

Implementing the soft path approach to water management:  
A case study of southern York Region, Ontario

by

William Thomas Patch

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, 2010

© William Thomas Patch 2010

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.

William Thomas Patch

## **ABSTRACT**

This research study develops a framework of indicators to evaluate the ‘institutional capacity’ of a municipality to implement the soft path approach. The soft path approach is a new strategy for water conservation that complements existing supply and demand water management regimes. The soft path approach aims to achieve sustainability by changing how individuals think about water and how water is used. The framework of indicators consists of qualitative descriptions of elements that should be present in a municipality to successfully implement the soft path approach. These indicators fit into eight themes: human resources, information resources, financial resources, policy and legal environment, political environment, community awareness and involvement, technological solutions, and practical considerations. These indicators are also applied to evaluate the institutional capacity of a case study (southern York Region, Ontario, Canada) for its potential to implement the soft path approach. The case study is compatible and equipped to implement the soft path approach, but this can only be accomplished if coordinated with other levels of government and external organizations.

Key words: institutional capacity, soft path approach, municipal water management

## **ACKNOWLEDGEMENTS**

This thesis study has been a long and strenuous process. It would not have been possible without friends and family to support me. I would like to thank my family, including my father Richard and my brother Michael, who have both been of great support to me throughout this process.

I would like to personally thank Dr. Paul A. Kay, Associate Professor & Department Chair of Environment and Resource Studies, University of Waterloo. Professor Kay is the Faculty Advisor for this research. He has been of tremendous and unending assistance developing this thesis.

Many thanks are also due to my committee members, who helped to refine my thesis: Dr. Sarah Wolfe, Assistant Professor in the Department of Environment and Resource Studies, and Dr. John Lewis, Assistant Professor in the School of Planning.

This research study has been funded by the Social Sciences and Humanities Research Council of Canada and the University of Waterloo.

# TABLE OF CONTENTS

LIST OF FIGURES .....	ix
LIST OF TABLES .....	x
CHAPTER ONE: INTRODUCTION .....	1
1.1 Problem context .....	1
1.2 Research questions and objectives .....	2
1.3 Significance of research .....	4
1.4 Thesis overview .....	5
CHAPTER TWO: LITERATURE REVIEW .....	6
2.1 Planning theory and practice .....	6
2.2 Approaches to water management .....	8
2.2.1 Supply management .....	9
2.2.2 Demand management .....	11
2.2.3 Soft path approach .....	12
2.3 Institutional capacity .....	17
2.3.1 Literature on ‘capacity’ .....	20
2.3.2 Defining ‘institutional capacity’ .....	27
2.3.3 Preliminary indicators for evaluating ‘institutional capacity’ .....	30
2.3.3.1 Human resources .....	31
2.3.3.2 Information resources .....	32
2.3.3.3 Financial resources .....	34
2.3.3.4 Policy and legal environment .....	36

2.3.3.5 Political environment .....	39
2.3.3.6 Community awareness and involvement .....	41
CHAPTER THREE: METHODOLOGY .....	44
3.1 Case study .....	45
3.1.1 Case study characterization.....	45
3.1.2 Water management in case study .....	49
3.1.3 Justification of case study .....	51
3.2 Qualitative interviews .....	52
3.2.1 Participants' selection .....	53
3.2.2 Interview structure .....	54
3.3 Analysis of interviews.....	59
3.4 Developing final indicators.....	63
3.5 Evaluation of study area.....	65
3.6 Limitations of research.....	67
3.7 Ethical considerations .....	68
CHAPTER FOUR: ANALYSIS.....	70
4.1 Interview analysis .....	70

4.1.1 Human resources .....	73
4.1.2 Information resources.....	74
4.1.3 Financial resources.....	75
4.1.4 Policy and legal environment.....	76
4.1.5 Political environment .....	81
4.1.6 Community awareness and involvement .....	81
4.1.7 Technological solutions .....	83
4.1.8 Practical considerations.....	85
4.2 Final indicators.....	87
CHAPTER FIVE: CASE STUDY EVALUATION .....	98
5.1 Indicator themes .....	98
5.1.1 Human resources .....	99
5.1.2 Information resources.....	99
5.1.3 Financial resources.....	101
5.1.4 Policy and legal environment.....	103
5.1.5 Political environment .....	110
5.1.6 Community awareness and involvement .....	111
5.1.7 Technological solutions .....	112
5.1.8 Practical considerations.....	114
5.2 Conclusions and recommendations.....	115
CHAPTER SIX: CONCLUSIONS.....	119
6.1 Envisioning a new water future.....	121

6.2 Future research.....	127
REFERENCES.....	129
APPENDIX A: MAP OF CASE STUDY.....	136
APPENDIX B: YORK WATER SYSTEM.....	137
APPENDIX C: YORK-DURHAM SEWERAGE SYSTEM.....	138
APPENDIX D: GENERAL INTERVIEW QUESTIONS.....	139
APPENDIX E: CORRESPONDENCE WITH PARTICIPANTS.....	140



## **LIST OF FIGURES**

Figure 1: Schematic of a generic water and wastewater supply system .....	10
Figure 2: Six step WSP analysis framework (Friends of the Earth Canada) .....	17
Figure 3: Broad overview of research process .....	44
Figure 4: Map of the Oak Ridges Moraine .....	49
Figure 5: York Region’s guiding principles of sustainability .....	104

## LIST OF TABLES

Table 1: Dimensions of 'capacity' .....	28
Table 2: Preliminary indicators for human resources .....	32
Table 3: Preliminary indicators for information resources .....	34
Table 4: Preliminary indicators for financial resources .....	36
Table 5: Preliminary indicators for policy and legal environment .....	39
Table 6: Preliminary indicators for political environment.....	41
Table 7: Preliminary indicators for community awareness and participation.....	43
Table 8: Estimated population and population change in case study municipalities.....	46
Table 9: 40% intensification targets in case study municipalities (2006-2031) .....	47
Table 10: Breakdown of interview codes .....	70
Table 11: Framework of final indicators for institutional capacity .....	89

# CHAPTER ONE: INTRODUCTION

## *1.1 Problem context*

It is a common misconception among Canadians that the supply of fresh drinking water is abundant and secure, with the consequence that many people do not believe that water conservation is needed (Biro, 2007; Brandes & Ferguson, 2004; Sprague, 2007). This belief is called the “myth of superabundance” and it must be overcome to successfully advocate for water conservation measures (Jordaan, Stevens, & Brooks, 2009).

In reality, very little of Canada’s natural freshwater supply is renewable and most of it is located far from where the majority of Canadians live (Sprague, 2007). The Great Lakes contain much of this freshwater, but this water is mostly non-renewable. The majority of the water in these lakes is left over from the last glacial period and would not be replaced if taken. Only a small portion of Great Lakes water is renewed annually and can be safely taken for human use. About 60% of the remainder of Canada’s freshwater flows north into the Arctic Ocean and Hudson Bay. This water is too far away to make piping it to southern population centres economically viable.

As our cities and economies have grown, Canadians have become accustomed to plenty of water at a low price, but this paradigm is changing as the least expensive sources of water have been tapped out and ever more expensive and complex water infrastructure is required (Brandes, Brooks, & Gurman, 2009). In recent history, it has become apparent that water is not an unlimited resource. Between 1994 and 1999, one in four Canadian municipalities had water shortages (Shrubsole & Draper, 2007). Furthermore, water in the

most heavily populated regions of Canada is “heavily used and overly stressed,” (p. 38) leading to “falling water tables and lower water levels as well as degraded water” (p. 38).

