

Curbside Organic Waste Collection
&
The 60% Waste Diversion Goal:
A Case Study of Select Municipalities in
the Greater Golden Horseshoe

by

Aaron Matthew Stauch

A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Master of Environmental Studies
in
Planning

Waterloo, Ontario, Canada, 2012

© Aaron Matthew Stauch 2012

Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Ontario has provided an interesting canvas for waste management planning. As the home of the world's first blue box program, a successful deposit return system, an extended producer responsibility initiative, and recently the Green Energy Act: Ontario presents many opportunities and challenges for a waste management planner. In addition to the above, Ontario is expected to grow significantly (through immigration) over the next 25 years. In order to manage this, the government of Ontario has created a significant urban planning hierarchy and has focused efforts to accommodate this growth in the Greater Golden Horseshoe. To address the management of waste in the province, the government, in 2004, established a 60% waste diversion goal by 2008. When evaluated in 2009 the province had yet to make significant progress toward the target. This thesis seeks to examine how municipalities in the Greater Golden Horseshoe have developed and implemented their organic waste diversion program in response this target, and examine the issues that arose in reaching it. This thesis attempted to interview waste management planners at eight municipalities, with five agreeing to participate. Based on the interviews it was determined that each of the municipalities had used several different approaches to organic waste diversion, with most having recently implemented (pilot or full scale) curbside organic waste collection programs (green bin). It was also determined that many of the municipalities replicated the same steps as neighbouring municipalities and did not always factor in other's learning. Most importantly, while the government set the waste diversion goal, they did not take responsibility for ensuring that outcomes were achieved.

Acknowledgements

I would like to thank my advisor Dr. Murray Haight, who provided tremendous mentorship through this process. Murray helped me find funding for this research, guided me through various roadblocks, and was patient at my sometimes snail-like progress. I would also like to thank Jeff Casello for his feedback and agreeing to be part of my committee. Without his frank feedback, I would still be stuck.

I would also like to thank all participants in the research process; their insights and information made the research possible. I would particularly like to thank: Melissa Kovacs, Chris Rickett, and Dennis Braun. Two groups provided significant financial support to this undertaking: the Toronto and Region Conservation Authority; and MITACS; without it, this process would have been far more difficult.

Finally I would like to thank my family and friends. Graduate work is often tedious and lonely work; without my family and friends it would have been a much more difficult journey.

Table of Contents

| | |
|--|------|
| Author’s Declaration | ii |
| Abstract..... | iii |
| Acknowledgements..... | iv |
| Table of Contents..... | v |
| List of Figures..... | viii |
| List of Tables | ix |
| List of Abbreviations | xi |
| Chapter 1 : Introduction..... | 1 |
| Chapter 2 : Literature Review..... | 2 |
| 2.1 Sustainable Development | 2 |
| 2.2 Planning & Waste Management Planning..... | 4 |
| 2.2.1 Public Participation in Waste Management Planning | 6 |
| 2.2.2 Equity in Waste Management Planning | 8 |
| 2.2.3 Summary of Planning Models | 9 |
| 2.3 Other Disciplinary Approaches to Waste Management | 10 |
| 2.4 Integrated Solid Waste Management Planning..... | 11 |
| 2.5 Planning in the Greater Golden Horseshoe | 14 |
| 2.6 Waste & Organic Waste Management in Ontario | 14 |
| 2.6.1 Ontario & Canadian Waste Generation Statistics..... | 14 |
| 2.6.2 Limited Landfill Capacity..... | 16 |
| 2.6.3 Provincial Waste Diversion Targets | 17 |
| 2.6.4 Curbside Organic Waste Management in Ontario..... | 17 |
| 2.6.5 Other Organic Waste Management Programs In Ontario..... | 18 |
| 2.7 The Management of OFMSW | 19 |
| 2.7.1 Organic Waste Collection & Source Separated Organics (SSO) | 19 |
| 2.7.2 Landfill | 20 |
| 2.7.3 Compost..... | 21 |
| 2.7.4 Anaerobic Digestion | 21 |
| 2.8 Summary of the Literature Review..... | 22 |
| Chapter 3 : Methodology | 24 |
| 3.1 Research Design & Methods | 24 |

| | |
|---|----|
| 3.1.1 Phase 1: Literature Review | 25 |
| 3.1.2 Phase 2: Data Collection | 25 |
| 3.1.3 Phase 3: Data Analysis | 27 |
| 3.1.4 Triangulation | 29 |
| 3.1.5 Research Ethics | 29 |
| 3.1.6 Research Limitations | 29 |
| Chapter 4 : Case Studies of Select Municipalities in the GGH..... | 30 |
| 4.1 Region of Waterloo | 30 |
| 4.1.1 General Waste Management Information | 31 |
| 4.1.2 Waste Management Planning Towards the 60% Diversion Goal | 33 |
| 4.1.3 Analysis of Case Study | 35 |
| 4.2 County of Dufferin | 37 |
| 4.2.1 General Waste Management Information | 37 |
| 4.2.2 Waste Management Planning Towards the 60% Diversion Goal | 38 |
| 4.2.3 Analysis of Case Study | 41 |
| 4.3 City of Hamilton..... | 43 |
| 4.3.1 General Waste Management Information | 43 |
| 4.3.2 Waste Management Planning Towards the 60% Diversion Goal | 44 |
| 4.3.3 Analysis of Case Study | 46 |
| 4.4 Region of Peel | 48 |
| 4.4.1 General Waste Management Information | 48 |
| 4.4.2 Waste Management Planning Towards the 60% Diversion Goal | 50 |
| 4.4.3 Analysis of Case Study | 52 |
| 4.5 Region of Halton | 53 |
| 4.5.1 General Waste Management Information | 53 |
| 4.5.2 Waste Management Planning Towards the 60% Diversion Goal | 54 |
| 4.5.3 Analysis of Case Study | 56 |
| 4.6 Summary of General Organic Waste Management Information | 58 |
| Chapter 5 : Discussion & Conclusions..... | 62 |
| 5.1 Lack of Political Will | 62 |
| 5.2 Failure of the Rational Comprehensive Model & Collaboration | 65 |
| 5.2.1 Lack of Collaboration..... | 67 |

| | |
|--|----|
| 5.3 Implications for Planning & Waste Management | 69 |
| 5.4 A Potential Waste Management Planning System | 77 |
| 5.4.1 Better Public Communication..... | 78 |
| 5.5 Implication for the Literature..... | 79 |
| 5.6 Conclusions..... | 81 |
| 5.6.1 Need for a Ban on Divertible Materials from Landfill | 82 |
| 5.6.2 Central Coordination of Waste Management | 82 |
| 5.6.3 Focus on IC&I Sector Diversion | 83 |
| 5.6.4 New Approach to Waste Management Decision Making | 83 |
| 5.7 Recommendations for Waste Management Practitioners..... | 83 |
| 5.8 Recommendations for Waste Management Researchers..... | 84 |
| Bibliography | 85 |
| Appendix “A” – Survey Questions..... | 96 |

List of Figures

| | |
|---|----|
| Figure 2-1: Illustration of the Concept of Sustainable Development (Adams, 2006)..... | 3 |
| Figure 2-2: Rational Comprehensive Model (Seasons, 2008) | 5 |
| Figure 4-1: The Greater Golden Horseshoe | 30 |
| Figure 4-2: Region of Waterloo, Ontario | 31 |
| Figure 4-3: County of Dufferin | 37 |
| Figure 4-4: City of Hamilton..... | 43 |
| Figure 4-5: Region of Peel | 48 |
| Figure 4-6: Region of Halton | 53 |
| Figure 4-7: Ontario's Waste Diversion in Relation to Other Jurisdictions..... | 60 |

List of Tables

| | |
|---|----|
| Table 2-1: Summary of Waste Management Planning Models as Outlined by Hostovsky (2000)..... | 9 |
| Table 2-2: Summary of Select Organic Waste Program from the GGH in Ontario in 2007..... | 18 |
| Table 3-1: Potential Municipal Participants | 26 |
| Table 3-2: Rationale for Participant Selection..... | 26 |
| Table 3-3: Barriers to 60% Waste Diversion..... | 28 |
| Table 4-1: Region of Waterloo’s Managed Organic Waste Volumes (2008) | 32 |
| Table 4-2: Region of Waterloo’s Organic Waste Diversion Program..... | 32 |
| Table 4-3: Region of Waterloo’s Organic Waste Diversion Timeline | 34 |
| Table 4-4: Assessment of Region of Waterloo Against Evaluation Criteria..... | 35 |
| Table 4-5: County of Dufferin’s Organic Waste Management Programs..... | 38 |
| Table 4-6: County of Dufferin’s Organic Waste Diversion Timelines | 39 |
| Table 4-7: Assessment of County of Dufferin Against Evaluation Criteria..... | 41 |
| Table 4-8: City of Hamilton’s Organic Waste Diversion Timelines..... | 45 |
| Table 4-9: Assessment of City of Hamilton Against Evaluation Criteria | 46 |
| Table 4-10: Region of Peel’s Organic Waste Diversion Programs | 48 |
| Table 4-11: Region of Peel’s Organic Waste Diversion Timelines | 51 |
| Table 4-12: Assessment of Region of Peel Against Evaluation Criteria..... | 52 |
| Table 4-13: Region of Halton’s Organic Waste Diversion Timelines | 56 |
| Table 4-14: Assessment of Region of Halton Against Evaluation Criteria..... | 56 |
| Table 4-15: Summary of Regional Organic Waste Generation and Diversion | 58 |
| Table 4-16: Organic Waste Diversion Programs..... | 58 |
| Table 4-17 Cost of Organic Waste Diversion Programs | 59 |
| Table 4-18: Barriers Encountered by Participating Municipalities | 60 |
| Table 5-1: Curbside Organic Waste Collection Program Summary | 62 |
| Table 5-2: Drivers Identified | 63 |
| Table 5-3: Summary of Evidence for Lack of Political Will..... | 64 |
| Table 5-4: Curbside Organic Waste Collection Program Summary | 65 |
| Table 5-5: Summary of Evidence for Failure of the RCM..... | 66 |
| Table 5-6: Accepted Bin Liners..... | 67 |
| Table 5-7: Timeline to the Acceptance of Bin Liners | 67 |
| Table 5-8: Barriers Identified | 68 |

Table 5-9: Summary of Evidence for Failure of the RCM68
Table 5-10: ISWM and EPA Evaluation of Municipalities' Performance.....74

List of Abbreviations

3Rs - Reduce, Reuse, Recycle

4Rs - Reduce, Reuse, Recycle, Recovery

AD - Anaerobic Digestion

CCF - Central Compost Facility

EPR - Extended Producer Responsibility

GHG - Greenhouse Gas

IC&I - Industrial, Commercial and Institutional

ISWM – Integrated Solid Waste Management

MRF - Materials Recovery Facility

MSW - Municipal Solid Waste

OFMSW - Organic Fraction of Municipal Solid Waste

NIMBY - Not In My Backyard

RCM - Rational Comprehensive Model

SSO – Source Separated Organics

Chapter 1: Introduction

In an effort to increase the lifespan of landfills and minimize environmental impacts, in 2004 the Government of Ontario established the ambitious goal of achieving 60% waste diversion by 2008 (Ministry of the Environment, 2004). In March 2009 the Canadian Broadcasting Corporation (CBC) reported that Ontarians were diverting less than 40% of their waste (The Canadian Press, 2009). Why did we fail to achieve this goal? There are many reasons that are often cited, including: population growth; strict environmental controls; the “Not-In-My-Backyard” or “NIMBY” phenomenon; and low participation in diversion programs (Hostovsky, 2006; Ministry of the Environment, 2009). However, ultimately there was a breakdown of the waste management planning process, and a lack of political will to ensure the target was met. Based on the Ontario waste stream composition, the 60% diversion target is achievable, and if we continue to grow as a province it must be realized to ensure that we protect human health and the environment. To achieve this, we need to move past the breakdown in waste management planning; we need to mobilize political will to ensure diversion goals are met; we need to address the lack of waste management coordination across the province; and waste management planners need to move away from the Rational Comprehensive Model as the fundamental decision-making tool. This thesis will examine the implementation of curbside organic waste collection programs as a proxy for the waste management planning process. When the 60% waste diversion goal was created, blue box recycling was already well established. However, organic waste collection was in the early planning stages and provides the best opportunity to observe the waste management planning process in action. In addition to being in the planning stage, organic waste diversion provides the most realistic avenue to achieve the 60% waste diversion goal.

This research intends to provide insight into the organic waste diversion planning process for select municipalities in the Greater Golden Horseshoe of Ontario. The research objectives are to: (1) examine the development of curbside organic waste collection programs in the Golden Horseshoe of Ontario; (2) identify the barriers and drivers that feed decisions around the planning process; and (3) examine why the planning process did not ultimately create a result that met the 60% waste diversion goal. This thesis is organized in five chapters, as follow: Chapter 1: Introduction; Chapter 2: Literature Review; Chapter 3: Methodology; Chapter 4: Case Study; and Chapter 5: Discussion and Conclusions.

Chapter 2: Literature Review

Waste is a major issue facing cities, provinces/states, and countries around the world. As the world population continues to increase, so does the waste we generate. Planners need to effectively deal with waste to ensure that all can share a sustainable and healthy future. This chapter presents a literature review completed as part of the research undertaking presented in later chapters. The literature review will clearly demonstrate the need for effective waste management practices, particularly for the diversion of waste, specifically municipal organic waste.

2.1 Sustainable Development

Sustainable development was brought into the mainstream in 1987 by the report *Our Common Future: Report of the World Commission on Environment and Development*, which states “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987). The most common understanding of sustainable development is the balance of economic, social (community development), and environmental priorities (Adams, 2006). Three interconnected circles commonly represent this concept, with the centre representing the point where sustainable development is achieved (illustrated in Figure 2-1).

Improved waste management and increased waste reduction will have significant impacts on our journey towards the ideals of sustainable development. As more energy- and resource-efficient means of production are developed, and as the waste management hierarchy is better implemented, the impact of waste generated by our growing population can be reduced. Conversely, without improvements in energy and resource efficiency our negative impacts will continue to increase, impeding progress towards a more sustainable world.

In October 2010, the Government of Canada released a sustainable development strategy, firmly supporting sustainable development as the Government of Canada’s approach to environmental issues (Environment Canada, 2010). The goal of Canada’s sustainable development strategy is: “To improve the federal government’s performance in putting sustainability at the heart of its policies and programs...” (Environment Canada, 2010, p. 3). The impact of this policy should be that all activities undertaken or directed by the Government of Canada have sustainability as a key consideration; this includes waste management. Therefore our waste management systems should be

moving forward, embracing the implications of sustainable development to ensure that future generations do not have to cope with the waste we generate today.

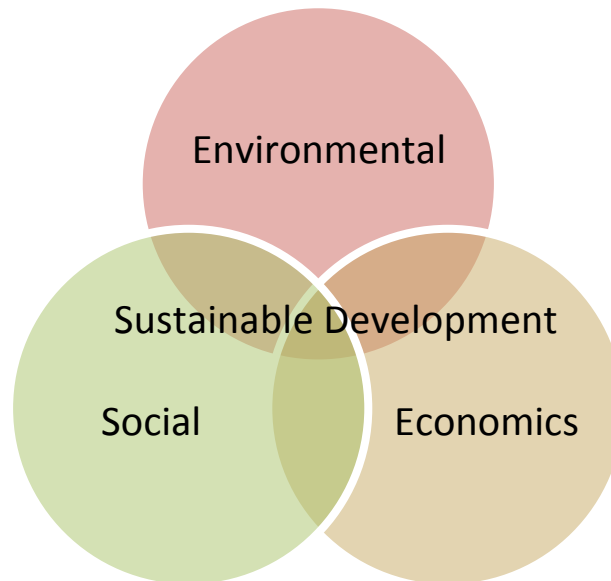


Figure 2-1: Illustration of the Concept of Sustainable Development (Adams, 2006)

A major theme in sustainability literature is waste. The United Nations' Agenda 21 outlines waste management as an area of concern in our efforts to balance environmental, social, and economic factors (UN Department of Economic and Social Affairs, 2010). Agenda 21 clearly articulates a need for any sustainable development framework to focus on waste management, and further outlines the waste management hierarchy as the preferential method for the management of waste. The Ontario government has designated sustainability as a primary goal for a waste management system, noting: "Ontario's challenge is to determine how best to manage waste in a way that is sustainable and protective of the health and well being of communities and the environment" (Ministry of the Environment, 2004, p.16). With this being part of the 60% waste diversion goal's focus, all planning around waste management systems should be incorporating sustainability as a fundamental goal of each program.

Effective and sustainable organic waste management requires a strong emphasis on the waste management hierarchy, meaning all solutions should: first, try to reduce the volume of waste generated; second, find new uses for waste; third, recycle waste; and finally, dispose of waste not diverted in the first three steps (UN Department of Economic and Social Affairs, 2010). Given Ontario's focus on sustainable waste systems, all waste management planning choices should be

based on the ideals of the waste management hierarchy. Without this focus, it is questionable whether the resulting decisions would truly move our waste management systems toward sustainability.

2.2 Planning & Waste Management Planning

The profession of Planning is at the core of many municipal decisions, including waste management. There are currently two major themes being discussed in the professional planning literature; sustainable and healthy communities (Canada Mortgage and Housing Corporation, 2010; Ministry of Municipal Affairs and Housing & Ontario Professional Planners Institute, 2009). Both themes have evolved out of concern regarding the negative impacts that our growth and urbanization can have on the health of our communities and the environment. Planners, as the designers of urban areas, have the ability to effect change and bring forth solutions that address these concerns (OPPI, 2008; CMHC, 2010). Both the Ministry of Municipal Affairs and Housing and the Ontario Professional Planners Institute have indicated that planners have an impact on both the environment and human health, and should work to ensure that these impacts are of a positive nature (MMAH & OPPI, 2009). As planners strive to make communities healthier and sustainable, it is important to effectively address waste, since waste has a significant potential to impact people's health and damage the environment. Based on the literature, it is evident that waste management planners should consider ways to mitigate the impact their decisions have.

There is limited academic literature focused on waste management through the discipline of planning. Rather, the literature focuses on an economic or engineering approach (Barlisen & Baetz, 1996; Clarke, Read, & Phillips, 1999; Eriksson, et al., 2005; G. H. Huang, Baetz, Patry, & Terluk, 1997; Li, Huang, Yang, & Nie, 2008; Longden, Brannmer, Bastin, & Cooper, 2007; Philip Sinclair, Eleni Papathanasopoulou, Warren Mellor, & Tim Jackson, 2005; Rada, Istrate, & Ragazzi, 2009; Tanskanen, 2000; Zotos, et al., 2009). However, Hostovsky (2000) provides an in-depth review of planning literature related to waste management and generally concludes:

Overall, preferences in waste-planning models were divided along disciplinary lines, with planners favoring the [Rational Comprehensive] model and those in engineering/science favoring adaptive modeling (p. 313).

While Hostovsky (2000) notes that there is a difference in disciplinary approaches to waste management, he also recognizes that the majority of approaches rely on technical experts versus more participatory or adaptive management approaches. Hostovsky (2002) also examines the failure of the

environmental impact assessment process (based on the rational comprehensive approach) in Ontario to site new landfill facilities. Most of the planning (discipline) literature advocates the use of the Rational Comprehensive Model (RCM) or some variation that includes a public participation component (Hostovsky, 2002), which is to be expected given that the RCM is “a common basis for most municipal planning decision making and, arguably, the closest thing planners have to a planning paradigm” (Seasons, 2003, p. 431).

Hostovsky (2006) describes the RCM:

The rational comprehensive model takes a scientific/rational approach to problem solving and, in its purest application, would result in a full analysis of all possible factors affecting a given set of circumstances and of all possible alternatives to resolving the problem under study. The objectivity and complexity of the rational comprehensive model thus represents its greatest strength and its greatest weakness. Theoretically, it results in the “best” solution because it has taken into account the widest variety of variables. In practice, the processes it engenders can be overly complex, redundant, time-consuming, and expensive (p.382).

Seasons (2003) notes that planners adhere to the RCM almost dogmatically. The problem with this approach is that waste management planning problems are inherently “wicked”: as they have “no definitive formulation”; have no “ultimate test of a solution”; cannot be solved by “trial-and-error”; and are often symptoms of other problems. As such, solutions to these “wicked” problems are prone to failure and can prove difficult for the planning profession (Rittel & Webber, 1973). In addition “planners are often uncertain about the efficiency, effectiveness or impact of their interventions” (Seasons, 2003b, p. 430). Uncertainties do not fit well within the RCM, as the RCM seeks a technically perfect solution. The RCM looks to define a problem, seek solutions, evaluate alternatives, determine the perfect solution, and then implement it; this is illustrated in Figure 2-2.



Figure 2-2: Rational Comprehensive Model (Seasons, 2008)

The model is based on an assumption that planners have access to: a clear problem; various alternatives; complete baseline data; a comprehensive understanding of consequences; complete understanding of all stakeholders; and unlimited resources (Hostovsky, 2002 and Forester 1983). However, none of these variables can be fully realized when dealing with complex waste

management problems. Therefore, the ultimate goal of the RCM, a perfect solution, cannot be achieved. At best, the RCM provides an ideal we should strive for in decision-making. While striving for this ideal we need to protect against the shortcomings of the model, especially its reliance on complete information and unlimited resources. Seasons (2003) notes that many practicing planning use this model for decision-making, yet do not incorporate evaluation and continuous improvement safeguards to address the issues of limited information and resources.

2.2.1 Public Participation in Waste Management Planning

Public participation is often discussed in planning literature, and often as a response to more traditional planning approaches including the RCM. Arnstein (1969, p.2) outlines “a ladder of citizen participation” to determine the level of citizen participation in planning. The ladder contains the following rungs: “(1) Manipulation; (2) Therapy; (3) Informing; (4) Consultation; (5) Placation; (6) Partnership; (7) Delegated Power; (8) Citizen Control.” The meaningfulness of participation increases as you move up the ladder from “nonparticipation” (rungs 1-2) to “tokenism” (rungs 3-5); and finally to “citizen power” (rungs 6-8) (Arnstein, 1969, p.5). Ultimately Arnstein advocates for increased and more meaningful citizen participation in decision-making (Arnstein, 1969).

Interestingly, despite the lessons of Arnstein, some planning literature address the NIMBY (Not-In –My-Backyard) and NIABY (Not-In-Anybody’s-Backyard) phenomena and even goes so far as to blame it for planning failures (Greenburg, 1977; Kovacs, 1993). However, as the planning literature grew, many theorists began to look past NIMBY-ism and address the meaningful integration of citizen participation in the literature. In waste management planning literature, this can be seen through Heiman’s (1990) discussion regarding public opposition to the siting of hazardous waste facilities and a shift from the NIMBY attitude to a NIABY outlook. Heiman suggests that planners must conduct more meaningful public education and consultations to overcome citizen concerns regarding new hazardous waste facilities. While this does not represent a complete shift away from the RCM, it does put significantly more emphasis on the public participation component. In addition to Heiman, McGee (1991, p. 332) explains the complexities of NIMBY-ism:

Inappropriately, a NIMBY label is often attributed to those residents who are believed to oppose the project without a substantive, valid reason for objecting. This attitude is both part of the cause of NIMBY and a reflection of the lack of understanding by many decision-makers as to the complex reasons behind NIMBY.

Citizen participation (in this case NIMBYs) does not fit in well within the RCM, as it is not always conducive to the evidence provided by technical experts. However, much of the planning literature evolved to include a participatory component in the RCM (Andrews, 1971; Conn, 1978; Anderson and Greenburg, 1982; Bryson and Crosby, 1989; Pushchak and Burton, 1983; Rowe 1992; Richards, 1996; Sobral, Hipel and Farquhar, 1981; and Maimore, 1985). In an annotated literature review, Hostovsky (2006) notes that there is some use of participatory theories related to waste planning; however, participatory approaches are usually incorporated as add-ons to the predominate approach of either the RCM or engineering (often optimization). This concept is summarized below:

A recent literature review suggests that the RCM and participatory planning are becoming synonymous in waste management EIAs, even though planning theorists usually present them as separate models (Hostovsky, 2006: p. 391).

A comprehensive knowledge of stakeholder wants and values is one of the areas the RCM depends upon to develop a solution. However, such knowledge cannot be obtained without meaningful and extensive citizen engagement. The addition of participatory planning provides an avenue to gain that knowledge and engage citizens in the planning process, ideally allowing planners to develop a better solution.

Waste management planning theory and literature largely started in the 1970's when American planners began to place emphasis on alternative waste management planning approaches: many of these approaches were based on the 3Rs (Hostovsky, 2006). In Ontario the waste management planning process was largely codified with the Environmental Assessment Act (EAA). The EAA has significant roots in the RCM, as it requires alternatives to be established (determined predominately by technical experts) and from these the best solution is chosen. Hostovsky (2000) notes:

...the discipline of environmental impact assessment is also dominated by technical rationality. Thus, it appears that waste management planning, an area of practice that creates a synthesis between traditional planning models and environmental impact assessment through the application of various environmental impact assessment (EIA) regulations, has also demonstrated a slavish adherence to the technical comprehensive rational model (p. 305).

In addition to the use of the RCM, the EAA includes a public participation component that is often blamed for planning failures (Rowe, 1992; Hostivsky, 2006). However, Hostovsky (2006; p.392 – 393) believes the real reason for failure was a “strict adherence to the RCM.”

2.2.2 Equity in Waste Management Planning

A portion of the waste management planning literature focuses on the equity issues associated with siting of waste handling facilities. Much of literature emphasizes the need to locate disposal facilities near the point of waste generation (Lang, 1990). Lang (1990) outlines the City of Toronto and Ontario’s attempts and successes in exporting waste to other communities and concludes that it is not equitable to do so, as these communities are not responsible for the waste generation, noting: “Equity is now part of the waste management problem. Somehow, it must also become part of the solutions” (p.12). Lang (1990) also notes that waste management in Ontario is practiced by adherence to recommendations by technical experts rather than by using equity.

Pushchak & Burton (1983) also discuss equity in regards to waste management practices. They address community resistance to the siting of nuclear waste facilities, and establish the notion of societal equity in relation to waste management planning. In the case of nuclear waste facilities, the host community bears significant “perceived” social costs, while the public at large receives a less significant “actual” benefit. The article goes on to address monetary and non-monetary compensation as a means to balance the perceived or actual inequity. The idea is that a host community will be compensated for being a willing host to nuclear waste facilities, but the article clearly notes that compensation cannot be in exchange for less stringent safety considerations. This approach and focus on equity is also known as the willing host model.

Richards (1996) outlines an example of the willing host approach, focusing on siting hazardous waste landfills in Montclam, Manitoba (a willing host community) and the siting process (completed with little difficulty). Using this example, the author suggests that planners should search for a community (given they have an acceptable site) rather than a site itself.

