies are certainly a barrier to sustainable local food production. These subsidies encourage large-scale, export-oriented industrial agriculture, as already established. This production helps to crowd out small-scale sustainable local production. Though these subsidies may “level the playing field” internationally, they distort domestic production away from sustainable local sources.

However, industrial agriculture and agribusiness lobby against the reduction of existing subsidies because they have an interest in maintaining the current status quo in which sustainable local food works to compete for market share. If industrial agriculture begins to perceive local sustainable production as a threat, it is very likely that agribusiness will push for new barriers for local food products. For example, these lobbyists might push for greater food safety inspection of local products. Because food inspection complements economies of scale, this could lead to a relative increase in the price of sustainable local food, hopefully making it less competitive in the eyes of agribusiness. The influence of industrial lobbyists underscores the importance of establishing a strong and coherent political voice for sustainable local food production.

### ***Lack of Political Will and Organization***

Though sustainable local food is emerging as a social movement, it is not sufficiently organized and represented to have a similar level of influence as agribusiness. Many important decisions are made on Parliament Hill and in the provincial legislatures, and the interests of industrial agriculture are represented far better in these channels. However, there are signs of progress. Local farmers’ markets and regional farmers’ networks are increasingly working with other sustainable local food groups to advance their agenda together. Food is a uniting issue, and can bring together many diverse groups to work towards a common goal. This broad coalition needs to keep expanding and reaching out to more groups, especially “ordinary” food consumers, who are also voters.

The sustainable local food movement will face barriers as it attempts to change policy, but there certainly are some milestones that can be achieved. Many policy instruments can be put into place to facilitate sustainable local food solutions. As Michael Pollan says, “voting with our forks can advance reform only so far.” To change the elements of the system that continue to enforce poor food choice upon the consumer, we need to also vote with our votes (*What you Grow* 139).

### ***Lack of Infrastructure and Supply Chain Management***

The current system depends on a highly integrated vertical chain of a small number of producers, processors, transporters, and markets

(supermarkets). This simplifies the logistical process, as everything moves through only a few narrow channels. As previously mentioned, current regulations favour industrial agriculture over small-scale agriculture, which cannot meet the same economies of scale in food inspection, challenging local capacity for food production. In 2006, the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) imposed very strict regulations on abattoirs, regardless of size (O'Connor).

As another example of impacts on infrastructure, a conventional restaurant has perhaps 2-3 suppliers for everything. By switching to local production, it can require anywhere between 20-40 suppliers to have farm products available year round. It takes more time and resources to develop and maintain a large network of "partners" than to shop at a one-stop shop, like a supermarket.

We must also remember that a farm is a business. Business knowledge is important in the ability to build networks and establish relationships and partnerships. If a farmer decides to work with supplying restaurants or grocers, they have to be able to negotiate fair prices, understand contracts, and know how to effectively manage their business to ensure a regular supply to fulfill such agreements.

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## **POLICIES THAT CAN FACILITATE THE LOCAL FOOD MOVEMENT**

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### ***Carbon pricing***

Though the central goal of carbon pricing is to mitigate climate change, a positive co-benefit of carbon pricing is that it would encourage sustainable local agriculture. It would make transported industrial products more expensive, and would encourage less emissions-intensive, more sustainable farming practices. Local sustainable food production fits the bill in a society with carbon pricing.

### ***Municipal Zoning and Bylaw regulations***

A major way municipalities can facilitate local agriculture is to create access to growing spaces, rather than impede it. Municipalities have significant jurisdiction over city property, parks, and zoning. It is essential that they open up land for community gardens, especially in areas where residents lack their own private growing spaces. The municipality should also mandate community gardens for all new development. In making a case to developers, it has been shown that community gardens increase the property values of neighbouring properties (Been and Voicu).

### ***Education and Awareness***

Education and awareness of the benefits of healthy local foods can be reinforced through institutional procurement like the federal and

provincial governments, as well as universities and schools. They can use this opportunity to send strong market signals, and as public institutions, communicate a message to consumers about the value of local food. If procurement is done effectively, it can cost the same or only slightly more than “traditional” industrially produced foods (Halweil 174). There is a loss of “traditional” knowledge, such as preserving, canning, following seasonal diets, or even the use of a cold storage that needs to be addressed.

Agricultural research and education can also be restructured to move from the current focus on production to an integrated view of whole farm business. It is not just about producing food, but learning the keys of business to know how to build networks for marketing, supply chains, and distribution to be able to support regional and local food systems successfully (Halweil 140). “Grow at school” programs that incorporate food gardening into the curriculum can enhance children’s socialization towards nature and connect a child with their food choices. These programs facilitate understanding of what food is and where it comes from. It also teaches responsibility and social interaction, while providing a sense of pride.