Fixing these (and other) water problems is difficult, in part because of jurisdictional fragmentation in Canadian water management institutions (Saunders & Wenig, 2007). Water flows do not obey political boundaries and the issue of who should manage it becomes an issue. Furthermore, there are differing views on the roles and responsibilities of different levels of government for managing water as well as differing views on methods and approaches to managing water (de Loë & Kreutzwiser, 2007).

## ***1.2 Research questions and objectives***

As a response to the above challenges, water conservation and efficiency have been increasingly sought as solutions to address deficiencies and make water systems more sustainable<sup>1</sup> (Brandes, Brooks, & Gurman, 2009). For example, water management in Ontario, Canada “has been shifting to incorporate water efficiency and conservation considerations since the late 1980s” (Wolfe, 2008, p. 43).

The institutional structures and arrangements of water institutions are of importance because they influence the allocation, use, and management of water (Saleth & Dinar, 2005; Livingston, 2005). Such considerations are particularly important for municipal governments

---

<sup>1</sup> Definition of *sustainability*: “social and environmental practices that protect and enhance the human and natural resources needed by future generations to enjoy a quality of life equal to or greater than our own” (USEPA, 2010).

There are many definitions of sustainability available. The above definition has been chosen for this study because it is: (1) recent, (2) it is sourced from a major and well-respected government institution (the United States Environmental Protection Agency), and (3) it is comprehensive and straightforward despite its relatively short length.

because they often have a decision-making role for water efficiency and a role implementing policies and programs to increase water efficiency (Wolfe, 2008).

This research study addresses the institutional component of implementing water conservation in Canada. More specifically, the study investigates the institutional capacity<sup>2</sup> that is necessary to implement the ‘soft path approach’<sup>3</sup> for water conservation in Canada at a municipal scale.

This study answers the following research questions:

**Question 1** What is the institutional capacity required to implement the soft path approach?

**Question 2** Are existing institutions compatible with and/or equipped to handle the soft path approach?

**Question 3** What would a move to the soft path approach require as an operable procedure?

---

<sup>2</sup> A definition of ‘institutional capacity’ is developed in **section 2.3.2**.

<sup>3</sup> The ‘soft path approach’ is defined and described in **section 2.2.3**.

To answer these questions, the following objectives were developed:

**Objective 1** To develop indicators of the institutional capacity that are required to implement the soft path approach in municipalities; and,

**Objective 2** To apply these indicators in an assessment of the institutional capacity of a case study for its ability to incorporate the soft path approach into its existing water management regime.

### ***1.3 Significance of research***

The soft path approach for water conservation is an emerging strategy that aims to fundamentally rethink the standard approach to water conservation (Brandes, Brooks, & Gurman, 2009). Rather than using the existing approach that consists of simply reducing water demand by consumers (this approach is called ‘demand management’), the soft path approach complements this to reduce water usage even further by changing how water is used in the first place.

According to one study, the soft path approach has the potential to reduce water usage by 20-40% beyond demand management alone (Brandes, Brooks, & Gurman, 2009). The soft path approach can have many benefits for sustainability including, but not limited to: (1) reducing the overall socioeconomic costs of water, (2) ensuring the long-term supply of water and wastewater services, and (3) preserving environmentally-sensitive sources of water from exploitation.

This study contributes knowledge about the practice of the soft path approach by describing the conditions necessary to implement the soft path approach for water management in Canadian municipalities.

#### ***1.4 Thesis overview***

Chapter One outlines the rationale, purpose, objectives, and significance of this research study. Chapter Two is a literature review that outlines the ‘theory-practice gap’ (2.1), the general approaches in water management (2.2), and develops the sensitizing concept ‘institutional capacity’ and develops preliminary indicators to judge institutional capacity for implementing the soft path approach in a municipality (2.3). Chapter Three outlines the methodology of the research, including a description and justification of the study area (3.1), the procedural order and staging of the research effort (3.2-3.5), the limitations of this research (3.6), and ethical considerations (3.7). Chapter Four presents the results of the analysis components of this research study, including the interviews (4.1) and the framework of final indicators of how to implement the soft path approach in a municipality (4.2). Chapter Five applies this framework to the case study. Finally, Chapter Six summarizes the broad conclusions of this research study, by addressing the research questions and recommending future research.

## **CHAPTER TWO: LITERATURE REVIEW**

The purpose of this literature review is threefold. First, the ‘theory-practice gap’ is identified and discussed. This is important because this study aims to bridge this gap by combining information from both academic literature and real-world practitioners.

The second part of the literature review familiarizes the reader with the soft path approach and places it within the broader theory of water management. The three primary water management approaches are reviewed: supply management, demand management, and the soft path approach.

The final part is dedicated to ‘institutional capacity,’ which is a sensitizing concept that is needed for this study. Capacity literature is reviewed, institutional capacity is defined, and preliminary indicators of institutional capacity are constructed. These preliminary indicators were later combined with interview codes to create a framework of final indicators for implementing the soft path approach to water management in municipalities (see **sections 3.4 & 4.2**) and these final indicators were used to evaluate a case study (see **sections 3.5 & 5**).

### ***2.1 Planning theory and practice***

Alexander (1997) states that there is a substantial difference between planning theory and its implementation into planning practice, such as the differences between public policy and how that policy is implemented in site-specific interventions. This problem is commonly referred to as the “theory-practice gap” (p. 5). For this study, ‘planning theory’ is defined as, “the process component of our profession; it guides us through a continuous self-



examination of what it is we are doing, how we are doing it, why, for whom, and with what results” (Brooks, 2002, p. 21).

Many reasons have been put forward to explain why this theory-practice gap exists<sup>4</sup>. One reason that has been put forward is the difference between the nature of theory and the complexity of the real world in which it is applied. Allmendinger and Tewder-Jones (1997) state that planning theory is almost exclusively normative because it is rooted in “a priori assumptions and prescriptions about how the world is and ought to be” (p. 802), rather than how the world *actually* is.

Another reason for the theory-practice gap is that theories are often created in an apolitical environment and cannot hold up within the highly politicized ‘real’ world of planning practice (Forester, 1989). In the real world, practicing planners are subject to political forces and must sometimes capitulate to these forces (e.g. city councilors) to keep their jobs, whereas planning theorists in academia are not subject to such pressure (Forester, 1989). Furthermore, society contains many competing interests with different values and it is difficult to apply specific theories in this environment because few people can agree on what is right to begin with (Grant, 2005).

The theory-practice gap also results from a time lag between when theory is developed and when it is applied in planning practice. Harris (1997) notes that cutting-edge theory and concepts take time to reach seasoned professionals who have been trained in other

---

<sup>4</sup> This is not an exhaustive list of reasons and is intended to list only a few main reasons to familiarize the reader with the subject matter. Indeed, this subject has a large literature that has been evolving for decades and there have been many more possible reasons put forward to explain the theory-practice gap.

theories and, “only the most recent of planning graduates are likely to be acquainted with theories enjoying currency at present” (p. 801).

Simonovic (2001) notes that there is a theory-practice gap in the water management sector with regards to the theory and practice of sustainability. The author notes that: “[a]lthough the concept and ideals of sustainable water resources development are well accepted” (p. 3), measuring relative sustainability is difficult. Furthermore, “[w]hile some methods have been proposed for incorporating sustainability into the water resources planning process, few have been tested in a practical setting” (p. 3).