Richards (1996) also outlines the following guidelines for community engagement, stating that: perception is everything; there needs to be sharing of power and responsibility through a co-management process; a voluntary process should delay focusing on communities and sites; people will not accept real or perceived environmental damage in return for economic benefits; a voluntary siting process is akin to a courtship; proponents must avoid seeking too much interest too quickly; the

proponents should seek ways to demonstrably make community priorities their priorities; the community defines itself; being responsive is crucial to project success; and local fears of a project being a “foot in the door” for something much larger must be addressed.

It is clear that engaging citizens in a meaningful and transparent manner is a fundamental of good waste management planning. However, the transfer of the ideal is less than guaranteed and is often over-looked. The research presented in this thesis will look at the issue of citizen engagement and buy-in to waste management-planning solutions.

2.2.3 Summary of Planning Models

Hostovsky (2000) outlines several planning models related to waste management planning (though they are not the dominant ones in use). Table 2-1 outlines these models as adapted from the literature.

Table 2-1: Summary of Waste Management Planning Models as Outlined by Hostovsky (2000)

| Model | Description |
|------------------------------|--|
| Comprehensive-Rational model | The dominant land use planning model in professional planning Staged approach: (1) ecological/socioeconomic profile, (2) examine alternative solutions, (3) best solution vis-à-vis criteria developed Reliance on planner as a “technician” |
| Incremental model | Attention given to the environment when there is a crisis—crisis management Environmental problems handled individually Planning responds to fragmented environmental regulations and is highly political |
| Adaptive (modeling) model | Reliance on modeling, especially computerized techniques Prepared responsiveness Recognizes successive and continuous approaches to human activity Anticipatory, predicts future events Recognizes dynamic character of ecosystem |
| Contingency model | Produce alternative courses of action to meet unexpected occurrences that may have adverse environmental consequences Mostly used for natural hazards or man-induced hazards Risk assessment based |
| Advocacy model | Ideology; planner cannot be neutral Cannot serve two masters Planning congruent with client values and goals Data may be manipulated to meet client goals Environmental outcome the “survival of the fittest” |
| Participatory model | Participatory democracy—public input into decision-making process Dispute resolution, mediation, negotiation Pluralistic view, looks for “win-win” planning alternatives Compromise does not ensure environmental quality |

Source: (Hostovsky, 2000: p. 307)

Based on the different models presented, it is clear that no one particular model presents the right approach to waste management planning. None are the right approach because they do not incorporate all aspects outlined above: sustainable development, citizen engagement, technically sound site and program selection, and an ability to incorporate continuous improvement. Therefore, it is important that waste management planners adjust their disciplinary approach, and consider a new theory that combines the strengths of various planning models. Planners, rather than looking for the perfect solution, should focus how we can make timely and meaningful progress to planning interventions that protect human health and the environment. It is likely that waste management planners need their own specific model, rather than adapting traditional planning models like the RCM.

2.3 Other Disciplinary Approaches to Waste Management

Environmental economics is often used when developing and implementing waste management systems. The environmental economics approach attempts to account for both traditional monetary costs and less traditional externalities, such as potential for water contamination, with the intention of finding the lowest cost option (Kinnaman, 2009; Palmer, Sigman, & Walls, 1997; Pipatmanomai, Kaewluan, & Vitidsant, 2009; Shmelev & Powell, 2006; Sonesson, Björklund, Carlsson, & Dalemo, 2000; Tudor, Adam, & Bates, 2007; Zotos, et al., 2009). While using environmental economics provides good information, it fails to adequately account for the long-term use of land associated with landfill applications. It also fails to address citizen concerns.

Another common approach to waste management planning is optimization (an engineering approach). It attempts to address as many factors as possible to provide the optimal waste management solution, based on the factors and value weighting considered (such as: time, money, distance, and risk). Much of the current literature examines how optimization can address issues such citizen concern (Chung & Poon, 1996; Earth Tech Canada Inc., MacViro Consultants Inc., & Gartner Lee Limited, 2001; G. H. Huang, et al., 1997; Gordon H. Huang, Linton, Yeomans, & Yoogalingam, 2005; Li, et al., 2008; Lin & Chen, 2009). Barlishen et. al. (2009. p.75) note that an engineering approach looks at (1) waste generation and composition forecasting; (2) technology evaluation; (3) source separation composting and recycling programme design; (4) facility cost and operational data estimation; (5) facility location, sizing and investment timing, and waste allocation investigation; and (6) simulation of an existing or proposed MSW management system. It is noted that engineering and

optimization provide a “reasonably objective form of decision support system for use at the municipal and regional MSW management decision-making levels” (Barlিশen et. al., 2009, p.84).

However, much like the RCM approach to waste management planning, environmental economics and optimization are looking for a perfect solution. An expert evaluates options, generates a model, and determines the best solution. These approaches do not allow for complex problems and are not based on incrementally moving towards better solution. Instead the perfect perfect solution must be found and implemented.

2.4 Integrated Solid Waste Management Planning

The Waste Management Hierarchy; also known as the 3Rs or 4Rs (reduce, reuse, recycle, and recovery) is a common approach to developing and evaluating waste management solutions. This hierarchy (shown in Figure 2-3) focuses on moving waste management from less desirable (landfilling) to more desirable diversion strategies (waste reduction) (Environment Canada, 1996; MacLaren, 2004).

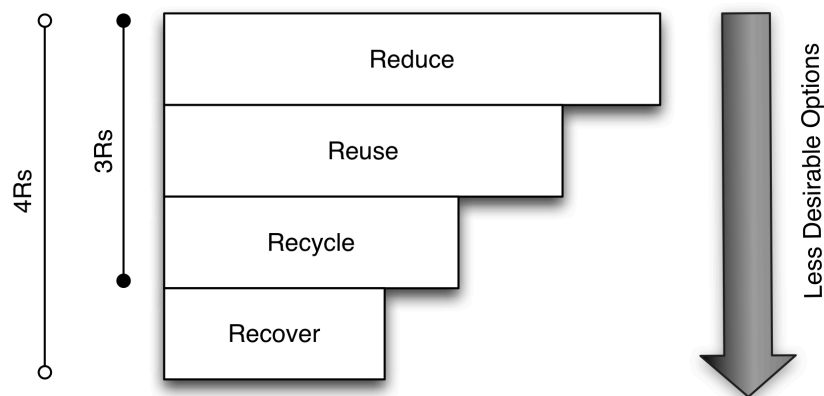


Figure 2-3: 3Rs & 4Rs Waste Management Hierarchy

Source: (Environment Canada, 1996; MacLaren, 2004)

While other conceptual frameworks in the waste management field have become considerably more complex, including integrated waste management, integrated solid waste management, life cycle assessment, and environmental economics, it is important to note that each of these incorporates some aspects of the waste management hierarchy (Dijkgraaf & Vollebergh, 2004; Haight, 2005; Li, et al., 2008).

The United States Environmental Protection Agency (2002, p.5) describes ISWM as “...a comprehensive waste prevention, recycling, composting, and disposal program.” Figure 2-4 illustrates the conceptual model for an ISWM system. McDougall and White (2001, p.19) outlined the components of an ISWM system, which include an optimized collection program; appropriate recycling; biological treatment of organic material; thermal treatment (waste-to-energy) of waste that cannot be diverted; and finally the landfilling of residuals. In addition to these key components, McDougall and White (2001) indicate that an ISWM system should aim for environmental effectiveness; aim for economic affordability; be integrated; be market oriented; be flexible; take care to define clear objectives; take care to design a total system against those objectives; take care to operate on a large enough scale; and never stop looking for improvements in the overall environmental performance and methods to lower operating costs, all while keeping in mind there is no perfect system. As such, an ISWM is a systems or holistic approach to waste management, providing significant benefit.



Figure 2-4: Components of Integrated Solid Waste Management

Source: (US Environmental Protection, 2002)

The US Environmental Protection Agency (2002) also suggests a planning process for the implementation of an ISWM system. Figure 2-5 illustrates this process. The key component of the planning process is that it incorporates an iterative loop. The process is never complete, there is constant evaluation and refinements made towards an ideal solution. This focus allows for incremental improvements to be made, rather than a focus on finding the perfectperfect solution.



Figure 2-5: ISWM Planning Process

Source: (US Environmental Protection, 2002)

The United States Environmental Protection Agency (2005, p.3) outlines some key considerations when implementing a ISWM plan, including: “are existing laws and policies adequate to allow the government to properly implement ISWM?”; “what types of waste does your community generate and how is it managed?”; “where will you go to get funds for creating a solid waste management system?”; “what will it cost to implement various waste management activities?”; “where will you build collection and disposal facilities and what equipment will you need?”; and “will solid waste management activities affect the environment?” These considerations highlight the ISWM’s focus on being a holistic approach to waste management.

Since the ISWM looks at a holistic waste management system and is focused on incremental improvement, it provides a good lens to examine organic waste diversion in Ontario. Ontario already has a well-established waste management system, including blue box recycling. However, with the establishment of a 60% waste diversion goal there is a need to make incremental improvements to the system. In addition to embracing an incremental approach, the ISWM is focused on the value of the waste management hierarchy. Since the focus in Ontario is diversion, rather than least costs or the most popular solution, the ISWM provides a framework to examine the planning process that aligns with the purpose of that process.

2.5 Planning in the Greater Golden Horseshoe

In 2006 the Ontario Government released *The Growth Plan for the Greater Golden Horseshoe* (Order-In-Council No. 1221/2006). This document outlines a plan to accommodate population growth in the GGH, as it is expected that the area will grow by 3 million people in the next 21 years. A central focus of this document is to increase urban density and ensure the protection of our agricultural lands (Ministry of Public Infrastructure Renewal, 2006). The increased population and population density provide a challenge for waste management planners who do not have sufficient capacity for the waste we currently generate, let alone that of an additional 3 million people. Given the focus on increased intensification it is important that effective waste management strategies are employed.

2.6 Waste & Organic Waste Management in Ontario

Ontario provides an interesting backdrop for waste management planning, as it is home to the first blue box program; a successful deposit refund system; bold diversion goals; an extended producer responsibility initiative; and the Green Energy Act (Canadian Institute for Environmental Law and Policy, 2008, 2009; Ministry of Energy and Infrastructure, 2009; Ministry of the Environment, 2009). However, Ontario still faces many challenges when trying to manage the volume of waste we generate. The Ontario Waste Management Association has indicated that we have shrinking landfill capacity (Ontario Waste Management Association, N.D.). Without significant progress towards our waste diversion goals, landfill supplies will continue to decline. Many organic waste diversion programs have been slow to develop. As we look forward, we need to critically examine why past approaches have not worked and adjust to ensure that we successfully implement diversion programs. The Ministry of the Environment's (2007) Policy Statement on Waste Management Planning highlights the Greater Golden Horseshoe as an area requiring waste management attention, due to population growth. It is important that this attention is effective and provides increased diversion from landfill. The following sub-sections will provide an overview of waste management in Ontario, and highlight some unique features of this landscape.

2.6.1 Ontario & Canadian Waste Generation Statistics

In 2004 Ontario generated over 12 million tonnes of solid waste. Of this, 9.4 million tonnes were sent to landfill; meaning only 2.6 million tonnes (21.6%) of waste were diverted for reuse or recycling (Ministry of the Environment, 2004). Given the nature of waste generated by the industrial,

commercial and institutional (IC&I) sector (composed of: 23% paper; 21% wood; 11% metal; 5% glass; 3% plastic) and the residential sector (composed of: 26% paper; 25% food; 13% yard; 5% glass; 4% plastic; 2% ferrous; 1% aluminum), which is largely divertible, this represented a significant failure to effectively manage waste according to the waste management hierarchy (the 3Rs) (Ministry of the Environment, 2004). The waste stream breakdowns are presented in Figures 2-6 and 2-7. Based on the composition of Ontario's waste it is possible to achieve between 63% and 76% waste diversion.

Ontario generated 4.39 million tonnes of residential waste in 2002 (Statistics Canada, 2005), with diversion estimates for residential waste ranging between 949,830 and 1.2 million tonnes (or approximately 27%) during this time (Ministry of the Environment, 2004; Statistics Canada, 2005). There is significant potential to increase the diversion of organic waste in this sector, and doing so will be important to meeting Ontario's waste diversion targets. In order to achieve better organic waste diversion there needs to be a focus on good planning and sustainable development; elements that appear to be missing from the current system.

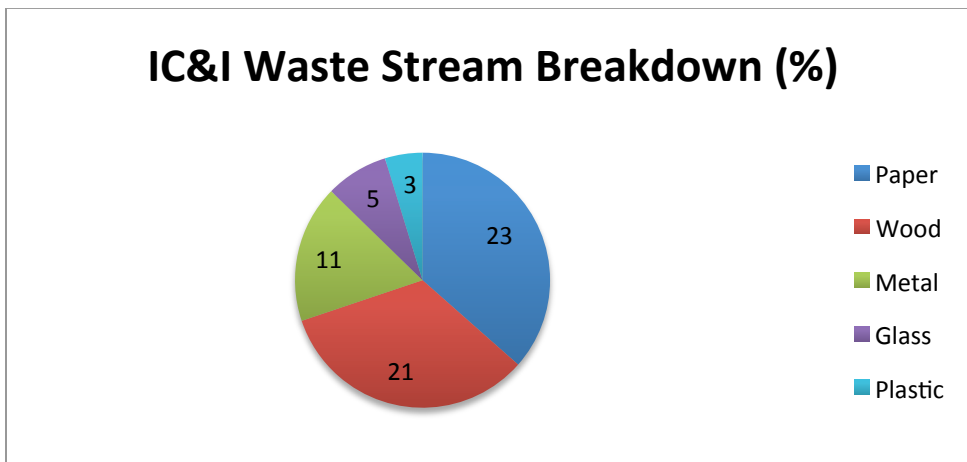


Figure 2-6: IC&I Waste Stream Breakdown

Source: (Ministry of the Environment, 2004)

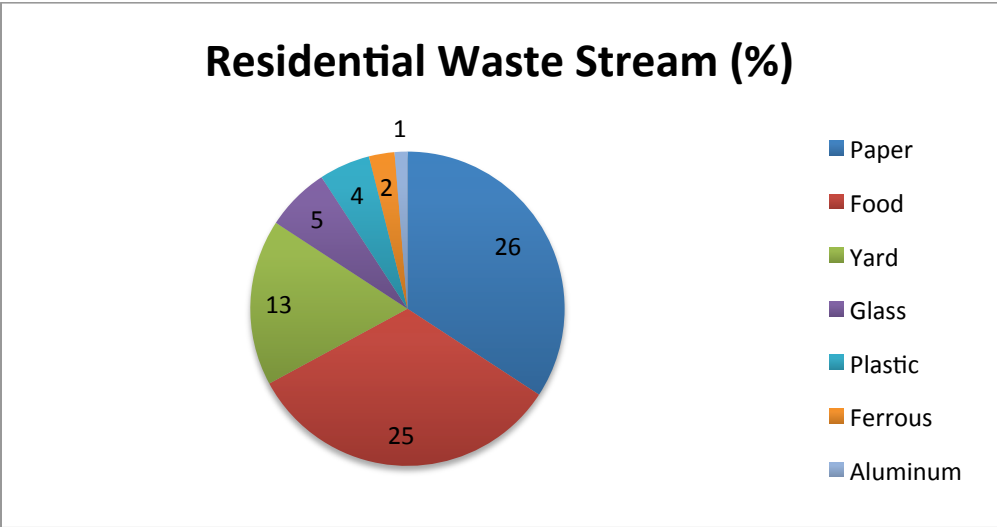


Figure 2-7: Residential Waste Stream Breakdown

Source: (Ministry of the Environment, 2004)

2.6.2 Limited Landfill Capacity

Given the volume of waste Ontarians generate and our low diversion rates, significant landfill capacity is required. To this end, Ontario has spent a significant amount of time and money attempting to site new waste disposal facilities, with little luck establishing new facilities. This failure has forced the issue of waste diversion, and has caused Ontario to investigate new strategies to extend the lifespan of its landfills (Hostovsky, 2002; 2006). In 2005 the Ontario Waste Management Association (OWMA) took an inventory of landfill capacity in Ontario, identifying 79.5 million tonnes of usable approved capacity. This was a significant decrease (through usage) from the 117 million tonnes identified in 1999 (Ontario Waste Management Association, N.D.). In response to decreasing landfill capacity, there have been several attempts to site new facilities in Ontario. However, regardless of site selection methodology, there has been significant public opposition to these undertakings and little success increasing landfill capacity (Hostovsky, 2006; MacLaren, 2004).

Given the limited approval of new landfills, the rate at which Ontarians generate waste, and our low diversion rate, even the most optimistic projections only provide Ontario with 9.5 years of landfill capacity, without the export of waste to other jurisdictions. It is also important to note that there is some concern regarding the security of our ability to export waste to the United States. Goldstein (2004) highlights political pressures in the United States to close the border to Canadian waste. Exporting waste is clearly not a guaranteed waste management method. It therefore falls on

waste management planners to come up with alternative strategies. A major focus of these strategies will need to be the diversion of organic waste, as it represents a significant proportion of the waste stream. van der Werf & Cant (2007) notes that organic waste makes up about half the residential waste stream and therefore is vital to diversion efforts and landfill lifespans. In Ontario there has been the creation of curbside organic waste collection programs, in an effort to increase the lifespan of landfills (Smith and Lantz 2005b). However, the research presented in this thesis will show that these efforts have been insufficient to make significant progress towards the province's diversion goals. It is important that the organic waste diversion programs increase in effectiveness in order to ensure the longevity of our landfills.

2.6.3 Provincial Waste Diversion Targets

In 2004, as a response to our low diversion rate and limited landfill capacity, Ontario established a waste diversion target for the province, requiring 60% of all waste be diverted from landfill by 2008 (Ministry of the Environment, 2004). The Ministry of the Environment (2004) produced a summary report regarding the public consultation processes associated with setting the diversion goal, which showed strong general support. However, support for this target has failed to achieve significant progress towards the desired diversion rates. Current estimates place Ontario's waste diversion rate at 22% (39% of residential and 12% of IC&I) (Ministry of the Environment, 2009). The provincial government's drive towards higher diversion should be used as a catalyst for quick and meaningful change to our current waste management system. Much of the needed change will come through the effective diversion of organic waste, as it represents a significant portion of the waste stream.

2.6.4 Curbside Organic Waste Management in Ontario

MacLaren (2004) notes that waste management planning in Ontario has been largely focused on the collection and disposal of discarded goods and on the diversion of recyclables. However, this historic focus has done little to divert significant amounts of waste from our landfills, as much of the diversion potential is in organic waste. van der Werf & Cant (2007, p.29) note that while "organic waste seems like an obvious place to start with regards to MSW diversion," recycling is often the diversion strategy receiving the most attention.

The establishment of the 60% goal changed the focus of diversion efforts to organic materials (Lantz & Smith, 2005). The Ministry of the Environment's 2009 review of the Waste

Diversion Act noted “26 Ontario municipalities, including the Greater Toronto Area municipalities, have implemented household organic composting programs” (Ministry of Environment, 2009). In a report planning for their own organic waste collection program, the Region of Halton collected information on organic waste diversion programs in select Ontario cities (Crockett, 2007a). The findings of this report are summarized in Table 2-2.

Table 2-2: Summary of Select Organic Waste Program from the GGH in Ontario in 2007

| Region | Status | Residential Participation | Processing | Diversion |
|-----------------|-------------------|---------------------------|-------------------------|-----------|
| Halton | Demonstration | 49% | Aerated Windrows | 43% |
| Toronto | City Wide | 90% | Anaerobic Digestion | 53% |
| Markham | City Wide | 88% | Static pile & in-vessel | 52% |
| Vaughan | City Wide | 60% | Static pile & in-vessel | 31% |
| Richmond Hill | City Wide | Not Reported | Static pile & in-vessel | 28% |
| York | Being Implemented | Not Reported | Static pile & in-vessel | 33% |
| Niagara | Being Implemented | 50% | Windrow | 47% |
| Peel | Pilot | 85% | Aerobic Composting | 45% |
| Durham | Region Wide | 80%-90% | In-vessel + Windrow | 36% |
| Peterborough | Pilot | 40% | Windrow | 60% |
| Hamilton | City Wide | Not Reported | In-vessel aerobic | 37% |
| Dufferin County | Pilot | 70% | In-vessel | 34-57% |

Source: (Crockett, 2007a)

The Region of Halton’s report indicates that each of the select cities is operating some form of curbside organic waste collection and diversion program. The report highlights 12 municipalities, mostly in the Greater Golden Horseshoe. Six municipalities are operating full-scale programs, with the other half in either the pilot or implementation stage. Participation ranges from 40% to 90% (of the population served by the program) and has organic waste diversion ranging from 31% to 60% (Crockett, 2007a). It is important to note that an effective organic waste diversion program must approach a 100% diversion rate to ensure we are able to meet the 60% goal. Given the results of this report, there are areas for significant improvement (participation and diversion) that need to be understood. This understanding will allow for the creation of a better waste management system.

2.6.5 Other Organic Waste Management Programs In Ontario

In addition to curbside organic waste collection programs, many municipalities have maintained support for existing backyard-composting programs. Backyard composting in Ontario has been a popular initiative that has achieved some diversion success. However, these programs are not sufficient to achieve the results required under the province’s waste diversion goal (Ministry of the

Environment, 2004). The Ministry of the Environment (2004) highlights that approximately 485,000 tonnes of organic waste, from residential sources, were composted in 2002. Lantz & Smith (2005) note shortfalls in Ontario's composting system that have created our failure to achieve 60%, including: composting is not a key part of the overall strategy; landfilling food is still considered reasonable by some jurisdictions; composting is comparatively expensive to landfilling; Ministry of Environment approval for composting facilities is difficult to navigate; the impact of the NIMBY phenomenon; lack of regulatory support; inconsistent nature of the waste stream; and variations in market conditions. These factors have failed to create a system that is capable of achieving the province's 60% waste diversion goal. Without a focus on correcting these shortfalls we will continue to divert a low amount of our waste, see shrinking landfill supply, and have a negative impact on our environment (Lantz & Smith, 2005).

2.7 The Management of OFMSW

The effective management of the organic fraction of municipal solid waste is important, as it will minimize the impact our waste has on the environment and human health. While organic waste is considered non-hazardous, it can still have significant impacts on our environment (United States Environmental Protection Agency, 2009). Depending on the management methodology selected (landfill, compost, anaerobic digestions), organic waste can have a variety of impacts, including leachate and greenhouse gas emissions (El-Fadel, Findikakis, & Leckie, 1997). It should be noted that the vast majority of organic waste diversion in Ontario and Canada is managed through landfilling or composting (Marshall & Elliot, 2008; Statistics Canada, 2005, 2006). The following subsections will address the various management methodologies in detail, providing insight to what makes for an effective organic waste diversion system.

2.7.1 Organic Waste Collection & Source Separated Organics (SSO)

The first step in an organic waste diversion program is to collect the waste in a manner that allows for proper management. In the case of municipal organic waste, this is often referred to as source separated organics (SSO). "Municipalities recognize the limitations of curbside recycling programs and understand that to reach the 60 percent target, curbside collection of food residuals and other compostable materials must be initiated" (Smith and Lantz 2005b, p.43). Much of the debate is no longer about whether or not to have a curbside organics collection program, but rather what mechanics are required to achieve the highest participation (Smith and Lantz, 2005a). While the

current trend for collection has been toward “green bins” or “green carts,” there is also the option of using plastic bags. Plastic bags often have several perceived advantages, including: control of liquids and odours; easier management within a home; and there are no containers to clean. However, plastic bags can cause processing issues, and are often not used because they do not breakdown in the composting or anaerobic digestion process as readily as the organic waste (Smith and Lantz, 2005a). It is important that an appropriate SSO methodology is selected to prevent the contamination of the waste stream (with recyclables or other waste), as to ensure the organics can be used in various treatment options without additional costs (Smith and Lantz, 2005ab). Once separated at the source, municipal organic waste needs to be collected for treatment: this can be done with separate trucks, or split trucks that collect waste and organic waste. Either option requires a significant capital investment; ideally the co-collection presents the best economics (Smith and Lantz, 2005a).

2.7.2 Landfill

Household organic material has only recently become a target of diversion efforts. Historically, organic waste was included in the curbside trash where it was collected and disposed of in landfills (Environment Canada, 1996). When municipal organic waste is disposed of in sanitary landfills, it decomposes over time generating methane, carbon dioxide, and landfill leachate (Eriksson, et al., 2005; Kaplan, Decarolis, & Thorneloe, 2009; Ruth, 1998). In an effort to extend the life of our landfills and minimize the impact of waste management systems, many governments have moved to a system of integrated waste management, where individual streams of waste are disposed of in a more optimal fashion (Clarke, et al., 1999; De Feo & Malvano, 2009; Geng, Zhu, & Haight, 2007; MacLaren, 2004; Rada, et al., 2009). While historically landfills have been used as a universal solution for waste management, times have changed and diversion must occur. Flindall and Haight (1991, p. 435) note, “If the provincial targets are going to be met, organic waste must be kept out of Ontario’s landfills.” In the case of municipal organic waste, the technologies used for diversion include compost and anaerobic digestion. It is important to highlight landfilling as a component of the organic waste management strategy, as much of Canada and Ontario’s organic waste still ends up in landfill. This reduces their lifespan and increased the impact we have on the environment (Marshall & Elliot, 2008; Statistics Canada, 2005, 2006).

2.7.3 Compost

Haight and Flindall (1991, pp. 435-436) define composting as “...the biological decomposition of organic materials under controlled conditions.” It is important to note that composting occurs under aerobic (with oxygen) as opposed to anaerobic (without oxygen) conditions (United States Environmental Protection Agency, 2009). This distinction becomes important when discussing the various treatment methodologies for organic waste. The final product of composting is “compost,” which can be used in landscaping to enhance the soil with nutrients (County of Dufferin, 2010; Flindall & Haight, 1991; Otten, 2001; United States Environmental Protection Agency, 2009).

Composting is often used as an organic waste diversion methodology (Otten, 2001; Sonesson, et al., 2000). Cost is likely the largest factor in choosing composting over a technology such as anaerobic digestion (Sonesson, et al., 2000). Composting can also be implemented both on a municipal scale using “static piles,” “windrows” or “in-vessel” methods, or on an individual scale, using backyard composting programs (Flindall & Haight, 1991, p. 438). The most common municipal applications of composting noted during this research were windrows and backyard composting programs. While composting is an effective methodology (both in terms of cost and operation) for the treatment of organic waste, it does have some significant shortcomings. Composting generates significant amounts of methane and carbon dioxide, contributing to greenhouse gas emissions. The final product may also contain environmental toxins and pathogens (De Feo & Malvano, 2009; Flindall & Haight, 1991, p. 40; Haight, 2005; Mohareb, Warith, & Diaz, 2008; Otten, 2001; Solano, 1999; United States Environmental Protection Agency, 2009).