### ***Investing in Local Food Capacity and Small Scale Farming***

Reinvesting in rural infrastructure is a critical step in building the capacity for sustainable agriculture. Investment should not be restricted to roads and facilities, but should go towards the restoration of the small scale processing capacity that rural communities have lost. For example, in eastern Ontario the ratio of large to medium sized firms is four times higher than in the rest of the province. The difference is mainly attributed to the lack of demand for smaller scale suppliers, related to population density. It is up to the consumer to demand products that will create viable, small-scale, and regional industries, including food processing. With such an imbalance in the ability to process food in the Ottawa area, work needs to be put into bringing this capacity back into play.

Another possibility would be to shift subsidies from the major cash crops to farmers who are looking to diversify. Making the decision to switch away from corn or soy is attached to income reduction. Farmers could instead be supported through the transition, as they have to switch modes of production, change machinery, hire labour, and so on.

Lastly, supporting urban gardening may be one of the most important facets of this challenge. Increasing urban gardens requires support at all three levels of government, helping to create new places for the exchange of food and ideas, including farmers’ markets. For example, the National Capital Commission could reinstate its former program that rented out land for \$30-40 dollars an acre in the greenbelt for local, sustainable food production. However, a company located in Toronto now manages all of their properties corporately and this land is now inaccessible.

### **Marketing initiatives**

Foodland Ontario is a consumer promotion program that maximizes market penetration of Ontario produce. The intent is to get consumers to purchase over 80% Ontario goods, increasing producer market share. Savour Ontario was developed by OMAFRA in consultation with the Ministry of Tourism, and is designed to promote the bounty of Ontario's fresh, high quality foods featured in fine and vacation dining restaurants. A more targeted project is the Taste Trail of Prince Edward County — a tourist region promoted by the province, which features a cluster of small-scale local restaurants, farms, and vineyards that customers can visit (Government of Ontario).

Mike Schreiner, leader of the Ontario Green Party, emphasizes that local alternatives must be marketed not as commodities (unlike the current agricultural paradigm), but as "value propositions." Phrases like "Fair Trade", "Organic", and "Sustainable" all have value meanings to consumers and can help them to make conscious choices when purchasing food (Schreiner). As a part of its old policy framework, the federal government funded the establishment of several farmers' markets across Canada, including the Ottawa farmers' market at Lansdowne. The importance of farmers' markets in relation to local food promotion is significant, and should receive the support of all levels of government.

### **CONCLUSIONS**

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It is apparent that there are major problems with current agricultural practices and that there are many forces within the global market and within society which severely restrict efforts of agricultural reform. Sustainability requires a balanced approach to all three pillars, and a local, organic, and fair food system is an opportunity to transform the current industrial model to a sustainable one. It will not be a simple or easy task, however, there are several things that can and are being done now to facilitate such a transformation.

#### **Economic**

Subsidies – Global competition for market share and the subsidization of production costs by government limit the ability of sustainable food options to compete effectively. Western governments should reduce subsidies to industrial agricultural producers, and should explore the imposition of countervailing duties against subsidized and environmentally substandard industrial agricultural imports from other nations.

#### **Environmental**

Innovation – The drive for new ideas and new ways of doing things must continue. Lobbyists and lawmakers are set on maintaining the status

quo, so innovation will be key in adapting to and transitioning away from the current agricultural model.

**Pricing Carbon** – As one of the highest emitting sectors, putting a price on carbon will help the agricultural sector become more conscientious of its outputs and provide a price signal to consumers to aid decision making.

**Regulatory Change** – First, processing capacity, on a small local scale, can not be disadvantaged by regulations designed for large facilities and that favour economies of scale. Second, regulating in the appropriate sector will encourage the development and adoption of more environmental alternatives, such as fuel efficient farming vehicles.

### **Social**

**Recognize Environmental Services** – Paying for the preservation of sensitive land allows farmers to continue to earn income on that property and protects it from both farming and development.

**Build Social Capacity and Networks** – The potential for social benefit in local agriculture is great, and building and connecting community networks between citizens, small farmers, and vendors can help to develop and expand the local food movement in a way which is economical to those involved.

Though governments have the capacity to facilitate the growth of sustainable food production in many ways, the state has done more to impede progress than to advance it. Society must take a larger role in the development of a local, organic, and sustainable food system. Individuals need to create and maintain the impetus for sustainable local food production through their role as farmers, consumers, and even home gardeners. There are encouraging signs that this momentum is growing, but the sustainable local food movement must not become complacent and satisfied in its niche. Local food production needs to keep expanding, and the movement must do its best to engage all members of society while staying true to its sustainable roots.

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