The importance of a sustainability theory-practice gap to this research study cannot be underestimated because sustainability is one of the primary aims of the soft path approach (see **section 2.2.3**). Although some elements of the soft path approach have been implemented in some places, a complete water soft path approach has not been implemented in any Canadian community (Brandes & Maas, 2009). Without any practical case studies of implementation, the soft path approach has not been fully tested in real-life practice and remains predominately theoretical. It is for this reason that a theory-practice gap is perceived for the soft path approach and this research study has been designed to attempt to overcome this gap (see **Chapter Three**).

## ***2.2 Approaches to water management***

There are three primary approaches in contemporary water management: supply management, demand management, and the soft path approach (Brandes, Brooks, & Gurman, 2009). These three approaches are discussed in this section for the purpose of grounding the reader in water management theory.

### 2.2.1 Supply management

*Water supply management* (also known as *water supply planning*) is the “traditional approach” to water scarcity (Prasifka, 1984, p. 45). Agthe, Billings, and Buras (2003) state that “in urban water supply management, engineers are likely to seek technological solutions such as new dams, additional well fields, or elaborate water importation schemes to increase the water supply to meet increasing quantities of water desired by the public” (p. 2).

Supply management is the oldest form of water management and goes back to ancient times. For at least 2500 years, societies have been designing and building infrastructure (e.g. canals, dams, reservoirs, aqueducts) to exploit, transport, and store fresh water for domestic, agricultural, and industrial use (Brandes, Brooks, & Gurman, 2009). In the contemporary world, it was unusual to provide comprehensive water systems that connected to most buildings before the mid-20th century (Baumann, Boland, & Hanemann, 1998). Prior to this, people relied on cisterns for drinking water and privies or cesspools for sewage disposal.

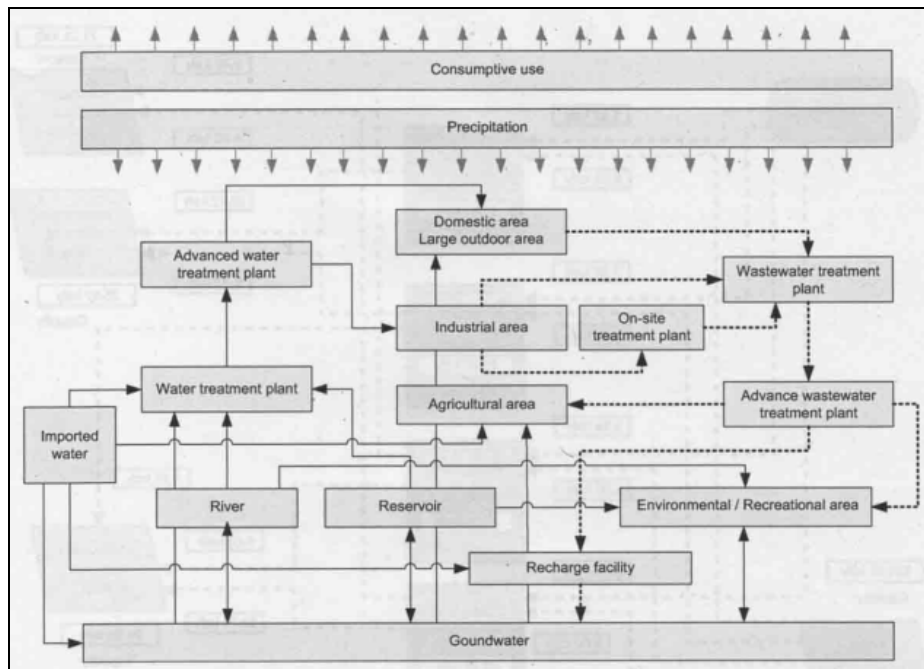
There are two main components to contemporary water supply management (Prasifka, 1984). The first, *demand fulfillment*, involves “providing sufficient water supplies to meet the water demands of a community” (p. 2) by extrapolating the future water demand through historical trends of water use (per capita, per household, or per unit area of land) and expected future population growth. The second component, *hazard mitigation*, involves identifying courses of action to provide water when there is a scarcity (i.e. a drought) for an extended period of time.

Contemporary water management uses systems engineering approaches to design and model water and wastewater systems (Chung et al., 2008). **Figure 1** visualizes a generalized

model of an integrated water and wastewater management system to assist the reader's understanding of these systems. In this model, solid lines represent water flow and dotted lines represent wastewater effluent flows. Water flows going in and out are measured at each stage in order to document how much water is available and where it is at any given time, from initial uptake at the original water source, through its treatment and consumption, then on to wastewater treatment and secondary use and/or back to the source. This model is based on conservation of mass and can be mathematically represented as (**S** is storage, **Q** is quantity, & **t** is time):

$$S_t - S_{t-\Delta t} = \Delta S_t = \sum Q_{input,t} - \sum Q_{output,t}$$

**Figure 1: Schematic of a generic water and wastewater supply system**



Source: Chung et al., 2008, p. 895

When presented with water scarcity, there are many supply-side management practices that planners and engineers may use (Baumann, Boland, & Hanemann, 1998). For short-term scarcity, they may conduct audits and metering of the water supply to determine wastage, detect and repair leaks in the system, as well as transfer and divert auxiliary supplies of water. In the long term, they may further develop freshwater sources, add new water supply infrastructure, and desalinate ocean water.

Although supply management has brought drinking water to many, there are negative ecological consequences to diverting and removing large amounts of water from rivers, lakes, and underground aquifers, including the destruction of habitat and ecosystems (Brandes, Brooks, & Gurman, 2009). There are also other problems associated with supply management, including increasing costs, water sources being depleted, and concerns that future demands will not be satisfied (Brandes & Ferguson, 2004). In one extreme case, the water flows of the Colorado River (in the south-western United States and Mexico) have been depleted to the point where water never makes it to the rivers ocean estuary in most years because all the water is withdrawn for agricultural and urban uses (Gleick, 2003).

### **2.2.2 Demand management**

To address the above concerns associated with supply management, *demand management* (also known as *demand-side management*) complements supply management by increasing the efficiency of water supply infrastructure (Brandes & Ferguson, 2004). Shrubsole and Tate (1994) define demand-side management generally as, “the planning and implementation of programs to influence the amount, composition, or timing of demand for some commodity or service” (p. 4). Applied to water, demand-side management is, “any

measure which reduces or reschedules average or peak withdrawals from surface or ground water sources while maintaining or mitigating the extent to which return flows are degraded” (Brooks & Peters, 1988, p. 10). Aside from saving water, demand management regimes often have the added benefit of being more cost-effective (per unit of water gained) than supply management solutions (Brandes & Ferguson, 2004).

There are many methods of implementing demand management for water (Baumann, Boland, & Hanemann, 1998). In a short-term water shortage, water rates and surcharges can be increased, penalties can be assessed for non-compliance to these rates and surcharges, voluntary requests can be made for individuals to reduce their water use, and, in severe cases, water use bans and rationing can be implemented. For saving water in the long term, options include: conservation programs, comprehensive metering for all water uses, marginal pricing schemes to penalize heavy water users, large-scale water auditing, public education, new plumbing efficiency standards, and retrofitting existing plumbing for greater efficiency.

### **2.2.3 Soft path approach**

To address the deficiencies of water demand management, the *soft path approach* has been put forward as a new paradigm to complement (not replace) demand management by increasing its effectiveness (Brandes, Brooks, & Gurman, 2009). Although its application to water management is new, the soft path approach itself is not and was first developed as an alternative approach to energy policy (named the ‘soft energy path’) after the 1970s oil crisis (Holtz & Brooks, 2009). The first major paper on the soft energy path, “Energy strategy: The road not taken?” by Amory B. Lovins, advocated for an energy policy that primarily focused on energy efficiency and for new energy supply to come from small-scale, renewable sources

(Lovins, 1976). This paper was expanded into a book (Lovins, 1977) and scenario-based economic analyses were later performed in some jurisdictions to quantitatively demonstrate the merits of implementing the soft energy path (e.g. Bott, Brooks, & Robinson, 1983).