2.7.4 Anaerobic Digestion

Charleston (2008, p. 23) outlines anaerobic digestion (AD) as “... the biodegradation of organic matter in the absence of oxygen.” While compost and anaerobic digestion both treat organic waste, both generate methane and carbon dioxide, and both create a usable end product (compost or biosolids), anaerobic digestion also has the potential to generate energy. Anaerobic digestion is completed under highly controlled conditions in the absence of oxygen, in a process that also captures and uses the generated methane. The biosolids, which are residual products from the process, can be used as fertilizer in agricultural applications (Balat & Balat, 2009; Charleston, 2008; Hamzawi, 1997; Mata-Alvarez, et al., 2000; Sonesson, et al., 2000; Tilche & Galatola). The capture of methane provides an environmental benefit, as methane is a greenhouse gas with a global warming potential

23 times greater than carbon dioxide (Environmental Protection Agency, 2010). In a study completed by Haight (2005, p. 558), the conclusions note:

By employing a life cycle methodology to quantify energy consumed (produced) and emissions released, a comparative analysis of differing waste management options can be performed. In the study described significant improvements to the waste management system were observed when AD was introduced as an option to process the organic fraction of wastes. Improvements were better than composting alone or when energy recovery was included at the landfilling operations.”

While anaerobic digestion presents some excellent opportunities for waste diversion, it should be noted that the cost of implementation is considered prohibitive due to the infrastructure associated with the creation of an appropriate facility. As such, often compost is chosen on this basis (Pipatmanomai, et al., 2009; Sonesson, et al., 2000).

2.8 Summary of the Literature Review

The literature review examined literature that provides the bases for this Thesis. It examined the RCM, sustainable development, waste management planning, and the ISWM. This section will summarize the findings of the Literature Review.

Sustainable Development is a fundamental underpinning of many environmental planning decisions that are made. It focuses on balancing environmental, economic, and social factors. Effective waste management can be evaluated through the lens of sustainable development, as it can have impacts in all three areas of consideration. In order to protect the environment, and lower the long-term economic and social costs of waste, the Province of Ontario established a 60% waste diversion goal. The goal has not been met. It would seem that the planning process has broken-down, and is not implementing interventions quickly enough to increase diversion. The literature review shows that participating municipalities have implemented various organic waste diversion strategies in an effort to increase diversion, as this is where diversion potential exists. However, many of these programs have been slow to develop, have had trouble leaving the pilot stage, and have not factored in the diversion of ICI sector waste.

As Hostovsky (2002; 2006) indicated, planners, when making waste management decisions, use the RCM most often. As such, the RCM may have an impact on the effective and timely implementation of waste diversion programs. Seasons (2003) notes that the RCM is the fundamental paradigm used by planners, but its reliance on finding the technically perfect solutions often limits its

ability to address complex issues. Given the nature of waste management, the RCM might not be the best planning approach. The ISWM, and its focus on continual improvement, presents a more flexible option that allows for the complexities associated with waste management.

The implementation of organic waste diversion programs is not the first example of RCM failure in Ontario's waste management system. Hostovsky (2006) examined the failure to site new landfills in the province, noting the process relied heavily on the RCM. The process cost millions of dollars, took many years, and yet created little new landfill capacity. Hostovsky (2006) labeled this a successful failure since the province continues to effectively manage waste, and began the process of focusing on diversion. However, in hindsight, it is clear that we are not making significant progress towards higher diversion rates. Without a better understanding of the factors underlying this failure, the province will not be able to continue to effectively manage waste and make progress towards the ideals of sustainable development.

Chapter 3: Methodology

In Ontario there has been a failure to successfully implement the RCM as a model for waste management planning. Hostovsky (2002; 2006) examined this from the perspective of the landfill siting process and noted the use of the RCM failed to make any significant progress in the creation of new landfills. Hostovsky (2006, p. 383) characterized this as a “failure-as-success” noting, “...though landfill siting has largely failed, waste continues to be efficiently managed, even demonstrating increased diversion rates.” The literature review suggests this is not true, that significant diversion rates have not been achieved, and that our efficient management of waste will only last as long as we have landfill capacity. Once planners realized that siting new landfills was not an option, they moved towards examining new diversion programs, applying the RCM to these projects. The research presented in this thesis examines why these programs did not successfully increase our diversion rates, despite significant opportunity for organic waste diversion.

Based on the findings of the literature review, this research intends to provide insight into the organic waste diversion planning process for select municipalities in the Greater Golden Horseshoe of Ontario. The research objectives are to: (1) examine the development of curbside organic waste collection programs in the Golden Horseshoe of Ontario; (2) identify the barriers and drivers that feed decisions around the planning process; and (3) examine why the planning process did not ultimately create a result that met the 60% waste diversion goal.

The research conducted was examined from the “Pragmatic Worldview,” characterized by: “concern with applications”; “solutions to problems”; and a focus on the problem rather than a specific research methodology (Creswell, 2009, p.10). This lens was selected because the research examines very practical problems, and focuses on the issues identified by the practitioners of waste management planning. This chapter of the thesis outlines the research methodology employed.

3.1 Research Design & Methods

A qualitative approach was used in the research design. The features of qualitative research include: data derived from the “natural setting”; the researcher’s immersion in the research; “multiple sources of data”; “inductive data analysis”; retention and seeking of the “participants’ meaning”; “emergent design”; the use of a “theoretical lens”; it allows interpretive inquiry; and it provides a holistic account (Creswell, 2009, p.175). Qualitative research allows for a greater understanding of the planning issues involved in organic waste management, rather than simply looking at the volume of waste generated and its final destination. Much of the data collected during this research was

anecdotal, or from datasets that were not consistent across municipalities. The inconsistency of data reporting formats across municipalities made any form of quantitative analysis impossible. Some of the inconsistency was because the municipalities were in varying stages of program development. The research was divided into three distinct phases including: a literature review (outlined in Section 3.1.1); data collection (Section 3.1.2); and data analysis (Section 3.1.2).

3.1.1 Phase 1: Literature Review

During the formation of the research problem and questions outlined in Chapter 1, a literature review was completed. The literature review is a crucial element of the research, as Creswell (2009, p. 25) explains below:

The literature review accomplishes several purposes. It shares with the reader the results of other studies that are closely related to the one being undertaken. It relates a study to the larger, ongoing dialogue in the literature, filling in gaps and extending prior studies. It provides a framework for establishing the importance of the study as well as a benchmark for comparing the results with other findings.

In order to meet the research objectives, the literature reviewed scholarly journals, trade journals (such as Plan Canada), and government documents. These documents developed the context for waste management planning in Ontario and provide an understanding of currently accepted waste management planning practices.

3.1.2 Phase 2: Data Collection

Data collection focused on select cities in the Greater Golden Horseshoe (GGH) located in southwestern Ontario. The GGH was selected for this study for several reasons including: it is one of the most populated areas in Canada and has significant need for effective waste management; it is an area that is provincially mandated to increase intensification under the Places to Grow Act; several of the municipalities in the area have limited landfill capacity, so waste diversion is a major focus; the area is under the mandate of the 60% waste diversion goal; and the area has historically had various issues associated with its waste management planning practices (Hostovsky, 2006).

Municipal governments in Ontario are responsible for the collection and management of residential sector waste. As such they play a vital role in the planning of organic waste management systems and are the pivotal source of information for this thesis. Eight municipalities in the GGH were contacted for participation. Before contact, publicly available documents were reviewed and

individualized interview questions were developed. This ensured that the questions were tailored to each municipality and encouraged greater depth in their responses. Copies of the survey questions are provided in Appendix “A”. Each municipality was then contacted regarding their potential participation in the study, with the options of an in-person interview (preferred), telephone interview, or written responses. This was done to encourage participation regardless of potential time constraints. Questions focused on three distinct themes: general organic waste management; development of the municipality’s organic waste collection program; and processing capacity development and collaboration with other municipalities. The intention of these questions was to determine what is currently being done for the management of organic waste and how that will change in the future. The County of Dufferin and the Region of Halton agreed to provide in-person interviews. These were completed as semi-structured interviews in order to provide a richness of information. The remaining participants provided detailed written responses and all offered to allow for follow-up questions.

Table 3-1 provides an overview of the municipal participants contacted, documents reviewed prior to contact, and the status of their participation in the study. Table 3-2 provides the rationale for participant selection.

Table 3-1: Potential Municipal Participants

| Potential Participant | Documents Reviewed | Status of Participation |
|-----------------------|---|--------------------------|
| County of Dufferin | Waste management website | Participated (interview) |
| Region of Waterloo | Waste management master plan (2006) | Participated (written) |
| Region of Halton | Waste management website | Participated (interview) |
| Region of Peel | Long term waste resource management strategy (2004) | Participated (written) |
| City of Hamilton | Solid waste management master plan; 2002-2009 Annual Report Cards | Participated (written) |
| Region of Niagara | Waste management website | Did not participate |
| City of Toronto | Waste management website | Did not participate |
| City of Guelph | Waste management website | Did not participate |

Table 3-2: Rationale for Participant Selection

| Potential Participant | Rational for Selection |
|-----------------------|--|
| County of Dufferin | The County of Dufferin represented a small municipality that had implemented significant diversion programs. The County of Dufferin’s organic waste program has been in development for several years. |

| | |
|--------------------|---|
| Region of Waterloo | The Region of Waterloo was the home of the first blue bin program. They are now developing a curbside organic waste diversion program. The Region of Waterloo also has a significant amount of remaining landfill capacity. |
| Region of Halton | The Region of Halton provides waste management services to a wide geographic area with both significant rural and urban populations. |
| Region of Peel | The Region of Peel has limited landfill capacity. It has set its own waste diversion goal of 70% and is using various diversion strategies to meet this goal. |
| City of Hamilton | The City of Hamilton used a significant public consultation process to develop its waste management strategy. It has also worked with Niagara to partner on waste management facilities. |
| Region of Niagara | The Region of Niagara was included because of its close working relationship with the City of Hamilton. |
| City of Toronto | The City of Toronto is the largest urban centre in Canada. It also has developed significant waste management infrastructure. |
| City of Guelph | The City of Guelph was included because it was one of the first municipalities in Ontario to develop a curbside organic waste collection program, but has had significant issues with the maintenance of the program. |

The municipalities selected for this study presented a broad cross-section of waste management planning in the Greater Golden Horseshoe. They all fall within the same general geographic area, the west side of Toronto, allowing the research to show any collaboration between municipalities. While other municipalities could have been included in the research, it was determined that these municipalities have significant responsibility for organic waste management. Each municipality was also actively engaged in the development of a curbside organic waste collection program. Other municipalities west of Toronto (not included in the study) had not been identified as having developed any significant organic collection programs.

3.1.3 Phase 3: Data Analysis

Information collected through the interviews and written responses were summarized. This allowed for common themes (such as organic waste management approaches) to emerge. The point of

the data analysis was to demonstrate similarities and differences in the development of municipal organic waste management systems. The results of this analysis can be seen in Chapter 5. The data was further analyzed to look at the barriers that have prevented Ontario from achieving its waste diversion goal of 60%. Based on the information collected, a series of indicators were used to assess and comment on the data. These are presented in Table 3-3 and will be included throughout the case studies.

Table 3-3: Barriers to 60% Waste Diversion

| Barrier to 60% Diversion | Indicator | Rational for Usage |
|---------------------------------|---|---|
| Lack of Political Will | Start of curbside organic collection program and motivation for development. Use of market instruments to deter landfilling. | McDungall and White (2001) indicated that waste management solutions should have the support of the appropriate level of government. In the municipal setting, council must approve all undertakings such as an organic waste diversion program or the use of market instruments to deter landfilling. The idea behind these indicators is to assess the degree to which local politicians were willing to take aggressive action towards the 60% diversion goal. |
| Failure of RCM | Inability to efficiently leave the pilot stage. | The RCM is based on finding technically perfect solutions. This does not work well with complex issues, such as waste management. As such a more adaptive approach should be used. McDungall and White (2001) clearly indicate that a perfect solution should not be sought in an ISWM system. Inability to efficiently leave the pilot stage was used to show the RCM's endless search to find a perfect solution. |
| Failure to Collaborate | Lack of consideration for others' learning | McDungall and White (2001) and the US Environmental Protection Agency (2002) outlined the need to assess available information in the planning process. They also emphasize that an ISWM should take advantage of economies of scale and opportunities for collaboration. As such these indicators were selected to determine the success of the development of curbside organic waste collection programs. |

3.1.4 Triangulation

Triangulation was used to provide strength to the qualitative research presented. Flick (1992) notes that triangulation provides validity to qualitative research. A literature review, semi structured interviews, and review of relevant municipal waste management documents (these documents were often provided during the interview or with written responses) were used to provide triangulation and ensure the rigor of the research undertaking.

3.1.5 Research Ethics

The research presented in this document received clearance from the University of Waterloo's Office of Research Ethics on September 29, 2009 under file number ORE#15929.

3.1.6 Research Limitations

The researcher was unable to reach the level of participation desired for the thesis. Despite repeated attempts to contact various individuals at the City of Guelph, City of Toronto, and the Region of Niagara, there was no response to the researcher's inquires. As such, while the research provides significant insight into organic waste management in Ontario, it does not provide the same rigor as would have been achieved with more participants. Specifically of note is the absence of the City of Toronto and the City of Guelph. Both of these cities have significant experience with organic waste management that would have provided valuable insight to the research.

Chapter 4: Case Studies of Select Municipalities in the GGH

The Greater Golden Horseshoe (GGH) is an area that is generally described as south-central Ontario and surrounds the west and northwest end of Lake Ontario. The area is made up of 21 municipalities and occupies an area of 31,561.57 km² (Ministry of Public Infrastructure Renewal, 2006). Figure 4-1 illustrates the geographic location and geopolitical boundaries of the GGH.

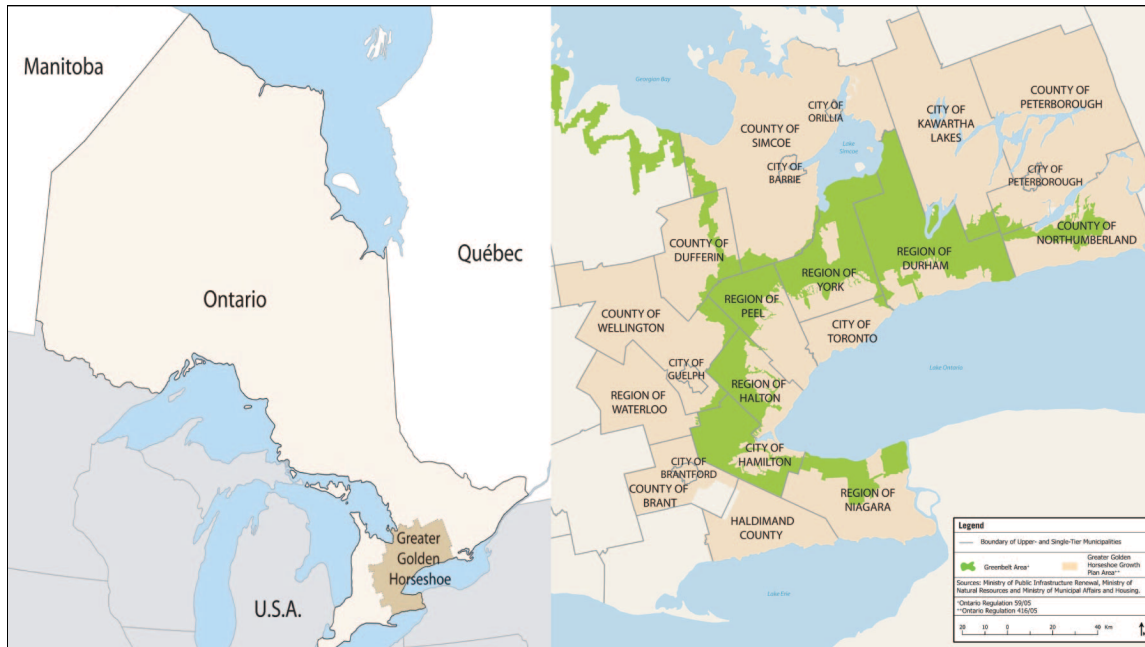


Figure 4-1: The Greater Golden Horseshoe

Source: (Ministry of Public Infrastructure Renewal, 2006)

With a population of 8.1 million people, the GGH is the most populated and urbanized area of Canada. The area experienced a population growth rate of 8.4% between 2001 and 2006, adding over 630,000 people (Statistics Canada, 2009). This chapter of the thesis comprises the case studies of municipal organic waste management in five area municipalities: the Region of Waterloo; the County of Dufferin; the City of Hamilton; the Region of Peel; and the Region of Halton. Each of these municipalities is part of the Greater Golden Horseshoe.

4.1 Region of Waterloo

The Region of Waterloo (Waterloo) is the most westerly municipality (Shown in Figure 4-2) in the GGH and is designated as a growth centre in *The Growth Plan for the Greater Golden Horseshoe* (Order-In-Council No. 1221/2006) (Ministry of Public Infrastructure Renewal, 2006). The

area's population in 2006 was 438,515, occupying an area of 1,360 square kilometers (Statistics Canada, 2010d). It is expected that by 2031, the Region of Waterloo will have grown to over 700,000 people (Ministry of Public Infrastructure Renewal, 2006).

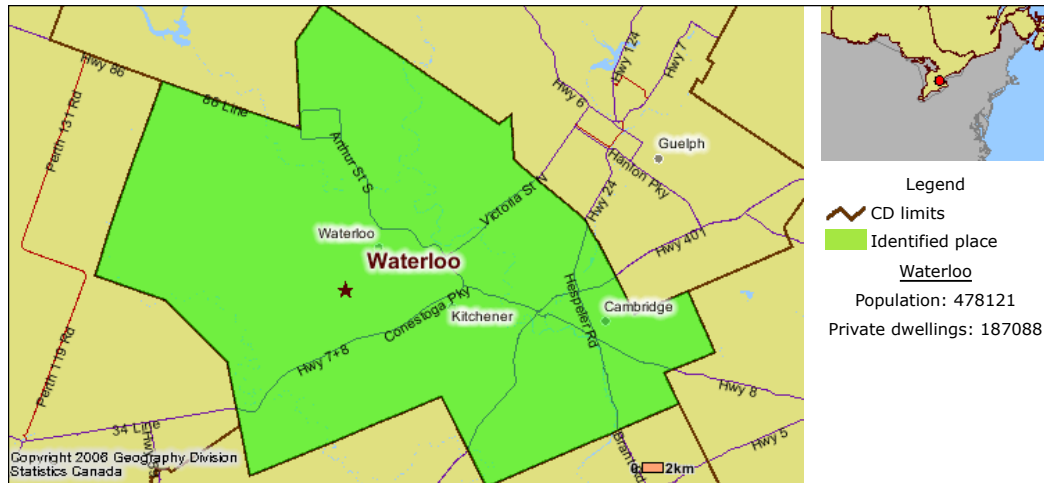


Figure 4-2: Region of Waterloo, Ontario

Source: (Statistics Canada, 2010d)

During this research undertaking, a representative of the Region of Waterloo's Waste Management Division was contacted for an interview. On March 11, 2010 the representative provided a written response to the interview questions. The following subsections provide the results and analysis of the research.

4.1.1 General Waste Management Information

The Region of Waterloo's Organic Waste Coordinator provided information regarding sources of organic waste managed by the Region. The Region of Waterloo manages the following organic waste from residential sources: seasonal yard waste through curbside collection; yard waste drop off at transfer stations; food waste/household organic materials through a curbside collection program; and loose leaf collection/land spreading. It also manages the following organic waste from IC&I sources: drop off at transfer stations; and Regional buildings have food waste organic collection. The Region of Waterloo does not accept waste from outside jurisdictions. Table 4-1 outlines the volume of waste collected from these sources. The information provided was 2008 data, as 2009 had not yet been calculated. It should be noted that waste collected through the Green Bin (curbside organics collection) program is likely less than what can be expected in the future, as 2008 was a pilot year for the program. The Green Bin program was collecting waste from 10,000 homes

from January to mid October 2008; in late October 2008 an additional 40,000 homes were added to the program. Yard waste is currently managed at the Cambridge Waste Management site and is composted in open windrows. Organic material collected through the Green Bin program is managed at transfer sites and is "...currently bulk[ed] and ship[ped] to [the City of] Hamilton for processing" (K. Kitagawa, response to interview questions, March 11, 2010).

Table 4-1: Region of Waterloo’s Managed Organic Waste Volumes (2008)

| Source of Organic Waste | Volume of Waste Managed |
|--|-------------------------|
| Residential Yard Waste – Curbside | 12,000 tonnes |
| Residential Backyard Composting | 7,700 tonnes |
| Green Bin Organics (Food Waste) | 1,700 tonnes |
| Residential and IC&I Yard Waste Drop Off | 25,300 tonnes |

An overview of organic waste management services offered in the Region is provided in Table 4-2.

Table 4-2: Region of Waterloo’s Organic Waste Diversion Program

| Program | Description |
|---------------------------|---|
| Backyard Composting | Over 75,000 backyard composters have been distributed in the past 15 years. Approximately 2,000 additional units are distributed each year. These are provided at no cost to residents. |
| Yard Waste Collection | Curbside pickup is provided to single-family homes every other week during the yard waste season (March to November). Yard waste can be set out for pick up in reusable containers, paper yard waste bags, or bundles. The yard waste is processed and composted in open windrows. |
| Christmas Tree Collection | Curbside collection is provided to single-family homes for the two weeks following Christmas. The processed wood chips are provided to residents from April until late fall free of charge. |
| Centralized Composting | Waterloo operates a 15-acre centralized composting site in Cambridge. "Yard waste and leaves are piled in windrows; monitored weekly; turned via loader." "After 6-8 months samples are taken and analyzed at an independent lab to ensure compliance with MOE guidelines." "Compost is provided to residents in 2 free giveaways (each spring and fall) at our Waterloo and Cambridge waste management sites." "Residents come to our Waterloo and Cambridge sites to pick up compost at these giveaways – and are encouraged at that time to make donations to the local food banks." "Otherwise, compost is sold in bulk to nurseries, landscapers." |
| Leaf Landspreading | The Region provides loose-leaf collection during the fall. The collection occurs curbside and at depots and is provided in the Cities of Kitchener, Waterloo and Cambridge. "These leaves are diverted to area farms for tilling into crop fields through a program managed by the Region." "The Region works with area farmers to establish Certificates of Approval, sample soil, sample leaves, etc." "The amount of leaves diverted through this program depends on the weather (e.g., field conditions)." |
| Green Bin Organics | 40 litre Green Bins are provided to residents and are used for food waste. |

| | |
|-------------|--|
| | Organic waste is “Collected in split body trucks (collecting both garbage and food waste organics). Trucks drop off at facilities located at both our Cambridge and Waterloo Waste Dropped off.” This waste is bulked and shipped to the City of Hamilton. |
| Landfilling | There is no current ban on food and yard waste at the Region’s landfill. A “potential ban has been proposed for 2013.” |

4.1.2 Waste Management Planning Towards the 60% Diversion Goal

The Region operates several different organic waste diversion programs including: backyard composting; yard waste collection; Christmas tree collection; centralized composting; leaf land spreading; and most recently curbside organics collection. The Region has been operating some form of organic waste diversion program for over 15 years (i.e., backyard composter give away). However, with the voluntary mandate of 60% waste diversion established by the province, the Region developed a more formal organic waste management strategy in 2006 (K. Kitagawa, response to interview questions, March 11, 2010).

In 2006 the Region released their *Waste Management Master Plan – 2006 Update*, outlining all aspects of the Region’s waste management strategy. Most importantly (from the perspective of this thesis) it outlines the plan for a curbside organic waste collection program. The report notes that based on a 2005 residential waste audit, compostable organics represent approximately 21% of the Region’s waste stream. Since waste not captured by backyard composting is ultimately landfilled, the Region identified the need to establish an expanded recovery of organic waste (Region of Waterloo, 2006).

The report went on to propose the development of a curbside organic waste collection pilot program, noting:

Staff are in the process of developing a one-year food waste organics pilot project expected to run from October 2006 to September 2007. Approximately 5,000 households in the tri-cities area will participate in this program. Food waste will be collected weekly on residents’ regular garbage day (Region of Waterloo, 2006, p. 8.8).

The intent of the 12-month pilot program was to assess the diversion rates, cost, and effectiveness. This information was going to be used to inform the roll-out of a full-scale curbside organic waste collection program. The report also outlined several metrics that would be used in the evaluation of its success, including: waste diverted; volume and nature of complaints; costs; participation; and

seasonal variations (Region of Waterloo, 2006). Table 4-3 provides a timeline outlining the development of the Region’s waste management activities.

Table 4-3: Region of Waterloo’s Organic Waste Diversion Timeline

| Year | Organic Waste Diversion Developments |
|---|---|
| 1995 | Backyard Composting Implemented |
| 1996 | Development of various other waste diversion initiatives including: yard waste collection; Christmas tree collection; centralized composting; and land spreading. |
| 1997 | |
| 1998 | |
| 1999 | |
| 2000 | |
| 2001 | |
| 2002 | |
| 2003 | |
| 60% Waste Diversion Goal Established | |
| 2004 | |
| 2005 | |
| 2006 | Recommendation of curbside organic waste collection pilot program. Pilot including 5,000 homes was started in October. Limited use of bin liners. |
| 2007 | An additional 5,000 homes were added to the pilot program. Limited use of bin liners. |
| 2008 | An additional 40,000 homes were added to the pilot program. Full use of bin liners |
| 60% Achievement Deadline | |
| 2009 | An additional 42,000 homes were added to the pilot program |
| 2010 | Planned full scale implementation in Fall of 2010 |

When asked if the Region of Waterloo considered the pilot program a success, an interesting and indicative answer was given. The representative noted, “We considered the pilot phases successful given we have expanded” and went on to say when fully implemented, the Green Bin program could divert up to “10,000 tonnes/year from single family households”; “up to 20,000 tonnes/year if/when multi-residential (and some businesses) [are] added to program”; and “with the potential landfill ban, [the program] could divert upwards of 40,000 tonnes/year.” This information is also documented in a report to council outlining Green Bin program plans ((K. Kitagawa, response to interview questions, March 11, 2010; Archibald, 2008). The criteria outlined for success in the above quotes do not align with the provincial diversion goal or the rationale for an organic waste collection program outlined in the master plan, as it does not define success as the achievement of 60% waste diversion.

The Region of Waterloo’s Waste Management Master Plan – 2006 Update indicates that there is a lack of organic processing facilities in Ontario. In its plan to implement a full-scale curbside

collection program, the Region is likely to continue to send its organic waste to Hamilton or Guelph, as it would cost approximately \$40 million to establish its own processing capacity. However, this could change, as staff are still investigating the Region’s options (Region of Waterloo, 2006).

4.1.3 Analysis of Case Study

The following table (Table 4-4) provides an analysis of the case study against the evaluation criteria set out in the methodology. This will be used at the end of each case study, and will be used in the summary section to provide an overview of organic waste management planning in the Greater Golden Horseshoe.