Both water demand management and the soft path approach are forms of water conservation but they differ in their aims (Brandes, Brooks, & Gurman, 2009). Demand management aims to decrease water usage but not change how water is used. Soft path thinking aims to change water usage altogether by asking the question: “[w]hy use water to do this in the first place?” (p. 8). Soft paths are ‘soft’ “partly because they require less steel, concrete, and other resource-intensive inputs, but mainly because they depend on human ingenuity to find ways around current natural resource use patterns without losing the benefits of economic development that have improved the quality of life for so many people” (p. 8).

There are four principles that distinguish the soft path approach from conventional water planning and management (Brandes, Brooks, & Gurman, 2009). These four principles are as follows:

1. “treating water as a service rather than an end in itself;
2. making ecological sustainability a fundamental criterion;
3. matching the quality of water delivered to that needed by the use;
4. planning from the future back to the present” (backcasting)

(Brandes, Brooks, & Gurman, 2009, p. 11).

Brooks (2005) identified three broad categories of methodologies to implement the soft path approach. First, an analysis of water usage is conducted as it cycles from its initial withdrawal at its source to its final disposal as wastewater. The potential for water savings is evaluated at each stage and strategies are identified to achieve this. Generally, the strategies that cost the least will be implemented first, followed by more expensive approaches as the need for conservation grows.

Second, an analysis is conducted to determine the appropriateness of supplying treated drinking water to specific end-use activities (Brooks, 2005). Drinking water requires resources to treat (i.e. energy, chemicals) and it is wasteful to supply to end-uses that do not explicitly require it. When it is determined that drinking water is not necessary for an activity, a plan is put into place to replace it with water of an appropriately poorer quality. For instance, rainwater may be collected in a rain barrel for use in residential lawn irrigation and the existing irrigation system would be disconnected from the supply of treated water, thus saving drinking water (Brooks et al., 2007).

Third, a ‘backcasting’ approach is performed in which a future scenario is envisioned at a certain point in the future in which water is used more efficiently (Brooks, 2005). Public participants think backwards in time to the present to determine what is necessary to achieve this scenario. This is different from the traditional forecasting approach, which begins with today and plans forward in time.

In practice, the soft path approach is fully integrated with demand management approaches and they complement each other (Brooks et al., 2007). As such, the line between demand management and the soft path is often blurred and difficult to distinguish. However,



this is not an issue since they are both conservation measures and aim to achieve (essentially) the same purpose.

Technology is not an impediment to implementing conservation measures (Brooks et al., 2007). There are many technologies for water conservation, such as low-flow toilets, water efficient showerheads, and collecting and storing rainwater from roofs, that would dramatically reduce water consumption if implemented. It is necessary to have, “a framework for implementation and integration of various methods and techniques so that they complement one another” (p. 13).

This study is not the first to propose a soft path approach in a community, so it is useful to examine what soft path implementation methods have been proposed for communities elsewhere. Brandes et al. (2007) propose soft paths for the Town of Oliver, British Columbia and give five ‘action items’ needed for its implementation, as summarized below:

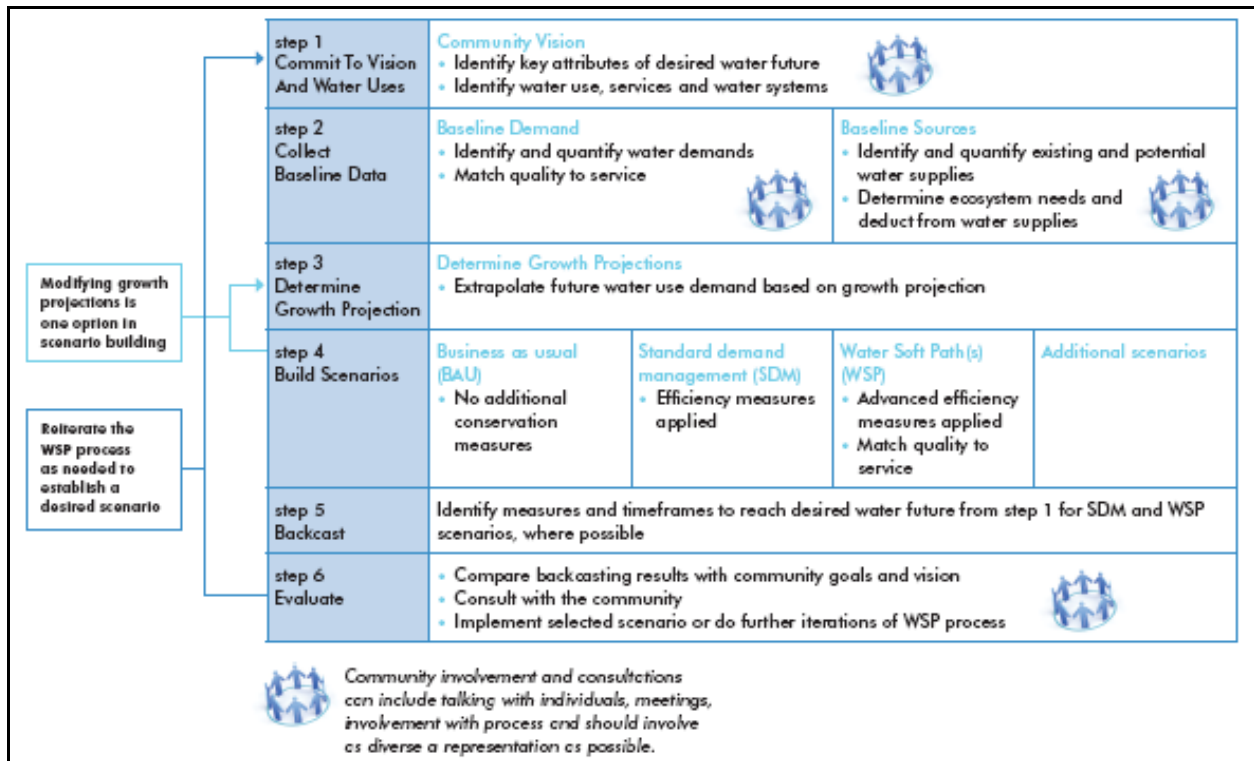
- institute a comprehensive conservation program with full-time staff,
- conduct a strong public awareness campaign,
- commit to the principle that all new growth will be provided by conservation, not additional supply management infrastructure,

- pass by-laws to require future developments to institute water conservation measures and give rebates to retrofit existing buildings, and
- continue looking for new, sustainable sources of water.

Friends of the Earth Canada has developed a six step framework to implement the soft path approach in Canadian municipalities to achieve sustainable water resource management (FOEC, 2009). This process is summarized in **Figure 2**. This framework is included as an additional example of a proposed methodology to implement the soft path approach.

This research study is intended to build on the literature of how to implement the soft path approach (e.g. Brooks et al., 2007; FOEC, 2009) and provide an expanded list of more specific methods and solutions for the implementation of the soft path approach in water management.

Figure 2: Six step WSP analysis framework (Friends of the Earth Canada)



Source: FOEC, 2009, p. 2

### 2.3 Institutional capacity

Successful water soft path implementation requires institutional action and management at the municipal level because there are many institutional barriers (Jordaan, Stevens, & Brooks, 2009). For this reason, the objectives of this study (section 1.2) refer to ‘institutional capacity.’ This is a *sensitizing concept* that is defined and discussed in the following sections via a literature review. **Section 2.3.1** surveys the literature of ‘capacity.’ **Section 2.3.2** critically analyses this literature and defines ‘institutional capacity.’ Finally, **section 2.3.3** develops indicators of ‘institutional capacity’ for judging the institutional capacity of municipalities to adapt to the soft path approach.

“Capacity building” in water management literature is predominately in reference to developing countries (e.g. Harvelt & Okun, 1991; Saleth & Dinar, 2005). This predominance is demonstrated by a scan of water management case studies in the World Water Development Report 3<sup>5</sup> (WWAP, 2009). This document reviews major international water management projects and undertakings (among other purposes). Using the country classification of the International Monetary Fund (IMF, 2010), this researcher has divided these case studies into whether they are in countries that are classified as ‘advanced economies’ or ‘emerging and developing economies.’<sup>6</sup> Of the 50 cases studies in total, 8 case studies were exclusively in advanced countries (16%), 37 were exclusively in emerging and developing economies (74%), and 5 included both country categories<sup>7</sup> (10%).

Since this case study is in Canada, an ‘advanced economy’ country, it is deemed appropriate to restrict this review to literature that focuses on or speaks exclusively to ‘capacity’ in advanced economy countries (commonly known as ‘developed countries’). This researcher perceives that water institutions in these two groups of nations are not comparable because they have different capacity requirements and different contexts. This perception may be controversial and requires further elaboration.

---

<sup>5</sup> These case studies are presented in Chapters 14 and 15 of the World Water Development Report 3 (WWAP, 2009).

<sup>6</sup> The exact definitions of each category are too complex to be listed here. Please refer to IMF (2010, p. 141-152) to learn how these categories are delineated.

<sup>7</sup> Several case studies cross international boundaries. This category includes case studies that cross boundaries between both country categories.

The conventional water management literature agrees with this perception (Wolfe, 2007) and argues that water management “situations in developing countries [are] completely different than the situations in more developed countries” (p. 186) due to five factors:

- the predominance of water scarcities in developing countries,
- water-efficient technology inaccessibility in developing countries,
- different rationales for water efficiency (absolute scarcity in developing countries versus capital and operational cost deference in developed countries),
- citizen inability to pay for water in developing countries, and
- government inability to finance water infrastructure in developing countries.

Despite the differences between developed and developing countries, many fundamental underlying problems of water management are still the same in both contexts (Wolfe, 2007). “In both situations, the practitioners and advocates struggle against similar societal and organizational challenges, draw similar resources from their social networks, and hold remarkable similar tacit knowledge” (p. 187).

While acknowledging these similarities, this researcher feels that the context differences in water management between developed and developing countries are still too

great to be fully comparable with regard to capacity. The following literature review finds that financial and technical elements are a critical part of institutional capacity (see **section 2.3.2**). Note that the above list of factors concern financial elements (i.e. financial constraints in developing countries) and technical elements (i.e. of technology inaccessibility in developing countries). These financial and technical differences in developing countries are understood to be significant enough to exclude from this study literature that speaks exclusively or primarily to capacity in developing countries because the case study is in a developed country (Canada).

### **2.3.1 Literature on ‘capacity’**

The concept of ‘capacity’ is used in the literature of many different fields. The following section reviews some of this literature. This section prepares the way for the following sections, which compare and contrast this literature and build toward an operable definition of ‘institutional capacity.’

The concept of ‘community capacity’ has been applied to the economic development of small communities to improve quality of life (McGuire et al., 1994). Community capacity is conceptualized as three factors: “citizen participation, community structure, and development instruments” (p. 427). These factors are then used as a framework to evaluate the capacity of several communities in the United States.

‘Capacity’ and ‘capacity-building’ has also been applied more broadly to public sector organizations. Grindle and Hilderbrand (1995) distinguish ‘capacity’ and ‘capacity building’ in this context. The former is defined as, “the ability to perform appropriate tasks effectively, efficiently and sustainably” (p. 445). The latter, “refers to improvements in the ability of public sector organizations, either singly or in cooperation with other organizations, to

perform appropriate tasks” (p. 445). The authors then go on to classify five dimensions of capacity:

- the **action environment**, including the “economic, political and social milieux in which governments carry out their activities” (p. 445),
- the **institutional context of the public sector**, including rules and procedures, financial resources, responsibilities, concurrent policies, and other structures (formal or informal) that influence how an organization functions,
- the **task network**, consisting of other organizations involved in the same task,
- **organizations** themselves, which are “building blocks of the task network and the vantage point from which diagnostic research is usually carried out” (p. 447), and
- **human resources**, including the education and skills of employees and the ability of an organization to attract and retain the best and brightest workers.

Healey (1998) discusses how to build ‘institutional capacity’ in European urban governance. Although not explicitly defining this term, “a key element of such capacity lies in the quality of local policy cultures” (p. 1531). Ideally, an organization with this capacity would be “well-integrated, well connected, and well informed, and can mobilize readily to act

to capture opportunities and enhance local conditions” (p. 1531). The author discusses five ways in which these objectives can be achieved:

- **integrative place making** by including professionals in the decision-making process from many different fields to gain a broader perspective,
- **collaboration in policymaking** with those who implement specific planning projects to reduce the conflict between them,
- **inclusive stakeholder involvement** to gain a larger range of viewpoints and to give more legitimacy to decision-making,
- **use of ‘local’ knowledge** of the public which is very valuable but not commonly recognized, and
- **building ‘relational’ resources**, which is defined as “[d]eveloping a context within which there is sufficient appreciation, trust, and communicative skill for different stakeholders to find their ‘voice’ and ‘listen’ to each other...” (p. 1540).

Capacity has been additionally applied to non-profit agencies. Schuh and Leviton (2006) develop an operable definition of *organizational capacity* for non-profit agencies, which is: “the ability to successfully implement and complete a new project or to expand an



existing one successfully” (p. 172). Organizational capacity exists on two levels, (1) the expertise of individuals and (2) organizational resources and experience, and has five features: (1) governance, (2) financial resources, (3) organizational development, (4) internal operations, and (5) core services.

Discussions of capacity have also been applied to the protection of water in communities, such as groundwater protection, source water protection, climate change adaptation, and drinking water protection. de Loë, Di Giandomasso, and Kreutzwiser (2002) develop a framework for evaluating the ‘local capacity’ for groundwater protection and use this framework to evaluate three Ontario communities. Based on a literature review of ‘capacity,’ the authors conceptualize local capacity as consisting of five dimensions:

- **technical capacity**, which includes the availability of knowledgeable staff who are able to undertake “water resource definition, threat assessment, monitoring data management, planning, and emergency response” (p. 221),
- **financial capacity**, which is “measured in terms of revenue sufficiency, credit worthiness, and fiscal management and controls” (p. 221),
- **institutional capacity**, including things such as plans, policies, programs, and by-laws,

- **political capacity**, which is effective leadership and the ability to form linkages with other organizations and community members, and
- **social capacity**, including the “levels of awareness and the amount and nature of community involvement” (p. 223).

Ivey et al. (2004) identify and describe three elements that affect “the capacity of communities to adapt to climate change-induced water shortages” (p. 38). This framework of elements is used to evaluate the Credit River watershed in Ontario. These three elements include: (1) institutional arrangements, (2) community characteristics, and (3) community and organizational resources.