Table 4-4: Assessment of Region of Waterloo Against Evaluation Criteria

| Barrier to 60% Diversion | Indicator | Analysis |
|--------------------------|--|--|
| Lack of Political Will | Start of curbside organic collection program and motivation for development. | <p>The Region of Waterloo began a backyard-composting program in 1995, well before the 60% waste diversion goal was established. Between 1995 and 2005 several other programs (i.e., yard waste collection) were created, but it was not until 2006 that the Region started a pilot program to investigate the use of curbside organic waste collection. This program started a full two years after the diversion goal was established. It continued to expand in small increments until its full implementation in 2010. This slow and late development process clearly shows that the political will needed to achieve the 60% waste diversion goal was not in place. In addition to these facts, the representative from the Region of Waterloo noted: “We considered the pilot phases successful given we have expanded.” While it is clear that the program was successful from this perspective, it failed to meet the provincial goal by the deadline established.</p> |
| | Use of market instruments to deter landfilling. | |

| | | |
|------------------------|---|---|
| | | forces. To this end the Region should have implemented a ban on organic waste from landfill, to ensure there was a driver to encourage participation (the Region is considering doing this in 2013). |
| Failure of RCM | Inability to efficiently leave the pilot stage. | The pilot study was originally suggested to be a one-year study to determine the effectiveness of curbside organic waste collection in the Region. However the program remained in the pilot stage for almost five years. Given the short timeframe to the 60% waste diversion deadline, there should have been quicker, more significant action. |
| Failure to Collaborate | Lack of consideration for others' learning | The Region did not fully include bag liners at the start of their program. If the Region had learned from other pilot programs, it would have ensured these were included from the start, allowing for a more timely adoption of the program. |

The Region has developed a curbside organic waste collection program that is moving towards full-scale implementation. Given the need to achieve 60% waste diversion by 2008, the creation and implementation of program took far longer than desired. The Region did not incorporate learnings for other municipalities and, in fact, made some of the same mistakes. Despite being an early leader in waste diversion, the Region of Waterloo has fallen behind its peers examined in this study.

4.2 County of Dufferin

The County of Dufferin is located north of the County of Wellington and includes the Town of Orangeville. Figure 4-3 illustrates a detailed map of the County. The County of Dufferin's population in 2006 was 54,436, occupying an area of 1,485 square kilometers (Statistics Canada, 2010a).

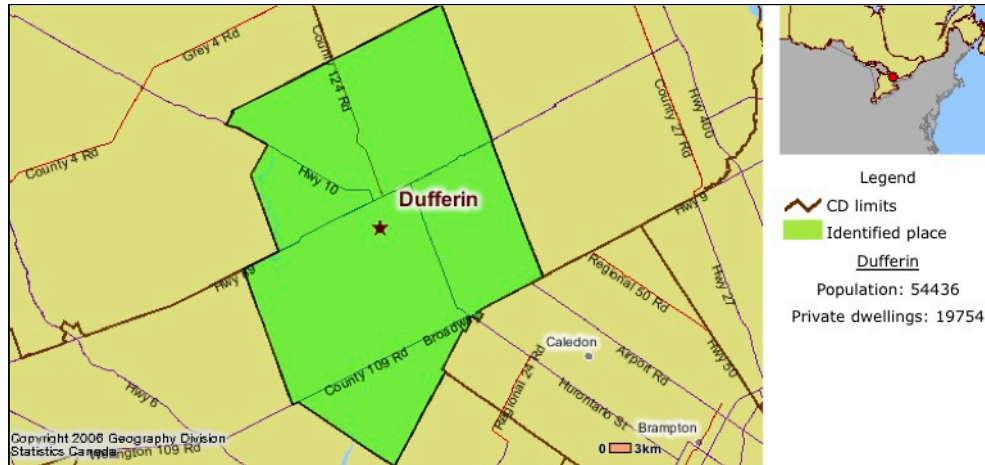


Figure 4-3: County of Dufferin

Source: (Statistics Canada, 2010a)

The waste management coordinator for the County of Dufferin was contacted and an interview was arranged for March 29, 2010. The following information summarizes the results of that interview and documents the County of Dufferin's organic waste management practices.

4.2.1 General Waste Management Information

There is a division of waste management activities within the County of Dufferin. The County is responsible for organic waste, hazardous, and electronic waste, while the eight lower tier municipalities within the county are responsible for yard waste (only collected by some), garbage, and recyclable collection. The County of Dufferin collects waste from single-family residences, small commercial operations, the local hospital, and schools: no waste is received from other jurisdictions. In addition to the Green Bin program (curbside organic collection), the County of Dufferin also buys backyard composters to provide to the lower tier municipalities. Table 4-5 outlines the organic waste management programs that the County of Dufferin has in place (M. Kovacs, response to interview questions, March 29, 2010).

Table 4-5: County of Dufferin’s Organic Waste Management Programs

| Management Program | Detailed Information |
|---------------------|---|
| Backyard Composting | The County of Dufferin purchases backyard composters for distribution to the lower tier municipalities. They are sold at cost (\$30) and this is a cost recovery program. The introduction of the Green Bin program in 2007 has reduced the number of backyard composters being sold. |
| Green Bin | The Green Bin program accepts most organic waste including food waste and soiled paper products, but does not accept diapers or kitty litter. The restrictions are the same as the Region of Peel, as that is the final location for disposal. No plastic bag liners can be used, only certified compostable liners. The County of Dufferin does not have a participation rate for their Green Bin program due to the effort required to determine this. However the County’s representative noted that they believe it is approximately 50%. All waste collected through the Green Bin program is disposed of at the Region of Peel’s compost facility. There is no long-term contract with Peel for this service, but it is believed that the Region of Peel would give plenty of notice if the waste needed to go elsewhere. |
| Yard Waste | This is collected by the lower tier municipalities and is not the responsibility of the County of Dufferin. Only three of the eight lower tier municipalities collect yard waste due to their urban nature. |

4.2.2 Waste Management Planning Towards the 60% Diversion Goal

In 2009 the County of Dufferin marked the tenth anniversary of its curbside organic waste collection program, which began as a pilot project servicing 2,000 homes. The County’s representative noted that in the early 1990s they were looking to establish a new landfill site. As a condition of the proposed Certificate of Approval, the Ministry of the Environment required the County to develop an additional diversion program; they chose to invest in curbside organic waste collection. The initial phase of the pilot program included approximately 2,500 homes, and “...went on for two years and everyone thought it went well, but it took until 2007 for it to go county wide, just for budget reasons mostly” according to the Waste Management Coordinator. Between the pilot program and full implementation in 2007, the program underwent several significant changes, including green bins rather than plastic bags (plastic bags were originally selected to be compatible with the City of Guelph’s organic waste processing facility); organic waste disposal moved from the City of Guelph to the Region of Peel, due to the closure of the City of Guelph composting facility; allowing the use of compostable bin liners in the green bins; and the addition of new households to

the program (M. Kovacs, response to interview questions, March 29, 2010). Table 4-6 provides a timeline outlining the development of the County’s waste management activities.

Table 4-6: County of Dufferin’s Organic Waste Diversion Timelines

| Year | Organic Waste Diversion Developments |
|---|---|
| 1999 | Development of curbside organic waste collection pilot program, servicing 2,500 homes |
| 2000 | |
| 2001 | |
| 2002 | |
| 2003 | |
| 60% Waste Diversion Goal Established | |
| 2004 | |
| 2005 | |
| 2006 | |
| 2007 | Full-scale implementation of curbside organic waste collection program, servicing approximately 25,000 homes. |
| 2008 | Allowed the use of certified compostable bags (bin liners). |
| 60% Achievement Deadline | |
| 2009 | |
| 2010 | |

The County of Dufferin did not end up constructing the landfill, which was the impetus for the development of an organic waste program. The County of Dufferin’s waste management coordinator noted: “quite honestly, we are a small municipality so I don't know if it [the development of the organic waste collection program] would have happened the way it did if we were not encouraged”. It was also noted that "our local municipal councilors have been very supportive.” While the landfill was not developed, the planning process associated with it clearly moved the County of Dufferin towards more progressive waste management strategies (M. Kovacs, response to interview questions, March 29, 2010).

Through their implementation of a curbside organic waste collection program, the County of Dufferin was able to document several key learnings, including seasonal and yearly variations in organic waste volumes; socio-economic factors in the collection of organic waste; concerns over using the compostable bag liners, as only certain composting facilities accept these; and the benefits for lower tier municipalities (Kovacs Reid & Lewis, 2010). It was noted that the lower tier municipalities have implemented “a ‘Clear Bag’ policy for garbage” (Kovacs Reid & Lewis, 2010, p.

5). The bag limit was reduced to one bag; this significantly increased the volume of organic waste collected between 2008 and 2009 (Kovacs Reid & Lewis, 2010). The report concludes:

Implementing garbage bag restrictions and limits will encourage residents to think of the 3 R's (reduce, reuse, recycle) first. Through the Green Bin Program and the municipal recycling programs, householders can achieve greater diversion of waste from landfill (Kovacs Reid & Lewis, 2010, p. 5).

It was also noted that adding popular features such as certified compostable bags or the weekly collection of divertibles (as opposed to for bi-weekly for non-divertibles) could significantly increase participation. The representative noted that their collection subcontract noticed a significant increase in the volume of organic waste associated with 50-90% of participants using certified compostable bags. However, it should be noted that only some facilities accept these, which could pose a problem for treating the County's organic waste (Kovacs Reid & Lewis, 2010).

The County of Dufferin, while a smaller municipality (in terms of population), has been actively involved in the waste management planning process. As noted, the County of Dufferin had planned on siting a landfill in the early 1990s; however, these plans were not acted upon, as there was little will by council or citizens.

According to the County of Dufferin's representative, the planning process for an organic waste processing facility started in 2005. The County requested expressions of interest for energy-from-waste and composting facilities, as they were interested in finding a different use for the land originally designated for a landfill (M. Kovacs, response to interview questions, March 29, 2010).

There were numerous responses to this request, and it was decided at the time it would be best to proceed with compost. The County of Dufferin recognized that it did not generate enough organic waste for a composting facility and therefore required a partner. The County of Dufferin reached out to neighbouring municipalities, and the Region of York was the only response. The drivers to seeking the partnership were a reduction in capital cost for the County, and securing enough organic waste to make a facility viable. The major issues faced when developing the partnership included dealing with two sets of councils and staff, and getting everyone to agree upon each step. The County of Dufferin is now "...in a Request for Proposal process with the Region of York to build our own composting facility on the property that was supposed to be the landfill". The Waste Management Coordinator for the County of Dufferin noted:

The driver to that process was there are various councilors that do not want that property to be used as a landfill site and therefore they wanted other uses. One being a composting facility, another one potentially being gasification energy-from-waste facility for garbage. Another driver is that there is not a lot of organics processing capacity in the province (M. Kovacs, response to interview questions, March 29, 2010).

It was also noted that the Region of York is looking to increase its capacity and options for processing organics and they partnered with the County of Dufferin "...because we have the land." "Also [the Region of York] has been relying on the private sector and this would be owned by [the County of Dufferin and the Region of York] but designed, built, and operated by the private sector." The representative noted that there are issues with sending organic waste to a completely private facility; there is a lack of control and risks associated with facility closure (M. Kovacs, response to interview questions, March 29, 2010).

4.2.3 Analysis of Case Study

The following table (Table 4-7) provides an analysis of the case study against the evaluation criteria set out the in methodology.

Table 4-7: Assessment of County of Dufferin Against Evaluation Criteria

| Barrier to 60% Diversion | Indicator | Analysis |
|--------------------------|--|---|
| Lack of Political Will | Start of curbside organic collection program and motivation for development. | The County of Dufferin began a curbside organic waste collection pilot program in 1999. Considering the size of the municipality, this was a very progressive action. The motivation was due to a requirement in the Certificate of Approval for a new landfill to start a new diversion program. The County did not go full-scale on their diversion program until 2007. Given the size of the municipality, it did an exceptional job developing a collection program. Much of this was due to strong local political will. |
| | Use of market instruments to deter landfilling. | No market instruments were consistently used in the County of Dufferin. However, they are looking at this for the future. Some of the lower tier municipalities have used bag limits and bans on organic waste from landfill. |
| Failure of RCM | Inability to efficiently leave the | The County of Dufferin did not leave the pilot |

| | | |
|------------------------|--|---|
| | pilot stage. | stage for ten years. This is likely indicative of a lack of resources provided to the waste management department. |
| Failure to Collaborate | Lack of consideration for others' learning | Given that the County of Dufferin pilot program started in 1999, there was little chance for them to learn from others in the study area. |

The County first established a curbside organic waste collection program in 1999, well before many other municipalities outlined in this study. The motivation behind such an early start was a condition included in a Certificate of Approval for a proposed new landfill. When it was decided not to proceed with a new landfill, progress on the curbside collection program seemingly slowed down.

4.3 City of Hamilton

The City of Hamilton is located on the southwestern side of Lake Ontario and is depicted in Figure 4-4. The City of Hamilton's population in 2006 was 504,559, occupying an area of 1,117 square kilometers (Statistics Canada, 2010e).



Figure 4-4: City of Hamilton

Source: (Statistics Canada, 2010e)

The waste management department at the City of Hamilton was contacted on May 14, 2010 via Email requesting an interview (interview questions were attached to the Email). On June 2, 2010 the City of Hamilton agreed to participate in this study and provided written answers to the interview questions on July 12, 2010. The following subsections summarize the results of that interview.

4.3.1 General Waste Management Information

According to the City of Hamilton's waste management representative, the City manages organic waste generated by residents through a curbside organic waste collection program green cart, along with leaf & yard waste collected at curbside and depot. Additional organics are received at the central composting facility from other municipalities. The City of Hamilton manages 87,500 tonnes of organic waste annually: 41% from residential sources; 16% from leaf and yard waste; and 43% from other municipalities. The City of Hamilton representative also notes that the City promotes the use of backyard composters and units are available for sale through its Municipal Service Centres year round. On November 21, 2001 waste management staff at the City of Hamilton submitted a Solid Waste Management Master Plan (SWMMP) to the Mayor and members of City Council. The

document included 19 recommendations dealing with the full breadth of the City of Hamilton's waste management system. It established a diversion goal of 65% by 2008. Council approved the SWMMP on December 5, 2001. The report included several recommendations regarding the City of Hamilton's organic waste management practices (Goodger, 2001). The recommendations included: the development of an organics processing facility; the adoption of three-stream waste collection; and that the City should seek out partnerships with neighbouring municipalities (Goodger, 2001).

4.3.2 Waste Management Planning Towards the 60% Diversion Goal

One of the key components to the City's SWMMP was the development of three-stream waste collection. An Annual Report Card notes that the "Green Cart Project" (curbside organics collection) started in October 2003 with over 2,300 households; in 2003 the participation rate was approximately 61% and the capture rate was approximately 50% (an increase from 48% in 2002). Council approved the expansion of the program, and there was a "diversion rate of 53% across the demonstration area" (City of Hamilton, 2003, p. 6).

The Annual Report Card for 2004-2006 discussed the phased implementation of the "Green Cart Project" and planning for the city-wide roll-out in 2006, which was completed in April 2006 (City of Hamilton, 2004, 2005, 2006). The 2007 Annual Report Card noted that 2007 was the first full year of "Green Cart" service to single family homes. It also noted that the City of Hamilton was beginning the process of implementing the "Green Cart" program in multi-residential buildings (City of Hamilton, 2007). The 2008 and 2009 Annual Report Cards noted that the "Green Cart" program is continuing to be implemented in multi-residential buildings; the program now accepts compostable bin liners; and the City of Hamilton is investigating the possibility of implementing a commercial "Green Cart" program (City of Hamilton, 2008, 2009). The City of Hamilton's waste management representative noted:

The City implemented the "green cart" program by following previous implementation processes used for extra blue box delivery (the second box) and multi-residential blue cart delivery. We also improved the methodology based on studies done since the last roll-out (multi-res blue cart). A compliment of students (10) [were] hired to assemble the [green carts], put together communication packages, stuff them into mini bins and deliver everything door to door. Every door was knocked on and questions were answered on the spot (A. Storey, response to interview questions, July 12, 2010).

The representative also noted the following barriers and drivers were considered in the development of the curbside organic waste collection program, including the “yuck factor”; odours and cleanliness; and fear of disease vectors. It was noted that the biggest drive to adoption was increased waste diversion. The City of Hamilton has had success with participation, citing a 71% participation rate for single-family households. The program is still being implemented at multi-residential units. The City of Hamilton considers the program successful, saying: “Yes, it has contributed to our diversion rate and as garbage container limits are lowered residents that have not been utilizing their green cart are now encouraged to do so” (A. Storey, response to interview questions, July 12, 2010).

In addition to implementing three-stream waste collection, the City of Hamilton has sited a centralized composting facility. According to the City of Hamilton’s 2003 Annual Report Card, a Request for Proposal for a centralized composting facility was issued, and a site has been selected (City of Hamilton, 2003). The 2004 Annual Report Card noted “Council awarded the design, build, and operations of the Central Composting Facility to Maple Reinders Constructors Ltd” (City of Hamilton, 2004, p. 6). In 2005 the Annual Report Card provided an update, noting: “Central Composting Facility construction commenced in February 2005, facility was 75% complete by the end of 2005 and all process equipment has been received” (City of Hamilton, 2005, p. 6). The 2006 report notes that “[the central composting facility] began operation in June 2006” (City of Hamilton, 2006, p. 6). The 2007-2008 Annual Report Cards did not provide any additional updates regarding the central composting facility (City of Hamilton, 2007, 2008, 2009). According to the City of Hamilton representative, the facility processes “60,000 tonnes per year with a peak capacity of 90,000 tonnes per year.” It was also noted that “[t]his facility is considered a great success due to its efficient operations and its waste diversion ability” (A. Storey, response to interview questions, July 12, 2010).

Based on the information provided in reports and the interview with a waste management representative, the following timeline of organic waste management division activities can be established (shown in Table 4-8).

Table 4-8: City of Hamilton’s Organic Waste Diversion Timelines

| Year | Organic Waste Diversion Developments |
|---|---|
| 2001 | Creation of the Solid Waste Management Master Plan. |
| 2002 | |
| 2003 | A curbside organic waste collection pilot program servicing 2,300 households waste began. |
| 60% Waste Diversion Goal Established | |
| 2004 | Phased implementation of curbside organic waste collection. |
| 2005 | Phased implementation of curbside organic waste collection. |

| | |
|---------------------------------|---|
| 2006 | Full-scale implementation of curbside organic waste collection program. Centralized Composting Facility began operations. |
| 2007 | |
| 2008 | Started a phased roll-out of curbside organic waste collection program to multi-residential buildings. |
| 60% Achievement Deadline | |
| 2009 | Allowed the use of certified compostable bags (bin liners). |
| 2010 | |

One of the recommendations in the SWMMP suggests that the City of Hamilton “should seek opportunities to share waste diversion facilities with neighbouring municipalities” (Goodger, 2001, p. 2). This was achieved through several initiatives, including; research into a joint waste-to-energy venture with Niagara; and acceptance of organic waste from the Region of Waterloo, Region of Halton, and the County of Haldimand at the centralized compost facility (City of Hamilton, 2003-2008). The City representative noted that a driver to partnering with a neighboring municipality would be the sharing of resources (e.g., consultants) and information. A barrier would be the lack of consistency in programs (e.g., different municipalities allow different items in their green carts) (A. Storey, response to interview questions, July 12, 2010).

4.3.3 Analysis of Case Study

The following table (Table 4-9) provides an analysis of the case study against the evaluation criteria set out the in methodology.

Table 4-9: Assessment of City of Hamilton Against Evaluation Criteria

| Barrier to 60% Diversion | Indicator | Analysis |
|--------------------------|---|---|
| Lack of Political Will | Start of curbside organic collection program and motivation for development. Use of market instruments to deter landfilling. | In 2001 the City of Hamilton created its Solid Waste Management Master Plan. The SWMP outlined the need for a curbside organic waste collection program. In 2003 a pilot program was initiated. In 2006 there was a full-scale roll-out to single family residential homes. In 2008 there was a phased roll-out to multi-residential buildings. The City Hamilton started the planning process before the 60% waste diversion goal was established and completed its roll-out before the 60% waste diversion goal deadline. This indicated that there was local political will to ensure that curbside organic collection was implemented; much of this was |

| | | |
|---|---|--|
| <p>driven through citizen input.</p> <p>The City of Hamilton has not used market instruments to try to reduce the amount of organic waste going to landfill. It did not indicate any intention to consider these in the future.</p> | | |
| Failure of RCM | Inability to efficiently leave the pilot stage. | In 2001 the City recognized the need for curbside organic waste collection. In 2003 a pilot program was introduced, and in 2006 the program went full-scale. While this represents a relatively short process in the GGH, it still took five years from the recognition of the need to implementation. |
| Failure to Collaborate | Lack of consideration for others' learning | The Region did not include bag liners at the start of their program, and did not incorporate them until 2009. If the Region had learned from other pilot programs it would have ensured these were included from the start, allowing for a more timely adoption of the program. |

The City of Hamilton utilized one of the most participatory planning process of the municipalities examined. They formed a citizens committee, which created recommendations that have shaped the development of their waste management system. The City still took five years to move from pilot to full-scale with their organic waste collection program.

4.4 Region of Peel

The Region of Peel is located on Lake Ontario between the Region of Halton and the City of Toronto and is shown in Figure 4-5. The Region of Peel’s population in 2006 was 1,159,405, occupying an area of 1,242 square kilometers (Statistics Canada, 2010b).

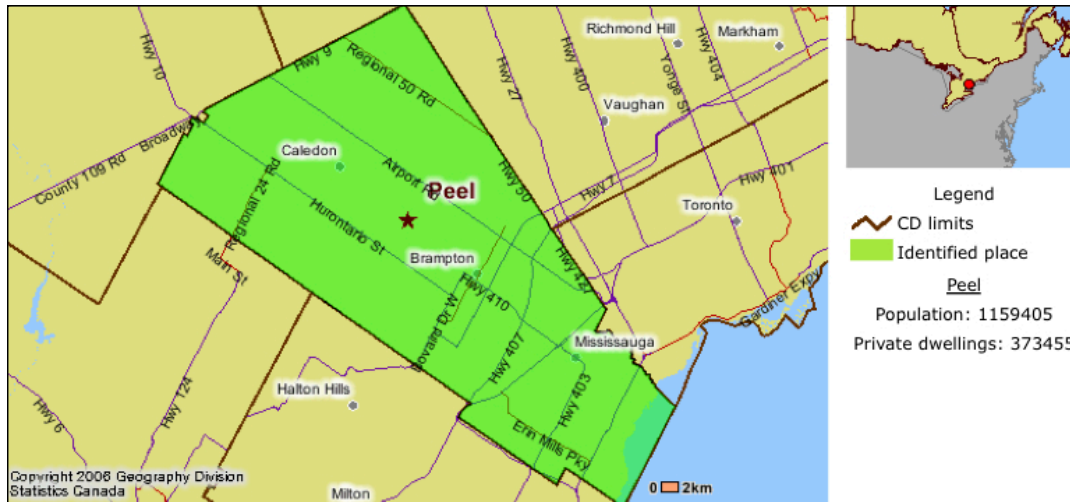


Figure 4-5: Region of Peel

Source: (Statistics Canada, 2010b)

Interview questions were sent to the waste management department on June 30, 2010. The Region of Peel provided written responses to the questions on July 21, 2010.

4.4.1 General Waste Management Information

According to the representative from the Region of Peel’s waste management department, the Region collects residential source separated organics curbside from single detached homes. The Region also operates backyard composting and grasscycling programs. The Region of Peel noted that a 2006 waste audit identified approximately 132,000 tonnes of organic waste being sent to landfill. Table 4-10 outlines the various organic waste management programs that the Region of Peel has in place (L. Conrad, response to interview questions, July 21, 2010).

Table 4-10: Region of Peel’s Organic Waste Diversion Programs

| Program | Description |
|---------------------|--|
| Organics Composting | “The Peel Organics Composting Program offers curbside collection of organic material to approximately 11,000 households in the settlement areas of the Town of Caledon and North Brampton. This program accepts organic material including household organics with |

| | |
|--------------------------------|--|
| | <p>yard waste, collected on a bi-weekly basis. After collection it is transported to the Caledon Composting Facility, at the Region's Caledon Sanitary Landfill Site (CSLS). In 2004, approximately 3,254 tonnes of organic material was processed at the Caledon Composting Facility.”</p> |
| Organics Demonstration Project | <p>“To facilitate the development of a Region-wide Organics Collection Program, three Peel Organics Demonstration Projects were initiated in May 2002. Over 1,600 residents were selected to participate in the program which is taking place in areas of Mississauga, Brampton and Bolton. In 2004, over 158 tonnes of organic material was collected and diverted from landfill through the demonstration projects. On average 83 per cent of the residents in the project have indicated that they have participated in the project at least once since the project began and 82 per cent would support a Region-wide organics collection program.”</p> |
| Region-wide Organics | <p>“In January 2003, a Region-wide organics curbside collection program was approved for Caledon, Brampton and Mississauga. Implementation of this program is scheduled to roll out in phases, beginning with Caledon in the fall of 2005 and Brampton and Mississauga in the spring of 2006. Approximately 286,000 single family households across Peel will receive curbside organics collection service in addition to Blue and Grey Box recycling, garbage, yard waste, bulky items and white goods pick up.</p> <p>In preparation and anticipation of the Region-wide launch of an organics collection program, Waste Management staff has continued to analyze collected data and user input gathered through the demonstration projects’ key elements and collection methods. A tender for kitchen bins and organics carts was issued on November 24, 2004 and closed on December 15, 2004. A total of four submissions were received. A review of the bids was undertaken through the latter half of December 2004.”</p> |
| Peel IWMF Composting System | <p>“Regional Council approved the expansion of the Caledon Composting Facility in February 2003, to provide 60,000 tonnes per year of processing capacity. After significant concerns were raised by the Niagara Escarpment Commission related to their approval of the expansion, staff sought Council approval in March 2004 for the relocation of the composting system to Peel IWMF in Brampton. Regional Council approved the relocation of the Caledon Composting Facility expansion to the Peel IWMF on March 4, 2004.”</p> |
| Backyard Composters | <p>“Backyard composters contribute to the diversion of organics from disposal. Approximately 1,946 backyard composters were distributed at a subsidized rate in 2004 through retail outlets, regional facilities and truckload sales. The Region has distributed approximately 113,072 backyard composters since 1985. In 2004, it is estimated that approximately 11,300 tonnes of organics were</p> |

| | |
|---------------------|--|
| | diverted from disposal through backyard composters.” |
| Leaf and Yard Waste | “Dedicated collection of leaf and yard waste is provided weekly from April to November in Brampton and Mississauga. It is estimated that approximately 37,400 tonnes of leaf and yard waste was diverted from disposal in 2004.” |

Source: (Region of Peel, 2004, pp. 14-15)

4.4.2 Waste Management Planning Towards the 60% Diversion Goal

According to the “2004 Update - Long Term Waste Management Strategy” report:

Current organics diversion in the Region of Peel includes the Peel Organics Composting Program, the Peel Organics Demonstration Project and backyard composting. In order to increase diversion of waste from disposal a Region-wide Organics Program has been approved by Council, which will include Caledon, Mississauga and Brampton. The extra organic material will be processed at the Peel IWMF (Region of Peel, 2004, p. 14).