Ivey et al. (2006) develop a framework for evaluating the capacity of local governments to protect source water and use this framework to evaluate the Oldman River basin in Alberta, Canada. This framework consists of four elements:

- **technical knowledge** of local water sources,
- **legal authority** to influence land and water management,
- **public involvement** in decision-making and implementation, and
- **land and water integration** in planning, because land use practices influence water quality and quantity.

Timmer, de Loë, and Kreutzwiser (2007) develop indicators for *community capacity* for preventing drinking water contamination in small communities. Five capacity components are listed and discussed, including: **financial capacity**, **human resources capacity**, **institutional capacity**, **social capacity**, and **technical capacity**. These five capacity components are noticeably similar to the earlier five capacity dimensions of de Loë, Di Giandomasso, and Kreutzwiser (2002), with two important distinctions. First, political capacity is noticeably absent and political leadership and its contents are spread into other capacity indicators. Second, technical capacity (from the older paper) has been divided into human resource capacity (including dedicated skilled and knowledgeable staff) and technical capacity (including water standards, monitoring, and data).

Finally, there is also literature that discusses the broader theory of water management ‘capacity’ itself. Biswas (1996) describes ‘capacity building’ as a “buzz-word” (p. 399), which is often used “interchangeably, with other terms like ‘education and training’, ‘institutional development’, ‘institutional building’, ‘institutional strengthening’ and ‘human resources development’ to indicate somewhat similar issues generally, but sometimes the emphases given to specific issues by individuals or institutions could be significantly different” (p. 399).

The United Nations Development Symposium occurred in 1991 in Delft, The Netherlands and this symposium defined ‘capacity building’ (Franks, 1999). It was decided at this symposium that ‘capacity building’ consists of three elements:

- “the creation of an enabling environment, with appropriate policy and legal frameworks” (p. 52),
- “human resource development and the strengthening of managerial systems” (p. 52),  
and
- “institutional development, including community participation” (p. 52).

Pres (2008) discusses the history of ‘capacity building’ since the early 1950s to the present and states that its “major challenge can be summarized in two words: continuous change” (p. 125). Six components are listed to build capacity and meet this challenge:

- “Professional knowledge” (p. 126),
- “Methodical competence” (p. 126),
- “Regional cooperation” (p. 127),
- “Training needs assessment, monitoring + evaluation” (p. 127),
- “Public relations and public awareness” (p. 127), and a
- “Community of practices” (p. 127).

### 2.3.2 Defining ‘institutional capacity’

An important observation can be made from Biswas (1996) that is relevant to this study. With such interchangeability and circumstantial use, the term ‘capacity’ is subjective and normative. To this end, there is no impediment to construct a new definition of ‘institutional capacity’ for this study, albeit one that is heavily based on other definitions.

**Table 1** uses de Loë, Di Giandomasso, and Kreutzwiser (2002) as a point of comparison for many different definitions of ‘capacity’ in the water management literature. This paper was chosen as a point of comparison for three reasons. Firstly, the authors define ‘capacity’ broadly enough that other definitions and uses of the term fit within it. Secondly, the authors define ‘capacity’ as consisting of five broad ‘dimensions’ rather than giving a straightforward one-or-two sentence definition. These dimensions provide useful categories under which other definitions of ‘capacity’ can be grouped. Thirdly, these five dimensions are themselves a product of an extensive literature review of ‘capacity’ by the authors.

**Table 1: Dimensions of 'capacity'**

Reference <sup>8</sup>	Term used	Dimensions of 'local capacity' <sup>9</sup> [as defined by: de Loë, Di Giantomasso, and Kreutzwiser (2002)]				
		Technical capacity	Financial capacity	Institutional capacity	Political capacity	Social capacity
McGuire et al. (1994)	community capacity		•	•	•	•
Grindle & Hildebrand (1995)	capacity building	•	•	•	•	
Biswas (1996)	capacity building	•		•	•	•
Healey (1998)	institutional capacity	•		•	•	•
Franks (1999)	capacity building	•		•	•	•
<b>de Loë et al. (2002)</b>	<b>local capacity</b>	<b>•</b>	<b>•</b>	<b>•</b>	<b>•</b>	<b>•</b>
Ivey et al. (2004)	community capacity	•	•	•	•	•
Ivey et al. (2006)	local capacity	•		•	•	•
Schuh & Leviton (2006)	organizational capacity	•	•		•	
Timmer et al. (2007)	community capacity	•	•	•	•	•
Pres (2008)	capacity building	•			•	•

Upon reviewing **Table 1**, the reader will notice that one of the five dimensions of de Loë, Di Giantomasso, and Kreutzwiser (2002) is 'institutional capacity' but Healey (1998) uses a much broader definition for this term. Furthermore, 'institutions' and 'institutional' are used in several other definitions and discussions of capacity (e.g. Biswas, 1996; Franks, 1999).

Two authors provide definitions for 'water institutions.' First, Saleth and Dinar (2005)<sup>10</sup> define 'water institutions' as:

---

<sup>8</sup> Please note that **Table 1** is intended as a sampling of the 'capacity' literature only and does not represent an exhaustive list of published works on this topic.

<sup>9</sup> Please note that **Table 1** is for general comparison only in order to show how different authors define and use the term 'capacity.' Inclusion into a category means that the specific 'capacity' definition fits "well" into that category and exclusion means that it does not fit well or at all. Although this is sometimes a subjective decision, it is justified because the differing language and context of different papers sometimes make it difficult to fit things perfectly into the given categories.

“rules that describe action situations, delineate action sets, provide incentives and determine outcomes both in individual and collective decisions related to water development, allocation, use and management. Like all institutions, water institutions are also subjective, path dependant, hierarchical and nested both structurally and spatially and embedded within the cultural, social, economic and political context” (p. 2).

Second, Livingston (2005) defines ‘water institutions’ as: “all the formal laws, policies and administrative rules governing water allocation and use in a particular context. Essentially, water institutions embody the relationship to things, in this case water” (p. 22).

The two above definitions of ‘water institutions’ fit within the realm of ‘capacity’ displayed in **Table 1**. If the definition provided by Saleth and Dinar (2005) were included in this table, it would fit well under *technical capacity* category and less well under a few other categories. If the definition provided by Livingston (2005) were included, it easily fits in the *institutional capacity* category.

In conclusion, this literature review has found that, although definitions differ, all definitions of ‘capacity’ fit into the five categories of ‘capacity’ developed by de Loë, Di Giandomasso, and Kreutzwiser (2002). Furthermore, this literature review has established that capacity and institutions are inherently tied together because the water management literature uses these terms interchangeably and within the same contexts. For these reasons, the five

---

<sup>10</sup> It was previously stated that Saleth and Dinar (2005) would not be used in the discussion of ‘capacity’ because it is mainly focuses on developing countries. As such, it is not included in **Table 1**. Nonetheless, the authors provide a very broad definition of ‘water institution’ that this researcher feels is still useful for this study.

categories of ‘capacity’ by de Loë, Di Giantomasso, and Kreutzwiser (2002) will be used as a definition of ‘institutional capacity’ in this study, upon which preliminary indicators will be developed in the following sections.

### **2.3.3 Preliminary indicators for evaluating ‘institutional capacity’**

Many studies have developed a framework of qualities that influence the capacity of institutions. These studies use many labels to describe these qualities: concepts (e.g. Healey, 1998), components (e.g. Pres, 2008), dimensions (e.g. Grindle & Hilderbrand, 1995; de Loë, Di Giantomasso, & Kreutzwiser, 2002), elements (e.g. Biswas, 1996; Franks, 1999; Ivey et al., 2004; Ivey et al., 2006), factors (e.g. McGuire et al., 1994), features (e.g. Schuh & Leviton, 2006), and indicators (e.g. Timmer, de Loë, & Kreutzwiser, 2007).