According to the staff at the Region of Peel, they began an initial organics collection pilot program in the Town of Caledon in 1995. This program expanded until it became a Region-wide program in April 2007. The Region of Peel representative outlined four major drivers that led to the development of the organics program: the imminent closure of Britannia Sanitary Landfill; imminent closure of cross-boundary shipment of residential waste to Michigan landfills; political will for a made-in-Peel solution to waste management; and the successful compost collection and processing pilot in the Town of Caledon. When exploring the development of the organics program, the following barriers were identified: “participation levels, communication, “yuck” factor, cost of liners for residents, acceptance of change, odour challenges, lack of organics processing capacity not only in Peel but across the province” (L. Conrad, response to interview questions, July 21, 2010).

During the first year of Region-wide organic waste collection (2007-2008), staff observed a 45% participation rate across the Region of Peel. In 2009 the participation rate fell to 40%. Region of Peel staff noted: “However, those who participate do fully where the kilograms per household is 130 kg per year” and still consider the program a success because “we are close to capacity at the centralized composter.” The Region of Peel noted that in the future they would like to determine the best technology, system and location to build a facility to handle residential organics and grow the program to include institutions, multi-residential buildings and the five Business Improvement Areas (BIAs) (L. Conrad, response to interview questions, July 21, 2010).

The Region of Peel decided it should build its own compost facility based on the success of an organics processing plant in Caledon, Ontario. According the representative from the Region of Peel, a call for proposals to build and operate the Region’s own compost facility yielded only cost-prohibitive options. Based on this, the Region of Peel “undertook a sole source discussion with [a] supplier for the construction and did most of the site planning and layout in house.” The Region of Peel operates multiple compost facilities, and “the largest plant can process approximately 38,000 [tonnes per year] of [source separated organics] and an equal amount of yard waste.” When selecting an organics treatment technology, the Region of Peel did not consider anaerobic digestion as an option (L. Conrad, response to interview questions, July 21, 2010).

Based on the information provided in reports and the interview with a waste management representative, the following timeline of organic waste management division actives can be established (shown in Table 4-11).

Table 4-11: Region of Peel’s Organic Waste Diversion Timelines

| Year | Organic Waste Diversion Developments |
|---|--|
| 1985 | Development of Backyard composter program. |
| 2000 | |
| 2001 | |
| 2002 | Curbside organic waste collection pilot program servicing 1,600 homes. |
| 2003 | |
| 60% Waste Diversion Goal Established | |
| 2004 | Creation of integrated waste management facility. |
| 2005 | |
| 2006 | Full-scale implementation of curbside organic waste collection program, servicing approximately 286,000 homes. |
| 2007 | |
| 2008 | |
| 60% Achievement Deadline | |
| 2009 | |
| 2010 | |

4.4.3 Analysis of Case Study

The following table (Table 4-12) provides an analysis of the case study against the evaluation criteria set out in the methodology.

Table 4-12: Assessment of Region of Peel Against Evaluation Criteria

| Barrier to 60% Diversion | Indicator | Analysis |
|--------------------------|---|---|
| Lack of Political Will | Start of curbside organic collection program and motivation for development. Use of market instruments to deter landfilling. | In 1985 the Region of Peel implemented a backyard composter program. In 2002 they started a curbside organic waste collection pilot program. From 2003 - 2006 they implemented the full-scale roll-out. While it took three years to roll-out, it was not in a pilot stage during this time. This was clearly a timely and effective process with strong political support. The motivation was due to limited landfill capacity and the immediate need for diversion. As a result Peel is the only municipality in this study approaching the 60% waste diversion goal. The Region of Peel uses bag limits to control waste to landfill. |
| Failure of RCM | Inability to efficiently leave the pilot stage. | The Region of Peel went from pilot stage to full-scale implementation in four years. After the pilot stage was complete, a detail roll-out plan was generated and followed. |
| Failure to Collaborate | Lack of consideration for other's learning's | The Region of Peel quickly went from pilot to full implementation, demonstrating good research into what the program should look like. While it did not explicitly state that it considered other programs, they clearly addressed things like the bin liner issue. |

The Region of Peel provides unique insight into what drives a successful organic waste collection program. They implemented organic waste diversion programs due to diminishing landfill capacity. This pressure rather than political mandate has moved them toward the 60% waste diversion goal.

4.5 Region of Halton

The Region of Halton is located on Lake Ontario between the County of Wellington and the Region of Peel and is shown in Figure 4-6. The Region of Halton's population in 2006 was 439,256, occupying an area of 967 square kilometers (Statistics Canada, 2010c). The Region of Halton includes the City of Oakville; the City of Burlington; the Town of Milton; and the Town of Halton Hills.



Figure 4-6: Region of Halton

Source: (Statistics Canada, 2010c)

Interview questions were sent to the waste management department on June 30, 2010 (Region of Halton, 2010). The Region of Halton provided an in-person interview on July 15, 2010.

4.5.1 General Waste Management Information

The Region of Halton is responsible for all waste management activities within the Region. They operate a sanitary landfill that includes yard waste composting, while blue box material and Green Cart organics are sent to independently operated facilities. The Region of Halton also operates transfer facilities that process much of the IC&I Waste. The Region of Halton's Green Cart (curbside organics collection) program only accepts residential organic waste. However, local school and municipal facilities are also included. The Region of Halton's representative noted, "Less than 5% of the organic waste stream is generated from IC&I sector sources." The Region of Halton does not accept organic waste from other jurisdictions. Green Cart organics are sent to the City of Hamilton's composting facility, while all other organic materials collected are processed at the composting

facility located at the Region of Halton's sanitary landfill (Crockett, 2007d). The operation of the composting facility at the sanitary landfill has been contracted out to an independent company. The Region of Halton reached 57.4% diversion in 2009, very close to their 60% waste diversion goal (Zamojc, 2010). According to the Region of Halton's representatives, their organics programs have been largely credited for this success. It should be noted that reaching this diversion goal has increased the lifespan of their sanitary landfill from 2021 to 2032 (Zamojc, 2010).

4.5.2 Waste Management Planning Towards the 60% Diversion Goal

“The 2006-2010 Solid Waste Management Strategy identifies a Region-wide Green Cart program as a key component to meet the Region's goal to divert 60 per cent of waste from disposal, thereby, extending the life of the landfill ” (Crockett, 2007a, p. 1).

In accordance with the 2006-2010 Solid Waste Management Strategy, in 2005 the Region of Halton established a Green Cart (curbside organic collection) demonstration program. The program initially was targeted at 5,000 households and began in October 2005. The Green Cart program was evaluated on the following criteria: amount of waste diverted; the number of and nature of complaints received; program costs; participation rates; and capture rate (Crockett, 2007a). The Region's representative outlined the main driver as extending the lifespan of the Region's landfill (N. Mantel, response to interview questions, June 30, 2010).

Originally, there were plans to establish a waste-to-energy facility at the landfill. However, due to various factors it was decided to postpone that initiative until at least 2012. Given the lack of waste-to-energy programs, the Region felt the need to get serious about organic waste diversion (N. Mantel, response to interview questions, June 30, 2010).

The representative outlined some of the barriers faced during the process of establishing a curbside organic collection program. These include mess and odours associated with organic waste and concern regarding bugs and vermin. During the initial phase of the demonstration project, the Region of Halton did not allow the use of compostable bin liners. The representative noted:

When we started the pilot we did not allow any plastic at all and people could only buy the paper bags, which were fairly expensive and did not fit the containers well. We started getting asked a lot of questions about compostable bags. We looked into it and very quickly decided to allow residents to use the certified compostable bags (N. Mantel, response to interview questions, June 30, 2010).

The Region of Halton's report on the demonstration phase of the project noted that "88 percent of the respondents who used the Green Cart gave the following three reasons: good for the environment; waste reduction; and easy to use" (Crockett, 2007a, p. 4). It was also noted that "the 12 percent of respondents who indicated that they do not use the Green Cart gave the following top three reasons: don't like the smell, don't like paying for liners, and it is inconvenient/too much work" (Crockett, 2007a, pp. 4-5). During the initial demonstration phase (October 2005 to September 2006), the Region of Halton observed a 49% participation rate, with an average 2.6 kilograms per dwelling per week of organic waste being disposed of via the Green Cart. It was estimated that during the initial demonstration phase, 324,510 kilograms of organic waste were diverted from landfill (Crockett, 2007a).

Based on the success of the Green Cart demonstration program staff provided a report to Municipal Council recommending that a Region-wide Green Cart program be implemented (Crockett, 2007c). The following was noted as the rationale for full-scale implementation:

While the Region's Waste Management Strategy identifies opportunities to further enhance the non-organics diversion programs, kitchen organics or potential Green Cart materials account for approximately 45 percent of the content of the garbage stream being collected from curbside. The Region will not achieve the 60 percent diversion target without a program to address the organics that are in the garbage stream. A Green Cart program will divert this material from landfill disposal for a beneficial use as compost material to improve the soil quality for gardens and landscaping projects (Crockett, 2007c, p. 4).

Finally, the report noted that important changes should be made to the waste management system in order to ensure diversion. These included weekly collection of divertibles; bag limits; and bag-tags (Crockett, 2007c, p. 5). According to staff reports, the implementation of the organics collection program went as planned (Zamojc, 2010). It further noted that organic waste collection increased significantly (35%), and noted that curbside organic collection would be implemented at multi-residential buildings and schools (Zamojc, 2010). The representative for the Region of Halton noted that "Right now we are running at about a 70% participation rate, which is actually fairly high. The program has been running for over two years." Also, "The participation study includes the rural areas within the Region, if they are removed the participation rate jumps to about 80%".

Based on their waste management strategy, the Region of Halton will be examining the establishment of their own organic waste processing capacity, which could include anaerobic

digestion. The representative noted that "at this stage we are not ruling anything out..." "...Because we are collecting the methane from the landfill we do have the generating facility on site, so that is something that should be looked at." However the representative did note that there is concern with developing their own facility due to cost, risk, and the approvals process and finally noted "we always keep potential partnerships in mind" (N. Mantel, response to interview questions, June 30, 2010).

Based on the information provided in reports and the interview with a waste management representative, the following timeline of organic waste management division activities can be established (shown in Table 4-13).

Table 4-13: Region of Halton’s Organic Waste Diversion Timelines

| Year | Organic Waste Diversion Developments |
|---|---|
| 1996 | Establish a Backyard Composting Program. |
| 1997 | |
| 1998 | |
| 1999 | |
| 2000 | |
| 2001 | |
| 2002 | |
| 2003 | |
| 60% Waste Diversion Goal Established | |
| 2004 | |
| 2005 | Curbside organic waste collection pilot program, servicing 5,000 homes. |
| 2006 | |
| 2007 | |
| 2008 | Full-scale curbside organic waste collection program rolled out. |
| 60% Achievement Deadline | |
| 2009 | |
| 2010 | |

4.5.3 Analysis of Case Study

The following table (Table 4.14) provides an analysis of the case study against the evaluation criteria set out in the methodology.

Table 4-14: Assessment of Region of Halton Against Evaluation Criteria

| Barrier to 60% Diversion | Indicator | Analysis |
|--------------------------|--|--|
| Lack of Political Will | Start of curbside organic collection program and motivation for development. | In 1996 the Region of Halton implemented a Backyard Composting Program. In 2005 it started a curbside organic waste collection pilot |

| | | |
|-------------------------------|--|--|
| | <p>Use of market instruments to deter landfilling.</p> | <p>program, servicing 5,000 homes. The collection program had a full-scale roll-out in 2008. Given that the province established the 60% waste diversion goal in 2004, the start of the planning process was significantly delayed in comparison to other municipalities in the study. The program also took three years to go full-scale and it did not happen until the year that 60% waste diversion was to be achieved. This demonstrates a lack of political will to divert waste in a timely fashion</p> <p>The Region of Halton has not implemented any market instruments to deter landfilling. However they are considering a ban on organics in landfills and a bag limit.</p> |
| <p>Failure of RCM</p> | <p>Inability to efficiently leave the pilot stage.</p> | <p>The Region of Halton took three years from the start of the Pilot stage to full implementation. This is a fairly aggressive implementation schedule and demonstrates a good use of the pilot program.</p> |
| <p>Failure to Collaborate</p> | <p>Lack of consideration for others' learning</p> | <p>The Region of Halton learned from other municipal pilot projects (their survey information was used in the literature review) and used this information to develop their program.</p> |

While the Region of Halton began the planning process later than the creation of the 60% waste diversion goal, they have made significant progress towards the full-scale implementation of a curbside organic waste collection program.

4.6 Summary of General Organic Waste Management Information

Each of the above case studies provides a very scoped narrative regarding the development of their organic waste diversion system. This section intends to summarize some of the information not captured in each of these case studies.

The municipalities involved in this thesis vary in both size and population and, as such, manage very different volumes of organic waste. Table 4-15 outlines the volume of organic waste managed by each region and the respective diversion rates.

Table 4-15: Summary of Regional Organic Waste Generation and Diversion

| Region | Organic Waste Managed | Diversion Rate | Year of Data Collected |
|--------------------|-----------------------|----------------|------------------------|
| County of Dufferin | 2,280 tonnes | Unknown | 2009 |
| Region of Waterloo | 46,700 tonnes | 40% | 2008 |
| City of Hamilton | 87,000 tonnes | 42% | 2009 |
| Region of Halton | 63,287 tonnes | 57.2% | 2009 |
| Region of Peel | 88,721 tonnes | 50.2% | 2009 |

Table 4-17 clearly demonstrates the difference in organic waste managed through diversion programs amongst the municipalities involved in the study. It should also be noted that the tonnage managed by each municipality ranged from 2,280 tonnes to 88,721 tonnes; this is based on the population of the regions, the infrastructure in place for organic waste management (i.e., a central composting facility), and stage of program development (i.e., pilot vs. fully implemented).

While the organic waste managed by these municipalities provides some insight into their respective diversion strategies, a closer look at the actual programs employed provide more meaningful information. Table 4-16 provides a matrix of the various organic waste diversion programs used by each municipality.

Table 4-16: Organic Waste Diversion Programs

| Region | BYC | YWC | CTC | CCF | LL | COC | LB | GC |
|--------------------|-----|-----|-----|-----|----|-----|----|----|
| Region of Waterloo | Y | Y | Y | Y | Y | Y | C | N |
| County of Dufferin | Y | Y | N | N | N | Y | Y | N |
| City of Hamilton | N | N | N | Y | N | Y | N | N |
| Region of Peel | Y | Y | N | Y | N | Y | Y | Y |
| Region of Halton | Y | Y | Y | Y | N | Y | C | Y |

BYC = Backyard Composting; YWC = Yard Waste Collection; CTC = Christmas Tree Collection; CCF = Central Compost Facility; LL = Leaf Land-spreading; COC = Curbside Organic Collection; LB = Landfill Ban and/or Bag Limits; GC = Grasscycling; Y = Yes; N = No; C = Considering

Municipalities use a number of different programs to divert organic waste, including: backyard composting; yard waste collection; Christmas tree collection; central compost facilities; leaf land-spreading; curbside organic collection; landfill ban of organics; and grasscycling. Table 4-18 clearly shows that all municipalities interviewed use some form of curbside organic waste collection, and most also use backyard composting, yard waste collection, and central composting facilities.

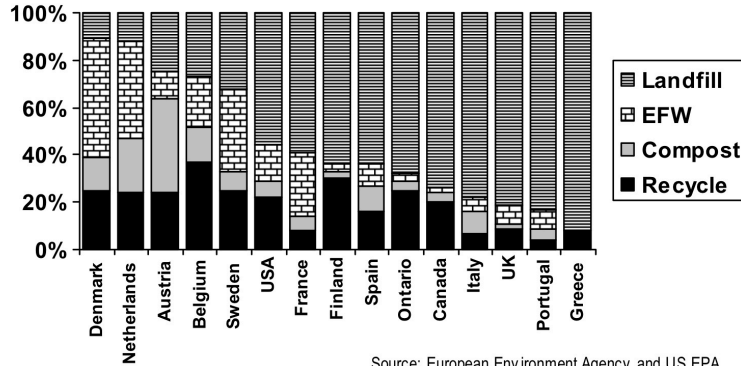
The cost of diverting organic waste differed from municipality to municipality. All municipalities involved in the study incurred operation costs associated with their organic waste management, while only some had capital costs. Table 4-17 provides a summary of the costs associated with each municipality’s organic waste management.

Table 4-17 Cost of Organic Waste Diversion Programs

| Region | Operational Costs | Capital Costs |
|--------------------|---|---|
| Region of Waterloo | Unable to separate from overall waste management budget | Unable to separate from overall waste management budget |
| County of Dufferin | \$932,040 (2009) | No capital costs |
| City of Hamilton | Unable to disclose due to contractual obligations | \$33,000,000 to build centralized compost facility |
| Region of Peel | \$16,058,295 (2009) | \$2,683,791 (2009) |
| Region of Halton | Not provided | Not provided |

As shown in Table 4-17, there is a varying degree of willingness and ability to disclose the costs of organic waste management practices.

The select municipalities examined have well-developed waste management system that effectively collects waste from homes and provides various forms of disposal. Historically, Ontario has been a leader in many areas of waste management, from having the first blue box program; to a deposit return system; to extended producer responsibility programs. Despite this, Ontario has stalled in its progress toward the 60% waste diversion goal and has fallen behind many of our peers. This can be seen when Ontario’s diversion rates are compared to other jurisdictions, as illustrated in Figure 4-7.



Source: European Environment Agency and US EPA

Figure 4-7: Ontario's Waste Diversion in Relation to Other Jurisdictions

Source: (Ministry of the Environment, 2004, p.8)

What is stopping us from making progress towards higher diversion rates? Table 4-18 provides an overview of the barriers faced, and each will be discussed further in the following sections. Municipalities have encountered a lack of political will, a failure of the planning process used, and a failure to collaborate. These barriers have significantly slowed our progress towards higher diversion rates.

Table 4-18: Barriers Encountered by Participating Municipalities

| Barrier to 60% Waste Diversion | Was this indicator a barrier? | ROW | COD | COH | ROP | ROH |
|--------------------------------|--|-----|-----|-----|-----|-----|
| Lack of Political Will | Start of curbside organic collection program and motivation for development. | Yes | No | No | No | Yes |
| | Use of market instruments to deter landfilling. | Yes | Yes | Yes | Yes | Yes |
| Failure of RCM | Inability to efficiently leave the pilot stage. | Yes | Yes | Yes | No | No |
| | Failure to quickly incorporate consumer demanded features. | Yes | Yes | Yes | No | No |
| Failure to Collaborate | Lack of consideration for other's learning | Yes | No | Yes | No | No |

ROW – Region of Waterloo; COD – County of Dufferin; COH – City of Hamilton; ROP – Region of Peel; ROH – Region of Halton

It is clear that information about each municipality's general organic waste management is inconsistent. Municipalities do not track a consistent set of indicators (such as diversion or

participation rates); they are not able to provide cost information in a consistent format; and they do not employ a consistent set of programs. However, all municipalities interviewed for this thesis do operate curbside organic waste collection programs.

Chapter 5: Discussion & Conclusions

In an effort to increase the lifespan of landfills and minimize environmental impacts in 2004 the Government of Ontario established the ambitious goal of achieving 60% waste diversion by 2008 (Ministry of the Environment, 2004). In March 2009 the Canadian Broadcasting Corporation (CBC) reported that Ontarians were diverting less than 40% of their waste (The Canadian Press, 2009). Why did we fail to achieve this goal? In short, there was a breakdown of the planning model used in Ontario, a lack of political will, and a failure to collaborate and learn from others. This section will discuss the general state of waste management, the results of this thesis and what they mean, and will provide some conclusions and recommendations for future action.

5.1 Lack of Political Will

Waste management is a municipal responsibility in the Province of Ontario and as such requires that municipal councils approve all new programs. Municipalities provide many services, including transit; waste management; public infrastructure; recreation services; and social programs. There are, therefore, competing priorities for municipal dollars, and unlike provincial governments, municipalities cannot run deficits. How important is waste management to municipalities in relation to other priorities? Table 5-1 illustrates when the municipalities involved in this study started their pilot and full-scale curbside organic waste collection programs.

Table 5-1: Curbside Organic Waste Collection Program Summary

| Region | Status | Pilot Started | Region-Wide Started |
|--------------------|-------------------|---------------|---------------------|
| Region of Waterloo | Pilot | 2006 | Fall 2010 |
| County of Dufferin | Fully Implemented | 1999 | 2007 |
| City of Hamilton | Fully Implemented | 2003 | April 2006 |
| Region of Peel | Fully Implemented | 2002 | Spring 2006 |
| Region of Halton | Fully Implemented | 2005 | April 2008 |

Three municipalities started pilot programs before the goal was announced, and only two municipalities had full-scale programs in place by the 2008 goal achievement date. Considering this was a provincial objective, full-scale programs should have been implemented no later than 2008. Table 5-2 provides a summary of the drivers that started the planning process for organic waste diversion in each municipality.

Table 5-2: Drivers Identified

| Region | Regulatory | Local Political Support | Public Support | Need to Divert | Desire to Divert |
|--------------------|------------|-------------------------|----------------|----------------|------------------|
| Region of Waterloo | NA | NA | NA | NA | NA |
| County of Dufferin | Yes | Yes | | | |
| City of Hamilton | | | Yes | | Yes |
| Region of Peel | | Yes | | Yes | |
| Region of Halton | | | | | Yes |

The drivers were varied, and there are a couple of interesting and important observations to be made. The County of Dufferin, which began its curbside organic waste collection pilot program in 1999, identified regulation as a driving force. The nature of this regulation was a stipulation in a Certificate of Approval (for a potential new landfill) to create a new diversion program. The Region of Peel identified the need to divert because of the closure of a landfill and risk associated with waste exports as a driver. The City of Hamilton had significant public consultation processes as part of the creation of its waste diversion strategy; these identified the need for organic waste diversion. It should be noted that both the County of Dufferin and the Region of Peel identified local political support as a driving force behind their diversion effort. These three municipalities all started organic waste diversion programs before the province initiated its 60% waste diversion goal. It seems clear that the province’s goal was not a motivating factor for action, but rather individual circumstance provided the catalyst in these municipalities. It should also be noted that Peel has made the most progress towards reaching the province’s diversion goal, their motivation being limited landfill capacity.

While the provincial government can provide oversight and regulation of waste management in the province, the provincial government has downloaded responsibility for waste management to municipal governments. This is one of the fundamental areas where Ontario has made a mistake under the framework of ISWM and why we have stalled in our progress toward a more ideal waste management system. According to the United States Environmental Protection Agency (2002, p. 7), for effective ISWM it is important to “Establish a national policy and pass laws on solid waste management standards and practices. Identify the roles and responsibilities of each level of government. Ensure the local government has the authority and resources to implement an ISWM plan.” Without a doubt Ontario meets more than the minimum standard outlined in this guiding statement. However, to move forward with better waste management systems, it will be important that the province more than meets the guiding criteria; it will need to strive to set new standards. To

this end, the Government of Ontario needs to take more responsibility for the coordination of waste management in the province. Municipalities are forced to run expensive programs that compete with many other municipal programs for scarce budget dollars.

Municipalities showed different levels of motivation in reaching the 60% waste diversion goal. It does not appear to be because of a lack of political will at the local level, but rather a lack of will at the provincial level. The province set a goal, but provided little support or guidance for its achievement. A goal is not enough to ensure municipal action when there are local competing priorities (an example includes the Region of Waterloo and the Light Rail Transit initiative). Rather, there needs to be a much more coordinated and centralized effort to ensure consistent approaches and achievement across the province.

Table 5-3 outlines the lines of evidence used to reach this conclusion.

Table 5-3: Summary of Evidence for Lack of Political Will

| Type of Evidence | Details |
|----------------------------|--|
| Literature Review | None |
| Government Document Review | Government documents regarding the development of curbside organic waste collection programs indicated their start dates for pilot programs. These were compared to the date when the 60% waste diversion goal was created. If the start date was significantly after creation of the goal it was considered evidence of lack of political will. |
| Interviews | Both the County of Dufferin and the Region of Peel indicated in their interview that local political support was a driving factoring in the early creation of their organic waste collection programs. While others did not indicated a driver of local political support. |

Key Learnings:

- The creation of a voluntary waste diversion goal by the province of Ontario has been insufficient to achieve significant diversion increases in the time desired.
- A key component of the ISWM is the establishment of a national policy and laws to direct waste management activities. While this exists in Canada and Ontario, there are little teeth to the 60% waste diversion policy. Therefore waste diversion is left to municipalities that have competing interests for scarce budget dollars.
- The Region of Peel identified local political interest as a key driver towards significant improvement in waste diversion. Other municipalities did not share the same driver, and the results appear to reflect this.

5.2 Failure of the Rational Comprehensive Model & Collaboration

The Rational Comprehensive Model is “a common basis for most municipal planning decision making and, arguably, the closest thing planners have to a planning paradigm” (Seasons, 2003, p. 431). As Seasons (2003) also notes, planners adhere to the RCM almost dogmatically; the problem with this approach is that waste management planning problems are inherently “wicked”: as they have “no definitive formulation”; have no “ultimate test of a solution”; cannot be solved by “trial-and-error”; and are often symptoms of other problems. As such, solutions to these “wicked” problems are prone to failure and can prove difficult for the planning profession (Rittel & Webber, 1973). Most of the municipalities in this thesis demonstrate how the RCM can end up causing problems in the waste management planning process. There were no specific question asked about the RCM in the survey (as it was not expected to be a key consideration in the research), however municipalities were asked how they developed their curbside organic waste collection programs and the responses clearly indicated a reliance on the RCM.

Many municipalities undertook their own pilot programs for the creation of a curbside organic waste collection program: these municipalities often experienced the same roadblocks, and often developed similar solutions. Given that many of these programs could have learned from other programs, it would make sense for municipalities to try to learn from others’ experiences. These similar problems could also explain why many of the municipalities took longer than initially projected to move from pilot to full-scale stages. Table 5-4 outlines the time from pilot to full-scale in each municipality.

Table 5-4: Curbside Organic Waste Collection Program Summary

| Region | Approximate Time | Pilot Started | Region-Wide Started |
|--------------------|------------------|---------------|---------------------|
| Region of Waterloo | 4 Years | 2006 | Fall 2010 |
| County of Dufferin | 8 Years | 1999 | 2007 |
| City of Hamilton | 3 Years | 2003 | April 2006 |
| Region of Peel | 4 Years | 2002 | Spring 2006 |
| Region of Halton | 3 Years | 2005 | April 2008 |

Municipalities took between three and eight years to move from pilot to full-scale implementation. Given that the province’s goal was to achieve 60% waste diversion by 2008 and two of the municipalities did not have full-scale program until after that date, there seems to have been a

breakdown of the planning process. Most of the municipalities intended to have a one-year pilot program followed by full-scale implementation. However, this process dragged out over a longer period of time. This is likely indicative of failed planning process and a lack of political will. While timelines from pilot to full-scale implementation are not necessarily reflective of the success or failure of the RCM, the municipalities underlying reasons for delay are. There was clear indication in the responses that planners were looking for high participation and diversion rates (i.e. the technically perfect solution), and kept modifying the pilot programs till they felt it was right. The incremental gains that could have been achieved if full-scale implementation had happened sooner would have been significant.