In some cases, these studies go beyond simply developing and rationalizing these frameworks and also actively apply them to evaluate the capacity of one or more case studies (e.g. McGuire et al., 1994; de Loë, Di Giantomasso, & Kreutzwiser, 2002; Ivey et al., 2004; Ivey et al., 2006). In these evaluative frameworks, the stated qualities of capacity are each assigned one or more ‘indicators.’ These indicators are qualitative descriptions of what goals or conditions must be met to achieve capacity.

These indicators may additionally come with questions with yes/no answers (e.g. McGuire et al., 1994; Ivey et al., 2004). A “yes” response to an indicator means that capacity is present and a “no” response means that capacity is not present.

Ivey et al. (2004) state that indicator questions frameworks are present in public administration and resource management literature (e.g. Mitchell & Pigram, 1989; USEPA, 1998). This framework has been used successfully in these contexts to “ascertain the



financial, managerial, and technical capacity of local organizations, with specific lines of inquiry dealing with training, infrastructure, reporting structures, and resources” (Ivey et al., 2004, p. 38).

Kean (2008) combines both qualitative indicators and indicator questions in an evaluative framework for the capacity for Ontario conservation authorities to adapt to climate change. This evaluative framework consists of four parts:

- **themes**, which constitute a broad component of capacity,
- **indicators of capacity**, including one or more qualitative descriptions,
- **indicator questions** with yes/no answers, and
- **rationales** for why the indicators are relevant and important.

This study adapts the evaluative framework of Kean (2008) to develop a preliminary evaluative framework (including preliminary indicators) of the institutional capacity of municipalities to implement the soft path approach to water management. Six broad themes are chosen and indicators are defined for each.

#### ***2.3.3.1 Human resources***

This theme of indicators is adapted from the dimension of *technical capacity* in de Loë, Di Giantomasso, and Kreutzwiser (2002). Human resources are commonly identified as an important component to capacity (e.g. Grindle & Hilderbrand, 1995; Healey, 1998; Franks, 1999; de Loë, Di Giantomasso, & Kreutzwiser, 2002; Ivey et al., 2004; Ivey et al., 2006; Schuh & Leviton, 2006; Timmer, de Loë, & Kreutzwiser, 2007; Pres, 2008). Biswas (1996)

goes further by stating that human resources are the most important element of capacity. The elements of human resources that are discussed by these authors include the skills, knowledge, education, and training of staff and their ability to learn and have access to new sources of knowledge to keep up-to-date with new policy and practice. Brandes et al. (2007) state the need for full-time water conservation staff as part of a soft path water conservation plan for the Town of Oliver, British Columbia.

From the above literature, two indicators of capacity for human resources have been identified to implement the soft path approach in a municipality. These indicators consist of the abilities and credentials of municipal water management staff themselves and their ability to continue learning throughout their careers. These indicators are presented in **Table 2**.

**Table 2: Preliminary indicators for human resources**

Theme	Indicators of capacity	Indicator questions	Rationale
Human resources	Full-time, specialized municipal staff for conducting water conservation programs.	Does municipality have full-time water conservation staff?  Do staff possess education, knowledge, skills, and training for water conservation?	Full-time, specialized staff is needed to oversee water conservation programs.
	Further education and training opportunities.	Does staff have the access and ability to have further education and training while on the job?	Water conservation policy and practice are constantly changing. Staff need to keep up-to-date to stay relevant.

### **2.3.3.2 Information resources**

This theme of indicators has been developed from the *technical capacity* component in Timmer, de Loë, and Kreutzwiser (2007), which is also a part of the *technical capacity*

dimension in de Loë, Di Giandomasso, and Kreutzwiser (2002). Having up-to-date and accurate information and data is critical to making informed decisions.

Jordaan, Stevens, & Brooks (2009) identify the lack of data and information as a key barrier to the management of Canada's water resources. Two types of data and information are identified:

- a “lack of regular time series data on water withdrawals, use and consumption” (p. 156),
- a “lack of access to relevant case studies and success stories” (p. 156).

Brooks and Holtz (2009) discuss the ideal minimum types of information needed for effective water conservation and the soft path approach. This information must include figures for water demand by region and sector, broken down into major end-uses and major end-users. Current and projected future population numbers are also needed, as well as growth rates by sector.

Four indicators of capacity for information resources have been identified from the above literature. These indicators are presented in **Table 3**. These indicators relate to municipal water management staff having access to data, keeping this data up-to-date, sharing data, and keeping current with the latest developments in the field.

**Table 3: Preliminary indicators for information resources**

Theme	Indicators of capacity	Indicator questions	Rationale
Information resources	Staff have access to data, including: current and future water demand and population, by sector and region.	Do staff have current and future water demand and population data?	This type of data is the basis of what is needed for water conservation programs.
	On-going monitoring is conducted at regular intervals to ensure information and data is up-to-date and accurate.	Do staff monitor the success of water conservation programs?  Is data kept up-to date?	
	Staff and other stakeholders share information and data with each other.	Do stakeholders openly share information and data with each other?	These greatly increase the knowledge base of staff, thereby contributing towards institutional capacity.
	Staff have the ability to keep up-to-date with water conservation research & developments.	Do staff make up-to-date with latest water conservation research & developments?	

### **2.3.3.3 Financial resources**

Having sufficient revenue and good fiscal management to support and maintain programs is an important element of capacity in an institution (McGuire et al., 1994; Grindle & Hilderbrand, 1995; de Loë, Di Giantomasso, & Kreutzwiser, 2002; Ivey et al., 2004; Schuh & Leviton, 2006; Timmer, de Loë, & Kreutzwiser, 2007). An institution must also be able to access funding from external sources, but this must be done with care because the source of this funding is important as grants from more senior levels of government “may impact a municipality’s ability to function independently” (de Loë, Di Giantomasso, & Kreutzwiser, 2002, p. 222). It is also important that the rate charged to end-users of water reflects the full

cost of the provision of drinking water, including treatment, distribution, maintenance, and source water protection (Timmer, de Loë, & Kreutzwiser, 2007).

Jordaan, Stevens, and Brooks (2009) discuss many financial barriers that prevent the soft path approach from being realized. These include:

- the price charged for water is less than what it actually costs to provide and little money is available for viable water conservation,
- the cost of conservation is perceived to be too high and the benefits are underestimated,
- since water rates do not account for the full cost of water provision, producers and consumers are not given adequate price signals to know when to change supply and demand,
- there are few, if any, incentives given to consumers who conserve,
- there is an absence of life cycle assessments, which would help to understand the full cost of various water management options.

A review of the above literature reveals six salient indicators of capacity for the financial resources theme (presented in **Table 4**). These indicators consist of having access to

secure and stable internal and external funding, conducting life cycle assessment of water management programs, charging consumers the full cost of water, and providing incentives for consumers to conserve.