Table 5-5 outlines the lines of evidence used to reach this conclusion.

Table 5-5: Summary of Evidence for Failure of the RCM

| Type of Evidence | Details |
|----------------------------|--|
| Literature Review | Both Hostovsky (2006) and Seasons (2003) addresses the RCM and concerns about its ability to effectively guide decision making towards solutions to complex problems. Hostovsky (2006) highlights the failures of the RCM in creating new landfill capacity in Ontario. Similar issues can be seen in the creation of new organic waste diversion programs under the 60% waste diversion goal. |
| Government Document Review | Municipal documents highlighted the duration of time to move from pilot to full-scale implementation of curbside organic waste collection programs. |
| Interviews | Interview questions asked about the development of curbside organic waste collection programs shed light on how pilot programs were run. Generally there was a tendency to continuously tweak pilot programs rather than move forward with full-scale implementation. |

Key Learnings:

- According to Seasons (2003) and Hostovsky (2006) the RCM is focused on finding technically perfect solutions. In the search for these solutions, many waste management planners at the participating municipalities remained in the pilot stage.

5.2.1 Lack of Collaboration

Many of the municipalities seem to fail at incorporating citizen participation and learning that occurred at other municipalities. The most significant examples of that is the adoption of bin liners, a citizen-demanded feature, and a strategy incorporated by other municipalities. Table 5-6 outlines the municipalities that allow different types of bin liners.

Table 5-6: Accepted Bin Liners

| Region | Paper Liner | Certified Compostable Bags |
|--------------------|-------------|----------------------------|
| Region of Waterloo | Yes | No |
| County of Dufferin | Yes | Yes |
| City of Hamilton | Yes | Yes |
| Region of Peel | Yes | Yes |
| Region of Halton | Yes | Yes |

All municipalities now allow some type of bin liner. However, in some instances it took an extended period of time for this to happen. If these municipalities had listened to citizen concerns or to the experience of other municipalities it could have been adopted more quickly. Table 5-7 shows the time from pilot project creation to when the regions allowed bin liners.

Table 5-7: Timeline to the Acceptance of Bin Liners

| Region | Approximate Time | Pilot Started | Bin Liners Allowed |
|--------------------|------------------|---------------|--------------------|
| Region of Waterloo | 2 Years | 2006 | 2008 |
| County of Dufferin | 9 Years | 1999 | 2008 |
| City of Hamilton | 6 Years | 2003 | 2009 |
| Region of Peel | 0 Years | 2002 | 2002 |
| Region of Halton | 0 Years | 2005 | 2005 |

Only two municipalities used bin liners from the start of their organic waste collection programs. The Region of Waterloo used them in some areas during pilot testing, but did not allow full use of them until 2008. It should also be noted that the Region of Waterloo still does not allow the cheaper option of certified compostable bags. The County of Dufferin and the City of Hamilton took nine and six years, respectively.

All regions experienced barriers to the adoption of their curbside organic waste collection program. Table 5-8 outlines some of these barriers. All regions were concerned about the “yuck factor” impacting people’s usage of curbside collection of organic waste, yet there was a relatively slow/limited adoption of the use of bin liners in the planning process. Despite the demand for this

feature and the learning of others municipalities failed to collaborate and adopt the use of bin liners. While the Region of Waterloo, County of Dufferin, and City of Hamilton all acknowledge that bin liner were a highly requested feature, they all delayed in the implementation of these strategies. This highlights that waste management planning happens in silos in Ontario, as the Region of Peel and Region of Halton both had significant successes with bin liners.

Table 5-8: Barriers Identified

| Region | Small Municipality | Lack of Processing | Participation Rates | “Yuck Factor” |
|--------------------|--------------------|--------------------|---------------------|---------------|
| Region of Waterloo | NA | NA | NA | NA |
| County of Dufferin | Yes | | | Yes |
| City of Hamilton | | | | Yes |
| Region of Peel | | Yes | Yes | Yes |
| Region of Halton | | | | Yes |

In addition, municipalities seem to not learn from each other’s pilot programs. Specifically, the Region of Waterloo and the City of Hamilton did not adjust their pilot programs according to others’ experiences. To help municipalities make the choice that will handle our organic waste in the most efficient manner, it is necessary that the Province establish what the best practices are and provide resources to each municipality to assist in the implementation of these best practices. This will help create a level playing field between municipalities, while recognizing that each local government needs to customize the best practice for their local situation. Most of all, it can help transfer knowledge and ensure the most efficiently implementation of programs.

Table 5-9 outlines the lines of evidence used to reach this conclusion.

Table 5-9: Summary of Evidence for Failure of the RCM

| Type of Evidence | Details |
|----------------------------|---|
| Literature Review | None |
| Government Document Review | Municipal documents noted the addition of the use of bin liners to curbside organic waste collection programs. |
| Interviews | Interviews outlined the perceived barriers to participation to curbside organic waste collection program, including the “yuck” factor. The interviewers did not highlight any meaningful collaboration or learning from other municipalities. |

Key Learnings:

- Both citizens and the experience of other municipalities indicated that bin liners were essential to the high organic waste diversion participation levels. However, municipalities often tried to implement a program without this feature. This showed an inability to learn from and collaborate with both citizens and other municipalities. This likely impacted timelines to full implementation, and citizen participation in the program.

5.3 Implications for Planning & Waste Management

There are two major barriers to the waste management planning process in the Greater Golden Horseshoe: a lack of political will, and a failure of the planning process. This is not a new trend in waste management planning in Ontario or for planning in general. Hostovsky (2006) discusses the failure to site new landfill facilities in Ontario, outlining the cost associated with the planning process and the failure to achieve any sort of meaningful outcome. Seasons (2003) indicates that the Rational Comprehensive Model (RCM) is the planner's decision-making framework of choice, but notes that it struggles to effectively deal with complex problems and uncertainty. The research presented in this thesis really elaborated on the existing research. Hostovsky (2006) thought that that failure of the landfill siting process, while costly and time consuming, forced municipalities to address diversion efforts. While this is certainly true, this research indicated that the same flaws in the planning process might be creating a costly and time consuming process for establishing new diversion programs. In addition, waste management planners are an interesting hybrid planners, engineers, and environmental technicians; despite this they seem to be trapped by the same concerns that Seasons (2003) outlined. This research showed there was dogmatic adherence to technical rationality in the curbside organic waste collection planning process. If Ontario's waste management system is going to avoid a crisis in the future it is important that planners find a new way to problem solve.

What does this mean for waste management planning in Ontario and the 60% waste diversion goal? Political will is a difficult issue to address; it is not just a model in need of tweaking. A change in political will requires a strong desire to correct an issue at hand. The Province of Ontario established the 60% waste diversion goal in 2004, but did so by outlining a voluntary policy for waste diversion, rather than legislating a target that must be met (Ministry of the Environment, 2004). The only incentive for a municipality to increase waste diversion rates was to extend the life of an existing landfill. The Region of Peel's responses to the interview questions provide some insight into the

political will required to increase waste diversion. The Region of Peel outlined the need to divert waste as one of the drivers to their successful organic waste diversion program. This need came from the closure of one of their landfills, and concern regarding the security (continued availability) of waste exports to the United States. The need to divert waste drove local political support for a "made in Peel" solution to waste diversion. The programs created from this strong political will have increased Peel's waste diversion to nearly 60%, and has created the most successful organic waste diversion programs found in this research undertaking.

The Region of Waterloo's approach to waste diversion stands in sharp contrast to the Region of Peel's. The Region of Waterloo did not identify any drivers to the creation of an organic waste diversion program. The Region of Waterloo did not start its curbside organic waste collection program until two years after the provincial target was created, later than any other participating municipality, and the program did not go full-scale until the fall of 2010. Why was there not a more significant effort put forth by the Region of Waterloo, which created the Blue Box program? The Region of Waterloo's landfill has sufficient capacity for approximately 20 years; as such, there appears to be no political will to increase waste diversion (Region of Waterloo, 2006). It should be noted that this does not mean the Region of Waterloo is not looking to divert more waste, simply that in contrast to the Region of Peel, there is no imminent driving force (such as landfill closure).

There are two very different approaches to waste management planning and the associated political will in the case studies of the Regions of Peel and Waterloo. While both regions were subject to the same provincial waste diversion target, one successfully implemented a curbside organic waste collection program in a timely fashion, the other did not. The Region of Waterloo did not and does not have concerns regarding capacity, so with competing priorities of social services, infrastructure, transit, and other regional responsibility, why would the Region of Waterloo dedicate valuable dollars and staff time to something that is not of imminent concern? The difference in local political will is understandable and rational given the factors surrounding it. However, the province still had established a target for 60% waste diversion by 2008. So, where does the lack of political will really lie? Based on the evidence collected through this research, it is clear that the province needs to do more to ensure diversion levels are increased. It is one thing to establish a goal and expect others to achieve it; it is something else to lead the change required and support others in achieving your goal.

Key Finding:

- To achieve higher diversion rates there must meaningful drivers to the municipalities

operating diversion program. A voluntary goal will not create an incentive to divert waste in the face competing interest for scarce budget dollars.

- The Government of Ontario needs to make stringent diversion legislation that provides meaningful incentives for diversion. One such drive could be a ban of divertibles at Ontario landfills.

If the province wants to see increased waste diversion it needs to show more political will. Simply setting a goal of 60% diversion and expecting others to do the work is insufficient, as can be seen from the case studies presented in this thesis. The government needs to show leadership and give direction to the goals it establishes. The Ontario Government is not a stranger to this leadership and direction; they have shown both in their work to create the Local Integrated Health Networks (LIHNs) and the Places to Grow Act. In both of these cases, the provincial government recognized the need for coordinated efforts to decrease hospital wait times, and to accommodate significant population growth, respectively. In the case of the LIHNs, the Province established healthcare-sheds where a centralized body would look at the system and optimize the allocation of resources, attempting to establish an efficient, holistic, and resilient system (Local Health Integration Networks, 2009). In the case of the Places to Grow Act, the Province realized that population growth was going to explode in the Greater Golden Horseshoe area of Ontario. In order to effectively accommodate this growth, the Province established the Places to Grow Act, which requires municipalities in the area to plan for this growth, increase urban densities, and protect farmland. Most importantly, the Places to Grow Act provide mechanisms for the provincial government to withhold infrastructure monies from municipalities that do not comply; the Act also ties into the Planning Act which binds municipal governments to certain actions (Ministry of Public Infrastructure Renewal, 2006).

Key Finding:

- The province of Ontario should create a body that provides systems coordination for waste management. Municipalities could rely on this body to provide best practices, such as the use of bin liners. It could also provide insight into how to achieve system efficiency, such as when municipalities should consider working together.

In 2009 the Government of Ontario conducted a formal review of the Waste Diversion Act to identify where improvements are needed, and to ensure that higher diversion rates are achieved (Ministry of the Environment, 2009). The report notes:

Currently, only 22 per cent of Ontario's waste is being diverted from disposal. We are better with our home-generated waste, diverting about 39 per cent. But at our places of work and play, we only divert about 12 per cent, and that rate appears to be dropping instead of going up. While our long-term goal is a zero waste society, our path to get there needs to look at the challenges and well as the opportunities of managing waste (Ministry of the Environment, 2009, p.2).

The report highlights areas that need focus, including that the Province strives to: establish a polluter pays principle; reduce the need for landfills; reduce the impact our waste has on climate change; and find the real value of waste and ensure that it is not lost (Ministry of the Environment, 2009). The report also highlights the need to create economic barriers to landfilling, and better government oversight. However, the report does not establish a new deadline for meeting the 60% waste diversion, and does not present a firm action plan on how to get there. It is concerning that despite the failure of the first 60% waste diversion goal, the Government of Ontario does not seem interested in expanding its efforts to ensure that it is achieved.

Political will was one of the major barriers noted; the other was a failure of the planning process. Hostovsky (2000) provides an in-depth review of planning literature related to waste management and generally concludes that either a Rational Comprehensive Model (RCM) or an engineering approach is utilized, noting:

Overall, preferences in waste-planning models were divided along disciplinary lines, with planners favoring the CR model and those in engineering/science favoring adaptive modeling. Modeling rarely addressed social concerns and public input (Hostovsky, 2000: p. 313).

As Hostovsky (2002) noted, and this research reiterates, planners need to reconsider their model (RCM) for making waste management planning decisions. Planners have traditionally tried to apply the RCM to waste management problems, which provides very little differentiation from engineering or economic approaches. This approach looks for a technically perfect answer that can be implemented. However, when working in complex systems, such an answer often does not exist. Planning problems are inherently "wicked" (Rittel & Webber, 1973). As such, "Planners are often uncertain about the efficiency, effectiveness or impact of their interventions" (Seasons, 2003b, p.

430). The combined “wicked” nature of planning problems and the lack of confidence in planning interventions is alarming and requires the attention of both planning theorists and practitioners. .

It is important to note that there are several other planning approaches that are discussed in the literature, including: the incremental model; adaptive modeling; the contingency model; the advocacy model; the participatory model; and the willing host concept (Hostovsky, 2000; Richards, 1996; Pushchak & Burton, 1983; Lang, 1990). While all these can be considered relevant to waste management planning, in practice it is the Rational Comprehensive Model that is relied upon. This is best summed up by Hostovsky (2000), who notes:

...the discipline of environmental impact assessment is also dominated by technical rationality. Thus, it appears that waste management planning, an area of practice that creates a synthesis between traditional planning models and environmental impact assessment through the application of various environmental impact assessment (EIA) regulations, has also demonstrated a slavish adherence to the technical comprehensive rational model (p. 305).

While other planning models exist, they do not provide great models for waste management. The incremental model does not take a systems approach (each case is handled individually) and tends to focus on solving an immediate crisis. The adaptive model is heavily based on modeling and works to predict the future and is typically used when ecosystems are involved. The contingency model is based on a risk management approach and determines alternative options based on unexpected outcomes. The advocacy model focuses on advancing an agenda, and abandons the idea of a natural planning. Finally, the participatory model involves the public in the decision making process and often requires significant compromise (Hostovsky, 2000). None of these models provide an ideal approach to waste management planning. However, there is the ISWM, which incorporates parts of many of these theories and applies it directly to waste management planning. So, why does this reliance on the RCM lead waste management planners down a path to failure?

The RCM requirement for technically perfect answers is the simple answer to the question. The RCM must examine all alternatives and select the perfect one. However, as noted above, planning problems are inherently “wicked”: as they have “no definitive formulation”; have no “ultimate test of a solution”; cannot be solved by “trial-and-error”; and are often symptoms of other problems. As such, solutions to these “wicked” problems are prone to failure and can prove difficult for the planning profession (Rittel & Webber, 1973). Thus, they are inherently complex, and do not

lend themselves to perfect solutions. The complexity of waste management problems and the failure of the RCM in handling these can be seen through the case study outlined in this thesis.

The research in this thesis focuses on the planning process and therefore much of the information and processes examined used some form of the RCM. As such, this section of the discussion focuses on why the RCM has failed in the planning for organic waste diversion, and why the Integrated Solid Waste Management (ISWM) may provide a better tool. Planners do not provide value to solving waste management planning problems by finding the technically perfect solution (it is best to leave that to engineers). Rather, planners can provide value by: balancing citizen participation; being able to see the shades of grey in a problem (not just black and white solutions); being able to provide corrective actions on the fly; and by providing a sense of context to planning problems. The ISWM provides planners with a tool to assist them in this pursuit.

It should be clear that the ISWM does not replace the RCM in general. The RCM is a planning paradigm and is the foundation to the planning professional decision-making. The ISWM provides an alternative for waste management planners, since the RCM has failed in Ontario as an effective waste management planning tool.

The ISWM provides the strongest alternative to the RCM of planning for waste management. The key elements of the ISWM include: an optimized collection program; appropriate recycling; biological treatment of organic material; thermal treatment (waste-to-energy) of waste that cannot be diverted; and finally the landfilling of residuals (United States Environmental Protection Agency, 2002). In addition to these key components, McDougall and White (2001) indicate that an ISWM system should aim for environmental effectiveness; aim for economic affordability; be integrated; be market oriented; be flexible; take care to define clear objectives; take care to design a total system against those objectives; take care to operate on a large enough scale; and never stop looking for improvements in the overall environmental performance and methods to lower operating costs, keeping in mind there is no perfect system. The principles of the ISWM are the very opposite of what causes the RCM to fail: it is flexible, systems focused, and acknowledges that a perfect system does not exist.

Based on the ISWM and the parameters outlined by the EPA for establishing a system, Table 5-10 outlines the performance of study participants.

Table 5-10: ISWM and EPA Evaluation of Municipalities' Performance

| EPA ISWM Key Questions | Case Study Performance |
|---|---|
| Are existing laws and policies adequate to allow the government to properly implement ISWM? | The Province of Ontario has extensive laws regarding environmental protection and waste management. However, these laws are not designed around the establishment of an ISWM system. Rather, they are intended to prevent us from killing ourselves. In order to design laws conducive to an ISWM system, there would need to be a change in the EAA to a non-RCM approach, and our laws would need to reflect the values of the waste management hierarchy. Specifically related to the case study presented, if our laws were conducive to an ISWM system there would be no need to establish a 60% waste diversion goal, as the diversion would happen naturally. Our shortcomings in this area are the fault of a lack of political will at the provincial level, as they ultimately have the ability to affect the required changes. |
| What types of waste does your community generate and how is it managed? | This is understood by municipalities regarding the residential waste that is being generated. However, there is little understanding of the IC&I sector waste generated. For a holistic approach through the ISWM model, this information is needed. |
| Where will you go to get funding for creating a solid waste management system? | At this time, most waste management activities in the province are funded through tax dollars. If we are to move to an ISWM system, there needs to be a greater move toward extended producer responsibility, and polluter/disposer pays principles. The easiest way to achieve some of these goals is to embrace market solutions. There should be a ban on divertibles from landfill, higher disposal fees, and incentives for participation in diversion efforts. In terms of the case study, there is little market incentive for people or municipalities to divert waste. It is often cheaper to landfill waste, due to artificially low disposal fees. A region with significant landfill capacity (such as the Region of Waterloo) has limited reasons to increase diversion efforts in the face of competing demands. The failure of the RCM to look at the whole system continues this problem. |
| What will it cost to implement various waste management activities? | Not of relevance to this thesis. |
| Where will you build collection and disposal facilities and what equipment will you need? | Not of relevance to this thesis. |
| Will solid waste management activities affect the environment? | Municipalities seemed to undergo increased waste diversion efforts with little consideration for what impact there would be on the environment. It was assumed that diversion would |

decrease the environment impact. This is counter to the ISWM. While diversion efforts are likely going to be beneficial, municipalities should prove it.

In addition to the considerations outlined in the above table, the following provides more a detailed discussion.

According to the United States Environmental Protection Agency (2002, p. 7), for effective ISWM it is important to “Establish a national policy and pass laws on solid waste management standards and practices. Identify the roles and responsibilities of each level of government. Ensure the local government has the authority and resources to implement an ISWM plan.” This presents an interesting area for discussion within the context of the research undertaken. Canada, Ontario, and the municipalities in the Greater Golden Horseshoe have significant policies, laws, standards and practices surrounding waste management. Perhaps of most importance is Ontario’s goal of 60% waste diversion by 2008. However, when it comes to the organic fraction of municipal solid waste, there is quite a bit lacking in both the regulatory framework and the institutional will to force the needed changes.

Key Findings:

- The RCM searches for technically perfect answers. However waste management planning is inherently complicated and therefore the RCM does not provide the best planning approach.
- The ISWM should be considered as a better model for waste management planning as it accepts that a perfect solution is not possible, but rather focuses on continuous improvement and a system that focuses on increased diversion rates.

The 60% diversion goal is voluntary, and there are no teeth for enforcement. If the Province of Ontario wants to be serious about waste diversion, it needs to create regulations that are enforceable. This could include: a roll-back of funding for municipalities that do not divert sufficient percentages of waste; a ban on all new landfill capacity for municipalities that do not divert sufficient waste; and new landfills could be approved on the condition that they do not accept divertible waste. Given that it is 2011 and Ontario has yet to meet its 2008 goal, it is crucial that more dramatic steps are undertaken.

It is also important to note that the Province of Ontario needs to pay particular attention to the Industrial, Commercial and Institutional (IC&I) sector. There is little knowledge of waste management activities going on in this sector and this needs to be corrected. The IC&I sector

generates significant quantities of the province's waste and without a better understanding of how this waste is disposed of, it will be nearly impossible to create a system that can achieve 60% organic waste diversion. The IC&I sector should be held to the same standards as municipalities when it comes to the disposal of divertible waste. These factors lead to one central concept: the Province of Ontario needs to create a level playing field for organic waste specifically, and waste in general. Due to the creation of voluntary guidelines, the province has failed to encourage both municipalities and the IC&I sector to take sufficient action to achieve meaningful waste diversion.

5.4 A Potential Waste Management Planning System

Ontario needs to get serious about waste management planning, starting with the provincial government. The follow section outlines what a waste management system could look like, based on the findings of this research. First, the Government of Ontario needs to focus on diversion with meaningful planning and regulation. This would look similar to the *Place to Grow Act* process, where the government identified the need for better planning and acted accordingly. In terms of waste management there would be several key components of this. It is important that Ontario codifies the 60% waste diversion goal, this should be done through a piece of legislation that bind municipalities to this target and establishes realistic support for such an initiative.

To support this new binding legislation the Government of Ontario should develop waste management planning sheds. These should be established in a similar manner as the Local Health Integration Networks (LHINs). This will allow for coordinated systems planning in "waste sheds". These should be established based on existing waste management capacity, population, and geographic area. Each of these planning bodies would be resourced to lead progress towards the 60% waste diversion goal. There would be a central coordination of these bodies across the province. Most importantly these would replace the approval and oversight process current held by the Ministry of Environment. These would be governed by appointed and elected board of directors, the directors would consist of politicians, citizens, and waste management planners.

In addition to new coordination efforts, a new model would be used for waste management decisions. This would embrace the ideals of the ISWM, ensuring: calculated risks are acceptable; incremental gains are better than perfect salutation; citizens are engaged and listened to; and that any new programs/approaches taken must consider a holistic system. The Government of Ontario should establish this approach in consultations with waste professional, they should remove risks to

municipalities, and they should empower the newly created planning bodies to full implement the model.

Without the integration of the IC&I section, no new approach to waste management planning can be successful. The IC&I sector creates a significant amount of un-diverted waste, this cannot continue. The Government of Ontario, along with Waste Diversion Ontario and the Stewardship bodies should integrate IC&I waste management into the new municipal planning bodies. All new waste management legislation should hold the IC&I sector to the same standards of diversion, while considering economic incentives for participation. In keeping with the ideals of sustainable development, all approaches should balance the environmental, economics, and social factors.

Finally the province and the new planning bodies should create a robust collection of waste data. We should fully understand the waste stream and management efforts. Without this information good decision-making will not happen. Through a holistic revamp of our waste management system all parties in the province can work together towards higher diversion rate, and lower environmental and health impacts associated with waste.

5.4.1 Better Public Communication

Any major public project (transit, public works, waste management, etc.) requires effective and meaningful public engagement and participation. During the research for this thesis it became clear that during the development of curbside organic waste collection programs there was insufficient public involvement. As such, it is important to address what this involvement would require and look like. Arnstien (1969) outlines a ladder of citizen participation moving from nonparticipation to citizen power. Much of the citizen participation done during the development of select curbside organic waste collection programs in Ontario was tokenism, and did not incorporate citizen concern. It is important to gain citizen buy-in for these programs and as such planners need to create more meaningful communication and engagement. Several key components have been identified as important to this communication and engagement process, including: meaning incorporation of ideas and comments; communication through various media; communication targeted toward different populations; communication of various aspect of the project (financial, technical, marketing, management, etc.); and ensuring that all stakeholder group have the potential to participate in a meaningful manner (El-Gohary et. al., 2006). In order to move forward with a progressive waste management system the province of Ontario needs to implement an effective

communication strategy that reaches all stakeholders and seeks to engage them in a meaningful way. If there is early citizen buy-in to the process then there is a much higher potential for success.

5.5 Implication for the Literature

There is little academic literature on curbside organic waste collection as a waste diversion strategy. However, there are several planning and waste management professional publications that have addressed this subject. This thesis builds on the professional work done, and adds to the academic literature on the subject.

Smith and Lantz (2005a; 2005b) in *Biocycle* (a professional publication that has a focus on waste management) highlight the curbside organic waste programs that are being developed in Ontario. They note that to achieve the 60% waste diversion goal, organic waste must be diverted effectively. However, they go on to highlight existing barriers, noting: composting has not been a key part of the overall strategy; landfilling food is still considered reasonable by some jurisdictions; composting is comparatively expensive to landfilling; Ministry of Environment approval for composting facilities is difficult to navigate; the impact of the NIMBY phenomenon; lack of regulatory support; inconsistent nature of the waste stream; and variations in market conditions. The research presented in this thesis was able to build upon some of the shortcomings noted by Smith and Lantz. Many of the municipalities interviewed indicated that they have been implementing curbside organic waste collection for residential waste, but have not looked at how to implement a system that is part of the overall strategy. A system that included this would include the IC&I sector, and would be seen as important as landfilling in terms of resource allocation. In addition, the impact of NIMBY can be seen in the implementation of organic waste collection program – while people are not complaining about something in their backyard, they are unwilling to engage in diversion activities due to the “yuck” factor of organic waste. Finally, the province needs to provide regulatory support to local governments to implement organic waste collection programs in a timely fashion.

Key Additions to the Literature

- Smith and Lantz (2005ab) indicate that there are still barriers to the effective implementation of organic diversion programs in Ontario. This paper was presented the information in a professional journal.
- The research in this thesis confirms some of their findings through an academic research undertaking. There is limited existing academic literature on planning and the barriers associated with organic waste collection programs.

Hostovsky (2002; 2006) noted that waste management planning in Ontario is dependent on the RCM for decision-making. Hostovsky notes that Ontario has spent millions of dollars and years trying to site new landfill facilities. This is because the RCM is intended to examine all alternatives to achieve the perfect solutions while ignoring the incremental gains that could have been achieved during the time used to find the perfect solution. Hostovsky (2006) labeled the failure to site new landfills as a successful-failure, as waste was still effectively managed and diversion became the focus of planning efforts. However, a half-decade has passed since Hostovsky's research and Ontario's diversion rates have not increased to the level determined to be necessary by the provincial government. Municipalities in Ontario began the process of considering organic waste diversion more than two decades ago (BioCycle, 2007); however, the research has shown that many of these municipalities have failed to implement a complete system (i.e., they are still in some stage of pilot program, or have not rolled out to multiple sectors). It seems that waste management planners still rely on the RCM for waste diversion planning. The issues outlined by Hostovsky still exist today. Planners have successfully implemented organic waste collection programs at the pilot stage, but have taken years to move from testing to implementation. This research indicated planners are still looking for the perfect solution to complex programs, and to achieve success they need to implement a new model of decision-making.

Key Additions to the Literature

- This thesis has added to the work completed by Hostovsky (2002; 2006), noting that waste management planners are reliant on the RCM for decision-making. This need to find perfect solutions has meant meaningful interventions have been avoided, and incremental system improvements have not been made.
- Waste management planners in Ontario need to find a decision making model that allows for uncertainty and continuous improvement.

Based on the work completed by Hostovsky and this thesis, waste management planners should consider using the ISWM as a decision making model. An ISWM is a systems or holistic approach to waste management, providing significant benefit. Hostovsky (2006); Smith and Lantz (2005ab); and this thesis have all addressed concern about the waste management planning process in Ontario. The ISWM presents a good alternative to the current planning model as it focuses on a holistic systems approach, continuous improvement, and diversion of divertibles. These features address many of the changes currently faced by waste management planners in Ontario.

Without a change in the planning model utilized in Ontario waste management there will be no significant progress towards the ideals of the Waste Management Hierarchy. The Waste Management Hierarchy is a common approach to developing and evaluating waste management solutions. This focuses on moving waste management from less desirable (landfilling) to more desirable diversion strategies (waste reduction) (Environment Canada, 1996; MacLaren, 2004). This is important in achieving sustainable development. The most common understanding of sustainable development is the balance of economic, social (community development), and environmental priorities (Adams, 2006). While Ontario is currently able to manage the waste we generate, there needs to be a change in our process to ensure we continue to implement effective diversion strategies.

Key Additions to the Literature

- Without improvements in our waste management systems we will not meet the expectations of Sustainable Development or the Waste Management Hierarchy.
- Both Sustainable Development and Waste Management Hierarchy are fundamental tenants of planning and waste management literature. Municipalities in Ontario are currently not making waste decisions that are moving towards the ideals of these frameworks.

5.6 Conclusions

In an effort to increase the lifespan of landfills and minimize environmental impacts, the Government of Ontario, in 2004, established the ambitious goal of achieving 60% waste diversion by 2008 (Ministry of the Environment, 2004). In March 2009 the Canadian Broadcasting Corporation (CBC) reported that Ontarians were diverting less than 40% of their waste (The Canadian Press, 2009). This thesis looked at: (1) the development of curbside organic waste collection programs in the Greater Golden Horseshoe of Ontario; (2) the process used for implementation; and (3) potential barriers to more effective implementation, in the hope of learning more about why we did not meet this target. The barriers that caused us to miss this target are outlined in the previous section. The following provides some conclusions and recommendations for the path forward.

It is first important to note that participation in this research undertaking failed to meet a level where generalized conclusions can be made. However, it is the researcher's opinion that additional participation would not likely have significantly changed the findings of this thesis. In the larger context of waste management theory, several things can be discussed given the findings of this thesis. First, Ontario presents a case where the Government has outlined a goal of 60% waste diversion, but the Province has failed to meet that goal. Second, waste management is a task that is delegated to

municipalities in Ontario, and the local political will seems to have a significant impact on the success of waste diversion programs. Third, the Rational Comprehensive Model of planning is used in waste management in Ontario and has provided less than desirable results, as it searches for the perfect answer and does not involve citizens enough. Finally, municipalities seem to work in silos and fail to learn from each other. These facts, while not statically proven in this thesis, are clearly illustrated in the case studies and the literature review. What does this mean for the practice of waste management planning in Ontario?

5.6.1 Need for a Ban on Divertible Materials from Landfill

If the Government of Ontario wants to achieve 60% waste diversion, they need to take more action beyond making it a goal. There is little incentive for a quick move from our current model of waste management, which focuses on the collection and disposal of discarded goods and on the diversion of recyclables, to a more environmentally sound alternative (MacLaren, 2004). The price of disposal has not increased enough to make landfilling cost prohibitive; as such there is little market incentive for the diversion of waste. Thus, the Government should consider a ban on all divertible waste from landfill. Not only would this significantly reduce the amount of waste going to landfill, it would force improvements to our waste management models.

5.6.2 Central Coordination of Waste Management

In order to realistically implement such a ban, the Government must help municipalities develop sufficient capacity for handling the diverted waste. It must also be ready to enforce such a ban, as toothless legislation will have little effect. In addition to the initiatives outlined above, the Government of Ontario should work toward breaking down the waste management silos established by each municipality. There are limited landfills in Ontario, and the geopolitical boundaries that create waste management sheds do not allow for increased landfill lifespans. The Government and municipalities should work together to create province-wide waste management systems that take advantage of economies of scale, location, and specialization. This will become increasingly important as more capital intensive (i.e., incineration and anaerobic digestion) waste management options are required. This would also potentially benefit smaller municipalities that do not have the capacity to develop such infrastructure.

As part of creating a waste management system in Ontario, waste management best practices should be established by the province. These would provide guidance in terms of what type of

disposal and diversion activities are acceptable. This would ensure that the best solution, as prescribed by waste management hierarchy, is selected and used across the province.

5.6.3 Focus on IC&I Sector Diversion

While this was not addressed specifically in the research for this thesis, information in the literature review clearly shows a need to address this area. The IC&I sector has been allowed to grow and prosper without a serious check on its waste diversion. The Government of Ontario needs to take a much more active role in managing and regulating waste generation and diversion in the IC&I sector, as this is where significant progress towards the 60% waste diversion goal can be achieved.

So, why should we care to implement the steps outlined above? As our population continues to increase, and as we generate greater volumes of waste, the environmental impacts of this waste increase. With the potential for increased greenhouse gas emissions, landfill leachate, the use of land associated with landfilling, and potential for health impacts, it is important that we manage our waste according to the 3Rs. Through this process we can work toward the goal of sustainable development and ensure that our resources are used in a wise manner with conservation in mind.

5.6.4 New Approach to Waste Management Decision Making

Finally, the information collected in this thesis indicates that waste management planners in Ontario are using a decision making model that will not move us towards higher diversion rates and the ideals of sustainable development in a timely manner. As has been highlighted many times in this document, planners rely on the RCM for decision making. This tool's dependence on finding perfect solutions amongst alternatives prevents timely decision making when complex problems, such as waste management, are involved.

Planners need a tool that allows for a holistic approach, continuous improvement, and uncertainty. These items are not considered within the RCM. The ISWM would make a better decision making framework for waste management, as it is specifically intended for waste management applications.

5.7 Recommendations for Waste Management Practitioners

Based on the results of the research, the following recommendations are made for waste management practitioners:

- Create bans on divertible waste going to landfill. This will dramatically change the drivers behind the diversion of waste;
- Develop formal organic waste management working groups. These would be comprised of members from each municipality and would allow the effective transfer of information, lobbying of government, formation of partnerships, and development of economies of scale. Try to engage the IC&I sector in these groups; and
- Based on the lessons learned from curbside organic collection, develop a standard tool kit that allows other municipalities to more easily implement similar programs. This will save costs on the research and pilot phases each of the municipalities in the thesis have undergone.

5.8 Recommendations for Waste Management Researchers

Based on the results of the research, the following recommendations are made for waste management researchers:

- Originally this thesis was going to focus more on the IC&I sector. It was very difficult to get their participation in the study. As such, researchers should work to gain a better understanding of IC&I waste management practices;
- Provide the necessary research in support of anaerobic digestion for municipal solid waste. The use of anaerobic digestion is more environmentally sound and can provide a renewable source of energy; and
- Work towards the development of a better planning model for waste management; one that includes elements of the RCM, participatory planning, and integrated waste management. This model should not seek the technically best answer, but look to develop optimal systems, with a realization that no system is perfect.

Bibliography

- An Act to enact the Green Energy Act, 2009 and to build a green economy, to repeal the Energy Conservation Leadership Act, 2006 and the Energy Efficiency Act and to amend other Statutes, 39th Legislature, Ontario, 1st Sess.(2009).
- Adams, W. M. (2006). *The Future of Sustainability: Re-thinking Environment and Development in the Twenty-first Century. Report of the IUCN Renowned Thinkers Meeting.*
- Agency, U. S. E. P. (2010). Glossary of Climate Change Terms. *Climate Change* Retrieved August 6, 2010, from <http://www.epa.gov/climatechange/glossary.html#M>
- Allen, W. (2010). Sustainable Development. Retrieved November 7, 2010, from <http://learningforsustainability.net/susdev/>
- American Planning Association. (2010). What is Planning? Retrieved November 1, 2010, from <http://www.planning.org/aboutplanning/whatisplanning.htm>
- Anderson, R. F., & Greenberg, M. R. (1982). Hazardous Waste Facility Siting A Role for Planners. *Journal of the American Planning Association*, 48(2), 204 - 218.
- Archibald, J. (2008). *Green Bin Update*. Retrieved from [http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/71D693479A0C1AD38525750F006974EA/\\$file/E-08-106.pdf?openelement](http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/71D693479A0C1AD38525750F006974EA/$file/E-08-106.pdf?openelement).
- Association of Municipalities of Ontario. (2009). Bill 150, Green Energy and Green Economy Act, 2009.
- Balat, M., & Balat, H. (2009). Biogas as a Renewable Energy Source, A Review. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 31(14), 1280 - 1293.
- Barlিশen, K. D., & Baetz, B. W. (1996). DEVELOPMENT OF A DECISION SUPPORT SYSTEM FOR MUNICIPAL SOLID WASTE MANAGEMENT SYSTEMS PLANNING. [doi: DOI: 10.1006/wmre.1996.0007]. *Waste Management & Research*, 14(1), 71-86.
- Caldwell, W. (2009). Ontario Professional Planners Institute Submission: Bill 150 - Green Energy and Green Economy Act, 2009.
- Canada Mortgage and Housing Corporation. (2010). Sustainable Community Planning. Retrieved November 11, 2010, from <http://www.cmhc-schl.gc.ca/en/inpr/su/sucopl/index.cfm>
- Canadian Institute for Environmental Law and Policy. (2008). *A Brief History of Waste Diversion in Ontario: A Background Paper on the Review of the Waste Diversion Act*. Toronto.
- Canadian Institute for Environmental Law and Policy. (2009). *CIELAP Brief on Ontario's Green Energy and Green Economy Act, 2009: March 2009*. Toronto, ON.
- Carter-Whitney, M. (2007). *Ontario's Waste Management Challenge - Is Incineration an Option.*

- Toronto: Canadian Institute for Environmental Law and Policy.
- Chanakya, H. N., Sharma, I., & Ramachandra, T. V. (2009). Micro-scale anaerobic digestion of point source components of organic fraction of municipal solid waste. *Waste Management, 29*(4), 1306-1312.
- Charleston, L. O. (2008). *Hyperthermophilic Anaerobic Digestion of Food Waste*. McGill University, Montreal.
- Chowdhury, M. (2009). Searching quality data for municipal solid waste planning. *Waste Management, 29*(8), 2240-2247.
- Chung, S. S., & Poon, C. S. (1996). Evaluating waste management alternatives by the multiple criteria approach. [doi: DOI: 10.1016/0921-3449(96)01107-X]. *Resources, Conservation and Recycling, 17*(3), 189-210.
- City of Guelph. (2010). Curbside Waste Collection. Retrieved 2010, July 21, from <http://guelph.ca/living.cfm?subCatID=902&smocid=1487>
- City of Hamilton. (2002). *2002 Annual Report Waste Management Division*.
- City of Hamilton. (2003). *2003 Annual Report Waste Management Division*.
- City of Hamilton. (2004). *2004 Annual Report Waste Management Division*.
- City of Hamilton. (2005). *2005 Annual Report Waste Management Division*.
- City of Hamilton. (2006). *2006 Annual Report Waste Management Division*.
- City of Hamilton. (2007). *2007 Annual Report Waste Management Division*.
- City of Hamilton. (2008). *2008 Annual Report Waste Management Division*.
- City of Hamilton. (2009). *2009 Annual Report Waste Management Division*.
- Clarke, M. J., Read, A. D., & Phillips, P. S. (1999). Integrated waste management planning and decision-making in New York City. *Resources, Conservation and Recycling, 26*(2), 125-141.
- County of Dufferin. (2010). DUFFERIN COMPOSTS. Retrieved July 22, 2010, from http://www.dufferincounty.on.ca/government_subsection.aspx?id=748
- Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Vol. 3). Thousand Oaks, California: SAGE Publications Inc.
- Crockett, P. M. (2007a). *PPW46-07 GreenCart Demonstration Program Evaluation*.
- Crockett, P. M. (2007b). *PPW56-07 Options to Divert Residential Organic Material from Landfill Disposal*.

- Crockett, P. M. (2007c). *PPW79-07 GreenCart Evaluation Summary and Recommendations*.
- Crockett, P. M. (2007d). *PPW145-07 Request for Proposal P-064-07 and P-063-07 Award Processing and Marketing of Recyclable Material and Organic Waste*.
- CSI Resource Systems, Incorporated, Initials. (1993). *Integrated solid waste management in japan*. Boston:
- De Feo, G., & Malvano, C. (2009). The use of LCA in selecting the best MSW management system. *Waste Management*, 29(6), 1901-1915.
- Dijkgraaf, E., & Vollebergh, H. R. J. (2004). Burn or bury? A social cost comparison of final waste disposal methods. *Ecological Economics*, 50(3-4), 233-247.
- Earth Tech Canada Inc., MacViro Consultants Inc., & Gartner Lee Limited. (2001). *Materials Recovery Facility Optimization Study*. Toronto, ON: Waste Diversion Ontario.
- El-Gohary, N., Osman, H., & El-Diraby, T. (2006). Stakeholder management for public private partnership. *International Journal of Project Management*, 24(7), 595-604.
- El Hanandeh, A., & El-Zein, A. (2009). Strategies for the municipal waste management system to take advantage of carbon trading under competing policies: The role of energy from waste in Sydney. *Waste Management*, 29(7), 2188-2194.
- El-Fadel, M., Findikakis, A. N., & Leckie, J. O. (1997). Environmental Impacts of Solid Waste Landfilling. [doi: DOI: 10.1006/jema.1995.0131]. *Journal of Environmental Management*, 50(1), 1-25.
- Environment and Plastics Industry Council. (2002). *SPECIAL NEWS & VIEWS REPORT: Integrated Waste Management (IWM) Model*. Toronto.
- Environment Canada. (1996). *A Primer on Waste Management*.
- Environment Canada. (2010). *Planning for a Sustainable Future: A Federal Sustainable Development Strategy for Canada*.
- Eriksson, O., Carlsson Reich, M., Frostell, B., Björklund, A., Assefa, G., Sundqvist, J. O., et al. (2005). Municipal solid waste management from a systems perspective. [doi: DOI: 10.1016/j.jclepro.2004.02.018]. *Journal of Cleaner Production*, 13(3), 241-252.
- Flindall, R., & Haight, M. (1991). Composting - Health and Environmental Risks. In M. E. Haight (Ed.), *Municipal Solid Waste Management* (pp. 435-455). Waterloo: Institute for Risk Research, University of Waterloo.
- Geng, Y., Zhu, Q., & Haight, M. (2007). Planning for integrated solid waste management at the industrial Park level: A case of Tianjin, China. *Waste Management*, 27(1), 141-150.

- Gerald Hodge, & David L.A. Gordon. (2008). *Planning Canadian Communities* (5th ed.). Toronto: Nelson.
- Goldstein, N. (2004). Residential organics diversion moves forward in Ontario. *BioCycle*, 2004(09), 46-49.
- Goldstein, N. (2005). Source Separated Organics as Feedstock for Digesters. *BioCycle*, 2005(8), 42-46.
- Goldstein, N. (2007). Ontario Regions Invest In Residential Organics Diversion. *BioCycle*, 2007(4), 32-34.
- Goodger, E. (2001). *Solid Waste Management Master Plan - Public Advisory Committee Recommendations*.
- Gorrie, P. (2010). Ontario Feed-In Tariff Not Quite Boost to Biogas. *BioCycle*, 2010(4), 45-48.
- Haight, M. E. (2005). Assessing the environmental burdens of anaerobic digestion in comparison to alternative options for managing the biodegradable fraction of municipal solid wastes. *Waste Science & Technology*, 52(1-2), 6.
- Haight, M., & Stauch, A. (2010). *Assessing the environmental impact of anaerobic digestion for organic waste in the project green study area*. Waterloo, ON: University of Waterloo
- Ham, R. K. (1991). The Future of Sanitary Landfilling. In M. E. Haight (Ed.), *Municipal Solid Waste Management*. Waterloo: Institute for Risk Research, University of Waterloo.
- Hamzawi, N. (1997). *Anaerobic Co-digestion of Municipal Solid Waste and Sewage Sludge*. University of Ottawa, Ottawa.
- Heiman, M. (1990). From, "Not in My Backyard!" to, "Not in Anybody's Backyard!". *Journal of the American Planning Association*, 56(3), 359 - 362.
- Heimlick, J, Hughes, K, & Christy, A. Integrated solid waste management. The Ohio State University Extension, 1-3.
- Hills, P. (1984). Urban planning perspectives on solid waste disposal. *Conservation & Recycling*, 7(2-4), 149-156.
- Hostovsky, C. (2000). Integrating Planning Theory and Waste Management - An Annotated Bibliography. *Journal of Planning Literature*, 15(2), 305-332.
- Hostovsky, C. (2002). *Integrating Planning Theory and Waste Management: A Critical Analysis of Current EIA Practice in Ontario*. University of Waterloo, Waterloo.
- Hostovsky, C. (2006). The Paradox of the Rational Comprehensive Model of Planning: Tales from Waste Management Planning in Ontario, Canada. *Journal of Planning Education and Research*, 25, 382-395.

- Huang, G. H., Baetz, B. W., Patry, G. G., & Terluk, V. (1997). CAPACITY PLANNING FOR AN INTEGRATED WASTE MANAGEMENT SYSTEM UNDER UNCERTAINTY: A NORTH AMERICAN CASE STUDY. [doi: DOI: 10.1006/wmre.1996.0106]. *Waste Management & Research*, 15(5), 523-546.
- Huang, G. H., Linton, J. D., Yeomans, J. S., & Yoogalingam, R. (2005). Policy planning under uncertainty: efficient starting populations for simulation-optimization methods applied to municipal solid waste management. *Journal of Environmental Management*, 77(1), 22-34.
- International Development Research Centre. (2010). Sustainable Development: The Local Context. Retrieved October 31, 2010, from http://www.idrc.ca/en/ev-84818-201-1-DO_TOPIC.html
- Kaplan, P. O., Decarolis, J., & Thorneloe, S. (2009). Is It Better To Burn or Bury Waste for Clean Electricity Generation? *Environmental Science & Technology*, 43(6), 1711-1717.
- Kinnaman, T. C. (2009). The economics of municipal solid waste management. *Waste Management*, 29(10), 2615-2617.
- Kollikkathara, N., Feng, H., & Stern, E. (2009). A purview of waste management evolution: Special emphasis on USA. *Waste Management (New York, N.Y.)* 29(2), 974-985.
- Kovacs Reid, M., & Lewis, T. (2010). *2009 Summary of the DUFFERIN COMPOSTS! Organic Waste Collecton Program*.
- Kussner, B. H., & Warren, R. B. (2009). Proposed Green Energy Act Places Limits on Municipal Land Use Planning Powers. In W. LLP (Ed.). Toronto.
- Lang, R. (1990). Equity in Siting Solid Waste Management Facilities. *Plan Canada: Canadian Institute of Planners*, 30(2), 9.
- Lantz, D., & Smith, B. (2005b). Entering the next phase in Ontario. *BioCycle*, 2005(5), 43-46.
- Lantz, D., & Smith, B. (2005a). Finding the Best Organic Collection Systems. *BioCycle*, 2005(6), 44-48.
- Li, Y. P., Huang, G. H., Yang, Z. F., & Nie, S. L. (2008). An integrated two-stage optimization model for the development of long-term waste-management strategies. *Science of The Total Environment*, 392(2-3), 175-186.
- Lin, H.-Y., & Chen, G.-H. (2009). Regional optimization model for locating supplemental recycling depots. *Waste Management*, 29(5), 1473-1479.
- Local Health Integration Networks, Initials. (2009, June 16). *Local health integration networks*. Retrieved from http://www.health.gov.on.ca/transformation/lhin/lhin_mn.html
- Longden, D., Brannmer, J., Bastin, L., & Cooper, N. (2007). Distributed or centralised energy-from-waste policy? Implications of technology and scale at municipal level. *Energy Policy*, 35(4), 2622-2634.

- MacLaren, V. W. (2004). Waste Management: Integrated Approaches. In B. Mitchell (Ed.), *Resource and Environmental Management In Canada: Addressing Conflict and Uncertainty* (3rd ed., pp. 371-397). Toronto: Oxford University Press.
- Marshall, J., & Elliot, A. (2008). Measuring Solid Waste: Statistics Canada' Surveys and Results.
- Mata-Alvarez, J., Mace, S., & Llabres, P. (2000). Anaerobic Digestion of Organic Solid Waste. An Overview of Research Achievements and Perspectives. *Bioresource Technology*, 74, 13.
- McDougall, F., White, P., Franke, M., & Hindle, P., (2001). *Integrated Solid Waste Management: a Life Cycle Inventory*. Oxford, UK: Blackwell Science.
- McDougall, F. R., White, P. R., Franke, M., & Hindle, P. (2009). *Integrated Solid Waste Management: A Life Cycle Inventory* (2 ed.). New York: Wiley-Blackwell.
- McGee, K. D. (1991). Overcoming "NIMBY" in Municipal Waste Management Planning. In M. E. Haight (Ed.), *Municipal Solid Waste Management* (pp. 353-367). Waterloo: Institute for Risk Research, University of Waterloo.
- Ministry of Energy and Infrastructure. (2009). Proposed Green Energy Act. Retrieved November 16, 2009, from <http://www.mei.gov.on.ca/en/energy/gea/>
- Ministry of Municipal Affairs and Housing, & Ontario Professional Planners Institute. (2009). *Planning By Design: A Healthy Communities Handbook*.
- Ministry of Public Infrastructure Renewal. (2006). *Places to Grow: Growth Plan for the Greater Golden Horseshoe*.
- Ministry of the Environment. (2004). *Ontario's 60% Waste Diversion Goal - A Discussion Paper*. Toronto.
- Ministry of the Environment. (2009). *From Waste to Worth: The Role of Waste Diversion in the Green Economy: Minister's Report on the Waste Diversion Act 2002 Review*.
- Mohareb, A. K., Warith, M. A., & Diaz, R. (2008). Modeling greenhouse gas emissions for municipal solid waste management strategies in Ottawa, Ontario, Canada. *Resources Conservation and Recycling*, 52(11), 1241-1251.
- O'Hagan, A., & Steele, J. (2006). *Ontario to get Additional Landfill Capacity: Environmental Assessment for Green Lane Landfill Expansion Approved*.
- Ontario Waste Management Association. (N.D.). A Landfill: Capacity, Export & EA.
- Ontario Ministry of the Environment, (2007). *Policy statement on waste management planning: best practices for waste managers*. Toronto, ON: Government of Ontario.
- Ontario Ministry of the Environment, (2009). *From waste to worth: the role of waste diversion in the green economy: minister's report on the waste diversion act 2002 review*. Toronto, ON:

Government of Ontario.

- Otten, L. (2001). Wet-dry composting of organic municipal solid waste: current status in Canada *Canadian Journal of Civil Engineering*, 28(1), 124-130.
- Palmer, K., Sigman, H., & Walls, M. (1997). The Cost of Reducing Municipal Solid Waste. [doi: DOI: 10.1006/jeem.1997.0986]. *Journal of Environmental Economics and Management*, 33(2), 128-150.
- Philip Sinclair, Eleni Papatathanasopoulou, Warren Mellor, & Tim Jackson. (2005). Towards an Integrated Regional Materials Flow Accounting Model. *Journal of Industrial Ecology*, 9(1-2), 69-84.
- Pipatmanomai, S., Kaewluan, S., & Vitidsant, T. (2009). Economic assessment of biogas-to-electricity generation system with H₂S removal by activated carbon in small pig farm. *Applied Energy*, 86(5), 669-674.
- Pushchak, R., & Burton, I. (1983). Risk and prior compensation in siting low-level nuclear waste facilities: Dealing with the NIMBY syndrome. *Plan Canada: Canadian Institute of Planners*, 23(3), 12.
- Rada, E. C., Istrate, I. A., & Ragazzi, M. (2009). Trends in the management of residual municipal solid waste. *Environmental Technology*, 30(7), 651 - 661.
- Region of Halton. (2010). Recycling & Waste. Retrieved August 5, 2010, from <http://www.halton.ca/cms/one.aspx?portalId=8310&pageId=9105>
- Region of Peel. (2004). *2004 Long Term Waste Management Strategy*.
- Region of Peel. (2010). Waste Management - Public Works. Retrieved July 30, 2010, from <http://www.peelregion.ca/pw/waste/>
- Region of Waterloo. (2006). *Waste Management Master Plan - Update April 2006*.
- Region of Waterloo. (2009). *2009-2012 Budget - Waste Management*. Retrieved from [http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/D2812E165503EA64852575080063663A/\\$file/Waste%20Management.pdf?openelement](http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/D2812E165503EA64852575080063663A/$file/Waste%20Management.pdf?openelement).
- Region of Waterloo. (2010). Welcome to Waste Management. *Living in the Region of Waterloo* Retrieved July 7, 2010, from <http://www.region.waterloo.on.ca/web/region.nsf/DocID/EFB7B80BD8C00C88852576DA0055B3D5?OpenDocument>
- Richards, A. (1996). "Implementing a Voluntary Process for Difficult-to-Site Projects." *Plan Canada: Canadian Institute of Planners* 36(1): 22.
- Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. [10.1007/BF01405730]. *Policy Sciences*, 4(2), 155-169.

- RIS International Ltd, Initials. (2005). *The private sector the private sector ic&i waste management system ic&i waste management system in ontario in ontario: report prepared for ontario waste management association*. Toronto, ON:
- Rogers, P., Jalal, K., & Boyd, J. (2007). *An Introduction to Sustainable Development*. Toronto: Earthscan.
- Rowe, S. (1992). "Landfill Planning in Ontario." Plan Canada: Canadian Institute of Planners March 1992: 4.
- Ruth, L. A. (1998). Energy from municipal solid waste: A comparison with coal combustion technology. [doi: DOI: 10.1016/S0360-1285(98)00011-2]. *Progress in Energy and Combustion Science*, 24(6), 545-564.
- Saxe, D. (2009a, December 3). Biomass and the Green Energy Act. <http://envirolaw.com/biomass-and-the-green-energy-act/>
- Saxe, D. (2009b). Ontario's Green Energy Act: Opening an Exciting New Frontier. *Municipal World*, September 2009, 45-46.
- Seasons, M. (2003). Monitoring and Evaluation in Municipal Planning: Considering the Realities. *Journal of the American Planning Association*, 69(4), 430 - 440.
- Sherman, R. (2004). Exploring options for organic collection. *BioCycle*, 2004(02), 46-47.
- Shmelev, S. E., & Powell, J. R. (2006). Ecological-economic modeling for strategic regional waste management systems. *Ecological Economics*, 59(1), 115-130.
- Sky, C. (2010). Retrieved 2010, August 10, from http://blog.jerryhung.com/2008_10_01_archive.html
- Solano, E. (1999). *Integrated Solid Waste Management Alternatives in Consideration of Economic and Environmental Factors: A Mathematical Model Development and Evaluation*. North Carolina State University, Raleigh.
- Sonesson, U., Björklund, A., Carlsson, M., & Dalemo, M. (2000). Environmental and economic analysis of management systems for biodegradable waste. [doi: DOI: 10.1016/S0921-3449(99)00029-4]. *Resources, Conservation and Recycling*, 28(1-2), 29-53.
- Spencer, R. (2007). Source Separated Collection and Composting Expansion. *BioCycle*, 2007(8), 38-40.
- Statistics Canada. (2005). *Solid Waste in Canada*.
- Statistics Canada. (2006). *Waste Management Industry Survey: Business and Government Sectors*.

- Statistics Canada. (2009). Three large urban areas: the Montréal and Vancouver CMAs and the Greater Golden Horseshoe. *2006 Census: Portrait of the Canadian Population in 2006* Retrieved July 5, 2010, from <http://www12.statcan.ca/census-recensement/2006/as-sa/97-550/p14-eng.cfm>
- Statistics Canada. (2010a). Census Division - County of Dufferin. *2006 Community Profiles* Retrieved July 13, 2010, from <http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-591/details/page.cfm?Lang=E&Geo1=CD&Code1=3522&Geo2=PR&Code2=35&Data=Count&SearchText=Dufferin&SearchType=Begins&SearchPR=35&B1=All&Custom=>
- Statistics Canada. (2010b). Census Division - Peel, Ontario (Regional Municipality). *2006 Community Profiles - Census Division* Retrieved July 30, 2010, from <http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-591/details/page.cfm?Lang=E&Geo1=CD&Code1=3521&Geo2=PR&Code2=35&Data=Count&SearchText=Peel&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=&GeoCode=3521>
- Statistics Canada. (2010c). Census Division - Region of Halton. *2006 Community Profiles* Retrieved August 4, 2010, from <http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-591/details/page.cfm?Lang=E&Geo1=CD&Code1=3524&Geo2=PR&Code2=35&Data=Count&SearchText=Halton&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=&GeoCode=3524>
- Statistics Canada. (2010d). Census Division - Waterloo, Ontario (Regional Municipality). *2006 Community Profiles - Census Division* Retrieved July 7, 2010, from <http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-591/details/page.cfm?Lang=E&Geo1=CD&Code1=3530&Geo2=PR&Code2=35&Data=Count&SearchText=Waterloo&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=&GeoCode=3530>
- Statistics Canada. (2010e). Census Subdivision - City Of Hamilton. *2006 Community Profiles* Retrieved July 14, 2010, from <http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/details/page.cfm?Lang=E&Geo1=CSD&Code1=3525005&Geo2=PR&Code2=35&Data=Count&SearchText=Hamilton&SearchType=Begins&SearchPR=01&B1=All&Custom=>
- Tanskanen, J.-H. (2000). Strategic planning of municipal solid waste management. [doi: DOI: 10.1016/S0921-3449(00)00056-2]. *Resources, Conservation and Recycling*, 30(2), 111-133.
- The Canadian Press. (2009). Ontario Diverting Less than 40 percent of Waste from Landfill. Retrieved December 7, 2009, from <http://www.cbc.ca/canada/ottawa/story/2009/03/16/ot-090316-waste.html>
- The Green Energy Act Alliance. (2009). Analysis of Bill 150 - The Green Energy and Green Economy Act, 2009. Toronto.
- Tilche, A., & Galatola, M. The potential of bio-methane as biofuel/bioenergy for reducing greenhouse

- gas emissions: a qualitative assessment for Europe in a life cycle perspective. *Water Science & Technology*.
- Tudor, T., Adam, E., & Bates, M. (2007). Drivers and limitations for the successful development and functioning of EIPs (eco-industrial parks): A literature review. *Ecological Economics*, 61(2-3), 199-207.
- UN Department of Economic and Social Affairs. (2010). Division for Sustainable Development - Waste. Retrieved November 9, 2010, from http://www.un.org/esa/dsd/susdevtopics/sdt_wast soli.shtml
- UN Department of Economic and Social Affairs. (2010). Division for Sustainable Development - Agenda 21. Retrieved November 9, 2010, from http://www.un.org/esa/dsd/agenda21/res_agenda21_21.shtml
- United Nations Environmental Programme, Division of Technology, Industry and Economics International Environmental Technology Centre. (2009). *Developing integrated solid waste management plan*
- U.S. Environmental Protection Agency, (2002). *Solid waste management: a local challenge with global impacts* (EPA530-F-02-026d). Washington, DC:
- United States Environmental Protection Agency. (2009). Composting | Reduce, Reuse, Recycle. Retrieved Jan 4, 2010, from <http://www.epa.gov/osw/conservation/rrr/composting/index.htm>
- University of Waterloo. (N.D.). Integrated Waste Model for Municipalities. Retrieved December 11, 2009, from <http://www.iwm-model.uwaterloo.ca/>
- van der Werf, P. & Cant, M. (2007). Composting Trends In Canada Show Varied Progress. *BioCycle*, 2007(4), 29-31.
- Waldman, D., & Morrison, M. (2009) *Energy @ Gowlings. Ontario Introduces Green Energy Act*. Toronto: Gowling Lafleur Henderson LLP.
- Willms, J. R. (1991). Integrated Waste Management: Help or Hindrance to Approvals. In M. E. Haight (Ed.), *Municipal Solid Waste Management* (pp. 353-367). Waterloo: Institute for Risk Research, University of Waterloo.
- World Commission on Environment and Development. (1987). Report of the World Commission on Environment and Development: Our Common Future Retrieved October 31, 2010, from <http://www.un-documents.net/wced-ocf.htm>
- Xinhao Wang, & Hofe, R. v. (2007). *Research Methods in Urban and Regional Planning*. Beijing: Tsinghua University Press.
- Zamojc, M. (2010). *PW-32-10-2009 Year End Waste Management Report*. Milton: Region of Halton
- Zotos, G., Karagiannidis, A., Zampetoglou, S., Malamakis, A., Antonopoulos, I. S., Kontogianni, S.,

et al. (2009). Developing a holistic strategy for integrated waste management within municipal planning: Challenges, policies, solutions and perspectives for Hellenic municipalities in the zero-waste, low-cost direction. *Waste Management*, 29(5), 1686-1692.

Appendix “A” – Survey Questions

County of Dufferin

Dear Ms. Kovacs-Reid,

You are invited to participate in a research study conducted by Aaron Stauch under the supervision of Murray Haight, in the School of Planning at the University of Waterloo. The objectives of the research study are to determine the types and quantities of organic waste generated by the County of Dufferin. The study will also look at the current and future organic waste management practices in this municipality. This work is being completed for the completion of the student's master's thesis.

If you decide to volunteer, you will be asked to complete a 20-minute survey, attached to this letter. Participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer, and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

The data collected from this study will be maintained on a password-protected computer database in a restricted access area of the university. As well, the data will be electronically archived after completion of the study, maintained for two years, and then erased.

Should you have any questions about the study, please contact either Aaron Stauch (amstauch@uwaterloo.ca) or Murray Haight (mehaight@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns regarding your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Thank you for considering participation in this study,

Aaron Stauch, BES
Student Investigator

Murray Haight, PhD, RPP, MCIP

Faculty Supervisor

Section 1: The following questions are in regards to your general management of organic waste.

1. What are the sources (i.e. residential, IC&I, other jurisdictions, etc.) of the organic waste managed by the County of Dufferin?
2. What proportion of the organic waste is represented by each of the identified sources?
3. How much organic waste does your municipality manage annually?
4. What are the capital and operational costs associated with the management of organic waste?
5. Please describe your current management practices (i.e. backyard compost, landfill, centralized compost, etc.) for the organic fraction of municipal solid waste. What proportion of waste is managed by each method?
6. Are different types of organic waste (i.e. yard waste and food waste) managed differently?
7. What proportion of organic waste is managed by each method (i.e. landfilling, composting, etc.)

Section 2: The following questions are in regards to waste management initiatives outlined on your website.

1. What have the participation and waste diversion rates been for the DUFFERIN COMPOSTS! Program?
2. How was the DUFFERIN COMPOSTS! Program developed?

Section 3: The following questions are in regards to future waste management planning

1. Has the County developed its own organic waste processing facility? What has the Region identified as the drivers and barriers to such an undertaking?
2. What options did the County consider in this process?
3. Has the County considered partnerships with neighbouring municipalities? What has the Region identified as the drivers and barriers to such an undertaking?
4. Has your municipality considered the use of anaerobic digestion for the management of organic waste? If so, what were/are the barriers and drivers regarding the use of AD?

City of Guelph

You are invited to participate in a research study conducted by Aaron Stauch under the supervision of Murray Haight, in the School of Planning at the University of Waterloo. The objectives of the research study are to determine the types and quantities of organic waste generated by the City of Guelph. The study will also look at the current and future organic waste management practices in this municipality. This work is being completed for the completion of the student's master's thesis.

If you decide to volunteer, you will be asked to complete a 20-minute survey, attached to this letter. Participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer, and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

The data collected from this study will be maintained on a password-protected computer database in a restricted access area of the university. As well, the data will be electronically archived after completion of the study, maintained for two years, and then erased.

Should you have any questions about the study, please contact either Aaron Stauch (amstauch@uwaterloo.ca) or Murray Haight (mehaight@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns regarding your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Thank you for considering participation in this study,

Aaron Stauch, BES
Student Investigator

Murray Haight, PhD, RPP, MCIP
Faculty Supervisor

Section 1: The following questions are in regards to your general management of organic waste.

1. What are the sources (i.e. residential, IC&I, other jurisdictions, etc.) of the organic waste managed by the Region of Waterloo?
2. What proportion of the organic waste is represented by each of the identified sources?
3. How much organic waste does your municipality manage annually?
4. What are the capital and operational costs associated with the management of organic waste?
5. Please describe your current management practices (i.e. backyard compost, landfill, centralized compost, etc.) for the organic fraction of municipal solid waste. What proportion of waste is managed by each method?

6. Are different types of organic waste (i.e. yard waste and food waste) managed differently?
7. What proportion of organic waste is managed by each method (i.e. landfilling, composting, etc.)

Section 2: The following questions are in regards to your Waste Management Master Plan (WMMP) released in August 2008.

1. The WMMP states that Guelph's Organic Waste Processing facility was forced to close. What is currently being done with the organic waste collected through Guelph's Wet-Dry+ program?
2. a) The WMMP also mentioned that the City of Guelph is exploring options to replace the above-mentioned facility? What options are being considered (i.e. compost, anaerobic digestion, etc.)?
b) What has the City of Guelph identified as the drivers and barriers to the above undertakings?
c) Has your municipality considered the use of anaerobic digestion for the management of organic waste? If so, what were/are the barriers and drivers regarding the use of AD?

Section 3: Other questions regarding the City of Guelph's organic waste.

1. When the City of Guelph's Organic Waste Processing facility was operational, what organic diversion rates were achieved?
2. Describe how the City of Guelph developed its Wet-Dry+ program. Has the program been considered successful? How do you evaluate the program?
3. Has the Region considered partnerships with neighbouring municipalities? What has the Region identified as the drivers and barriers to such an undertaking?

4. Are there any other documents that would be helpful in understanding the City of Guelph's organic waste management strategy?

City of Hamilton

You are invited to participate in a research study conducted by Aaron Stauch under the supervision of Murray Haight, in the School of Planning at the University of Waterloo. The objectives of the research study are to determine the types and quantities of organic waste generated by the City of Hamilton. The study will also look at the current and future organic waste management practices in this municipality. This work is being completed for the completion of the student's master's thesis.

If you decide to volunteer, you will be asked to complete a 20-minute survey, attached to this letter. Participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

Should you have any questions about the study, please contact either Aaron Stauch (amstauch@uwaterloo.ca) or Murray Haight (mehaight@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns regarding your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Thank you for considering participation in this study,

Aaron Stauch, BES
Student Investigator

Murray Haight, PhD, RPP, MCIP

Faculty Supervisor

Section 1: The following questions are in regards to your general management of organic waste.

1. What are the sources (i.e. residential, IC&I, other jurisdictions, etc.) of the organic waste managed by the City of Hamilton?
2. What proportion of the organic waste is represented by each of the identified sources?
3. How much organic waste does your municipality manage annually?
4. What are the capital and operational costs associated with the management of organic waste in your municipality?
5. Please describe your current management practices (i.e. backyard compost, landfill, centralized compost, etc.) for the organic fraction of municipal solid waste. What proportion of waste is managed by each method?
6. Are different types of organic waste (i.e. yard waste and food waste) managed differently?

Section 2: The following questions are based on the City of Hamilton's Solid Waste Management Master Plan - Public Advisory Committee Recommendations and the associated annual report Annual Report, specifically Recommendations 4-6 and 12.

1. a) Recommendation 4 required that the City of Hamilton include a centralized composting facility as part of its waste management system; the 2006 annual report indicates that this facility is fully operational. Has this facility been considered successful?
- b) How much organic waste can be processed by this facility?

c) Are there any restrictions on the type of organic waste that can be processed by this facility?

d) What are the capital and operational costs associated with this facility?

2. a) Recommendation 5 allows the City of Hamilton to consider the use of energy-from-waste facilities. Has your municipality considered the use of anaerobic digestion for the management of organic waste?

b) What were/are the barriers and drivers regarding the use of AD?

3. a) Recommendation 6 requires the City of Hamilton to develop a three stream (recyclables, organics, other) collection process. How did the City of Hamilton plan and implement the “green cart” program?

b) What did the City identify as the barriers and drivers to participation in this program?

c) What participation rates have been achieved?

d) Does the City consider this program successful?

4. a) Recommendation 12 suggests that the City of Hamilton should seek opportunities to share waste diversion facilities with neighbouring municipalities. Has the City considered partnerships with neighbouring municipalities?

b) What has the City identified as the drivers and barriers to such an undertaking?

5. Are there any other documents that would be useful in understanding the City of Hamilton’s organic waste management strategies?

Region of Niagara

Dear Ms. Tait,

You are invited to participate in a research study conducted by Aaron Stauch under the supervision of Murray Haight, in the School of Planning at the University of Waterloo. The objectives of the research study are to determine the types and quantities of organic waste generated by the Niagara Region. The study will also look at the current and future organic waste management practices within the Region. This work is being completed for the completion of the student's master's thesis.

If you decide to volunteer, you will be asked to complete an interview, questions attached to this letter. Participation in this study is voluntary. You may decline to respond to any questions that you do not wish to answer, and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

Should you have any questions about the study, please contact either Aaron Stauch (amstauch@uwaterloo.ca) or Murray Haight (mehaight@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns regarding your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Thank you for considering participation in this study,

Aaron Stauch, BES
Student Investigator

Murray Haight, PhD, RPP, MCIP
Faculty Supervisor

Section 1: The following questions are in regards to your general management of organic waste.

1. What are the sources (i.e. residential, IC&I, other jurisdictions, etc.) of the organic waste managed by the Niagara Region?
2. What proportion of the organic waste is represented by each of the identified sources?
3. How much organic waste does your municipality manage annually?
4. What are the capital and operational costs associated with the management of organic waste?
5. Please describe your current management practices (i.e. backyard compost, landfill, centralized compost, etc.) for the organic fraction of municipal solid waste. What proportion of waste is managed by each method?
6. Are different types of organic waste (i.e. yard waste and food waste) managed differently?
7. What proportion of organic waste is managed by each method (i.e. landfilling, composting, etc.)?

Section 2: Organic Waste Collection

1. When was Niagara Region's Green Bin program established? Was there a pilot stage? What was the nature of the pilot program?
2. What were the drivers that lead to the development of this program?
3. What did the Region identify as the barriers and drivers to participation in this program?
4. What participation rates have been achieved?
5. Does the Region consider this program successful?

6. What are the future plans for this program?

Section 3: Organic waste facilities and future planning

1. The Region's website indicates that organic waste is currently disposed of at the Walker Environmental Group's Composting Facility. Why was a private facility chosen over building a municipal facility?
2. Does the Region have any future plans to establish organic waste processing capacity? What is the stage and nature of these plans? What have been the barriers and drivers considered in creating these plans?
3. When developing the plan for any future organic waste processing capacity has anaerobic digestion been considered as an option? What are the barriers and drivers in any decisions made regarding anaerobic digestion?
4. Niagara Region waste management documents indicate significant planning partnerships with the City of Hamilton, how were these established? What drivers and barriers were considered in forming this partnership?
5. How does the Region's partnership with Hamilton impact organic waste management?
6. Would the Region recommend that other municipalities consider such partnerships?

Region of Halton

Dear Ms. Mantel,

You are invited to participate in a research study conducted by Aaron Stauch under the supervision of Murray Haight, in the School of Planning at the University of Waterloo. The objectives of the research study are to determine the types and quantities of organic waste generated by the Halton Region. The study will also look at the current and future organic waste management practices within the Region. This work is being completed for the completion of the student's master's thesis.

If you decide to volunteer, you will be asked to complete an interview, questions attached to this letter. Participation in this study is voluntary. You may decline to respond to any questions that you do not wish to answer, and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

Should you have any questions about the study, please contact either Aaron Stauch (amstauch@uwaterloo.ca) or Murray Haight (mehaight@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns regarding your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Thank you for considering participation in this study,

Aaron Stauch, BES
Student Investigator

Murray Haight, PhD, RPP, MCIP
Faculty Supervisor

Section 1: The following questions are in regards to your general management of organic waste.

1. What are the sources (i.e. residential, IC&I, other jurisdictions, etc.) of the organic waste managed by the Halton Region?

-

2. What proportion of the organic waste is represented by each of the identified sources?

-

3. How much organic waste does your municipality manage annually?

-

4. What are the capital and operational costs associated with the management of organic waste?

-

5. Please describe your current management practices (i.e. backyard compost, landfill, centralized compost, etc.) for the organic fraction of municipal solid waste. What proportion of waste is managed by each method?

-

6. Are different types of organic waste (i.e. yard waste and food waste) managed differently?

-

7. What proportion of organic waste is managed by each method (i.e. landfilling, composting, etc.)?

-

Section 2: Organic Waste Collection

1. Halton's Solid Waste Management Strategy discusses the development of a GreenCart pilot program in 2005. Has this moved passed the pilot stage? How long did it take to move from the pilot program to a full program?

-

2. What were the drivers that lead to the development of this program?

-

3. What did the Region identify as the barriers and drivers to participation in this program?

-

4. What participation rates have been achieved?

-

5. Where is the organic waste collected by this program treated/disposed?

-

6. Does Halton consider this program successful?

-

7. What are the future plans for this program?

-

Section 3: Future organic waste management planning

1. Does Halton Region have any future plans to establish organic waste processing capacity? What is the stage and nature of these plans? What have been the barriers and drivers considered in creating these plans?

-

2. When developing the plan for any future organic waste processing capacity has anaerobic digestion been considered as an option? What are the barriers and drivers in any decisions made regarding anaerobic digestion?

-

3. In the organic waste management planning process has the Halton Region considered partnerships with nearby municipalities? What has the Region identified as the drivers and barriers to such an undertaking?

-

Region of Peel

Dear Mr. Conrad,

You are invited to participate in a research study conducted by Aaron Stauch under the supervision of Murray Haight, in the School of Planning at the University of Waterloo. The objectives of the research study are to determine the types and quantities of organic waste generated by the Region of Peel. The study will also look at the current and future organic waste management practices within the Region. This work is being completed for the completion of the student's master's thesis.

If you decide to volunteer, you will be asked to complete an interview, questions attached to this letter. Participation in this study is voluntary. You may decline to respond to any questions that you do not wish to answer, and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

Should you have any questions about the study, please contact either Aaron Stauch (amstauch@uwaterloo.ca) or Murray Haight (mehaight@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns regarding your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Thank you for considering participation in this study,

Aaron Stauch, BES
Student Investigator

Murray Haight, PhD, RPP, MCIP
Faculty Supervisor

Section 1: The following questions are in regards to your general management of organic waste.

1. What are the sources (i.e. residential, IC&I, other jurisdictions, etc.) of the organic waste managed by the Region of Peel?
2. What proportion of the organic waste is represented by each of the identified sources?
3. How much organic waste does your municipality manage annually?
4. What are the capital and operational costs associated with the management of organic waste?
5. Please describe your current management practices (i.e. backyard compost, landfill, centralized compost, etc.) for the organic fraction of municipal solid waste. What proportion of waste is managed by each method?
6. Are different types of organic waste (i.e. yard waste and food waste) managed differently?
7. What proportion of organic waste is managed by each method (i.e. landfilling, composting, etc.)?

Section 2: Organic Waste Collection

1. When did the Region of Peel develop its organic waste collection program?
2. What were the drivers that lead to the development of this program?

3. What did the Region identify as the barriers and drivers to participation in this program?
4. What participation rates have been achieved?
5. Does the City consider this program successful?
6. What are the future plans for this program?

Section 3: The following questions are in regards to your current organic waste processing facility

1. When and how was it determined to build the Region's own organic waste processing facility?
2. How much organic waste can be processed by this facility?
3. Are there any restrictions on the type of organic waste that can be processed by this facility?
4. What are the capital and operational costs associated with this facility?
5. When developing the plan for the Region's organic waste processing facility was anaerobic digestion considered as an option? What factors lead to the selection of compost over anaerobic digestion

Section 4: Future organic waste management planning

1. Does the Region of Peel have any future plans to establish additional organic waste processing capacity? What is the stage and nature of these plans?
2. In the waste management planning process has the Region of Peel considered partnerships with nearby municipalities? What has the Region identified as the drivers and barriers to such an undertaking?

Region of Waterloo

Dear Ms. Kitadawa,

You are invited to participate in a research study conducted by Aaron Stauch under the supervision of Murray Haight, in the School of Planning at the University of Waterloo. The objectives of the research study are to determine the types and quantities of organic waste generated by the Region of Waterloo. The study will also look at the current and future organic waste management practices within the Region. This work is being completed for the completion of the student's master's thesis.

If you decide to volunteer, you will be asked to complete a 20-minute survey, attached to this letter. Participation in this study is voluntary. You may decline to respond to any questions that you do not wish to answer, and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

Should you have any questions about the study, please contact either Aaron Stauch (amstauch@uwaterloo.ca) or Murray Haight (mehaight@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns regarding your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Thank you for considering participation in this study,

Aaron Stauch, BES

Student Investigator

Murray Haight, PhD, RPP, MCIP

Faculty Supervisor

Section 1: The following questions are in regards to your general management of organic waste.

1. What are the sources (i.e. residential, IC&I, other jurisdictions, etc.) of the organic waste managed by the Region of Waterloo?
2. What proportion of the organic waste is represented by each of the identified sources?
3. How much organic waste does your municipality manage annually?
4. What are the capital and operational costs associated with the management of organic waste?
5. Please describe your current management practices (i.e. backyard compost, landfill, centralized compost, etc.) for the organic fraction of municipal solid waste. What proportion of waste is managed by each method?
6. Are different types of organic waste (i.e. yard waste and food waste) managed differently?
7. What proportion of organic waste is managed by each method (i.e. landfilling, composting, etc.)?

Section 2: The following questions are in regards to your “food waste organics pilot” as outlined in the 2006 update to the Waste Management Master Plan (WMMP).

1. The Update to the WMMP suggested that the pilot program would run from October 2007 to September 2008 and would involve approximately 5000 households. Has the nature or scope of the pilot program changed from what was proposed in the WMMP?

2. The WMMP outlined the following indicators for evaluation of the pilot program: “amount of waste diverted; number and nature of complaints/concerns received; program costs’ participation rate; seasonal variations; and capture rate.” What were the results? Does the Region consider the project successful?

3. Are there plans to extend the pilot program, or make it part of the permanent waste management strategy?

4. Given the success of the Region’s backyard composter and yard waste programs, what diversion potential can be achieved through a food organics program?

Section 3: The Region’s WMMP outlines the lack of organic waste processing facilities in Ontario as a barrier to increased diversion. As such, the following questions are in regards to your future plans for organic waste management.

1. Has the Region considered developing it own organic waste processing facility? What has the Region identified as the drivers and barriers to such an undertaking?

2. What options has the Region considered?

3. Has the Region considered partnerships with neighbouring municipalities? What has the Region identified as the drivers and barriers to such an undertaking?

4. Has your municipality considered the use of anaerobic digestion for the management of organic waste? If so, what were/are the barriers and drivers regarding

City of Toronto

Dear Mr. Whitter

You are invited to participate in a research study conducted by Aaron Stauch under the supervision of Murray Haight, in the School of Planning at the University of Waterloo. The objectives of the research study are to determine the types and quantities of organic waste generated by the City of Toronto. The study will also look at the current and future organic waste management practices within the City. This work is being completed for the completion of the student's master's thesis.

If you decide to volunteer, you will be asked to complete an interview, questions attached to this letter. Participation in this study is voluntary. You may decline to respond to any questions that you do not wish to answer, and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

Should you have any questions about the study, please contact either Aaron Stauch (amstauch@uwaterloo.ca) or Murray Haight (mehaight@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns regarding your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Thank you for considering participation in this study,

Aaron Stauch, BES
Student Investigator

Murray Haight, PhD, RPP, MCIP
Faculty Supervisor

Section 1: The following questions are in regards to your general management of organic waste.

1. What are the sources (i.e. residential, IC&I, other jurisdictions, etc.) of the organic waste managed by the City of Toronto?
2. What proportion of the organic waste is represented by each of the identified sources?
3. How much organic waste does your municipality manage annually?
4. What are the capital and operational costs associated with the management of organic waste?
5. Please describe your current management practices (i.e. backyard compost, landfill, centralized compost, etc.) for the organic fraction of municipal solid waste. What proportion of waste is managed by each method?
6. Are different types of organic waste (i.e. yard waste and food waste) managed differently?
7. What proportion of organic waste is managed by each method (i.e. landfilling, composting, etc.)?

Section 2: Organic Waste Collection

1. When was Toronto's Green Bin program established? Was there a pilot stage? What was the nature of the pilot program?
2. What were the drivers that lead to the development of this program?
3. What did Toronto identify as the barriers and drivers to participation in this program?
4. What participation rates have been achieved?
5. Does Toronto consider this program successful?
6. What are the future plans for this program?

Section 3: Organic waste facilities and future planning

1. Toronto's website indicates that City Council approved the creation of two organic waste processing facilities, what is the status of this undertaking? Where was organic waste sent prior to the establishment of these facilities?
2. When developing the plan for organic waste processing capacity has anaerobic digestion been considered as an option? What are the barriers and drivers in any decisions made regarding anaerobic digestion?
3. Has Toronto considered partnerships with neighbouring municipalities? What has the City identified as the drivers and barriers to such an undertaking?