**Table 4: Preliminary indicators for financial resources**

Theme	Indicators of capacity	Indicator questions	Rationale
Financial resources	Water institution maintains a balanced and sustainable budget for water conservation.	Is the annual budget stable and predictable from year-to-year?	Reliable budgets allow water institution to conduct long-term planning.
	Water institution is able to access to external funding.	Are sources of external funding available?	Allows water institution to conduct more water conservation activities.
	Life-cycle assessments are performed for water supply and demand projects/programs.	Are life-cycle assessments performed for all water supply and demand projects/programs?	Needed to understand the true financial benefits of water conservation versus new water supply infrastructure.
	Water rates reflect the full cost of water provision (including treatment, distribution, maintenance, and source water protection).	Do water rates reflect the full cost of water provision?	Water rates usually do not reflect the full cost and this severely curtails the capacity of a water institution to conduct water conservation.
	Incentives are available to consumers (residents, businesses, etc.) to reward water conservation.	Are there incentives for consumers to use less water?	Incentives increase water conservation because they effect the consumers bottomline.

#### ***2.3.3.4 Policy and legal environment***

The policy and legal framework is a significant determinant of capacity because it creates an enabling environment that gives a water institution its mandate, its authority, and the limits to its authority (McGuire et al., 1994; Grindle & Hilderbrand, 1995; Biswas, 1996;

Franks, 1999; de Loë, Di Giandomasso, & Kreutzwiser, 2002; Ivey et al., 2004; Ivey et al., 2006; Timmer, de Loë, & Kreutzwiser, 2007). This framework may include plans, policies, programs, and by-laws.

However, the policy and legal framework is not enough unto itself. Biswas (1996) cautions that there is a tendency for individuals in many institutions to ‘play it safe’ by choosing not to exert their full authority by refraining or delaying a controversial decision or action to avoid risk and, ultimately, keep their job. This inaction is part of what Livingston (2005) calls ‘path dependency,’ which states that there is significant pressure in an institution to maintain the status quo and it is very hard for an institution to make fundamental changes to the way it operates. As a consequence, a municipality must want to make a desired change and accept the potential risks of this decision.

Holtz (2009) discusses many policy changes that are required for soft path implementation in Canada. The author states that water conservation must be fully integrated with land use and economic planning and that this is best done at the municipal scale. Furthermore, sustainability must be an explicit goal of water policy. Within the framework of this goal, the maintenance of ecological services (e.g. nutrient cycling, aquatic habitat) must be given value alongside aesthetic values and human uses. Since these ecological services are difficult to measure, the author suggests a moratorium on building new water supply infrastructure until the true ecological effects and limits of present and further water takings can be determined through research.

Six indicators of capacity have been identified for the policy and legal environment theme by a review of the above literature. These indicators are presented in **Table 5**. A

municipality should have a water conservation plan or program in place that is focused on sustainability and has long-term goals. Elements of this plan/program should include: integration with other municipal planning efforts, backcasting, and a willingness to use conservation as a substitute for building new infrastructure.



**Table 5: Preliminary indicators for policy and legal environment**

Theme	Indicators of capacity	Indicator questions	Rationale
Policy and legal environment	Municipality has a stated goal of sustainability.	Does municipality have a stated goal of becoming sustainable?	Municipality must understand the importance of a sustainable water system and desire it as a first step towards conservation.
	Municipality has long-term goal(s) for water conservation.	Has municipality set long-term goal(s) for water conservation?	
	Municipality has a water conservation plan/program, which is being actively implemented.	Does municipality have an active water conservation plan/program?	To be implemented successfully, water conservation requires a coordinated plan or program.
	Water conservation is integrated into land use and economic planning activities.	Does municipality incorporate water conservation into land-use planning?  Does municipality incorporate water conservation into economic planning?	Municipalities can require or incentivize the making of water conservation plans in new development to use less water.
	Backcasting is used as a planning tool.	Does municipality use the backcasting method to set goal(s) for future water use and conservation?	Backcasting is a key planning tool in the soft path approach to identify a sustainable water future.
	Municipality is ready/willing to limit construction of new water supply infrastructure and substitute water conservation.	Is municipality willing to substitute water conservation for new water supply infrastructure (e.g. “no new water”)?	This is a key indicator as to whether a municipality is really interested in sustainability and understands the true benefits of water conservation.

### ***2.3.3.5 Political environment***

de Loë, Di Giandomasso, & Kreutzwiser (2002) define two main components to political capacity: leadership and linkages with other organizations. Strong leadership increases the capacity of a water institution by establishing the direction and vision of its

goals and by establishing an organizational culture of flexibility and teamwork (de Loë, Giantomasso & Kreutzwiser, 2002; Timmer, de Loë, & Kreutzwiser, 2007).

Another element of institutional political capacity is the ‘task network’ (Grindle & Hilderbrand, 1995), which may be defined as “the set of organizations involved in accomplishing any given task” (p. 447). Types of organizational linkages include horizontal linkages (with non-government organizations, including other municipalities and community organizations) and vertical linkages (with agencies in other levels of government) (de Loë, Di Giantomasso, & Kreutzwiser, 2002; Mitchell, 2005; Timmer, de Loë, & Kreutzwiser, 2007). By establishing such linkages, a ‘silo’ effect of fragmented responsibilities can be avoided and a water institution can take advantage of a wider range of individual perspectives and expertise (Mitchell, 2005).

Medd and Marvin (2008) discuss the importance of integration in water resources management through intermediary organizations, to turn “regional strategies into local practice” (p. 280). The authors explain that intermediary organizations cross the boundaries of “different ‘natural’, ‘technical’, and ‘social’ worlds” (p. 282) and are positioned for “mediating between interests” (p. 282), like those of the “utility companies, regulators, and the consumers” (p. 282). Intermediaries are more adaptable to fluid “processes, flows, movements, open boundaries, informal relations, etc.” (p. 297), which are “across different contexts, spaces, and boundaries” (p. 297), and which involve “meanings, practices, technologies, and materialities through which water is made to work” (p. 297).

Five indicators of capacity for the political environment theme have been identified by reviewing the above literature (see **Table 6**). These indicators express the need for strong

municipal leadership for water conservation and the need for the municipal water institutions to have horizontal and vertical linkages with other water management organizations.

**Table 6: Preliminary indicators for political environment**

Theme	Indicators of capacity	Indicator questions	Rationale
Political environment	Municipality has strong leadership for water conservation.	Does municipality have one or more strong leaders that publically advocate for water conservation?	Strong leadership is a key component of successful water conservation by increasing direction, vision, flexibility, and teamwork.  Collaboration among partners allows a water institution to access a larger base of individual perspectives and expertise, allows coordination of water conservation plans/programs, and increases the likelihood that water conservation is successful.
	Water institution collaborates its activities with other municipalities (horizontal linkages).	Does water institution collaborate with other municipalities?	
	Water institution collaborates with local community organizations (horizontal linkages).	Does water institution collaborate with local community organizations?	
	Water institution collaborates its activities with non-government organizations (horizontal linkages).	Does water institution collaborate with non-government organizations?	
	Water institution collaborates its activities with other levels of government (vertical linkages).	Does water institution collaborate with other levels of government?	

### ***2.3.3.6 Community awareness and involvement***

Community awareness about water issues and participation in decision-making is a component of the capacity of an institution (McGuire et al., 1994; Biswas, 1996; Healey, 1998; Franks, 1999; de Loë, Di Giantomasso, & Kreutzwiser, 2002; Ivey et al., 2004; Ivey et

al., 2006; Timmer, de Loë, & Kreutzwiser, 2007; Pres, 2008). Involving the public in decision-making allows access to ‘local knowledge’ of the day-to-day local experiences of individuals in the community and this knowledge can be used to increase the effectiveness of policies by uncovering problems and potential solutions (Healey, 1998). Wolfe and Brooks (2003) state that public education is needed to implement the soft path approach to link individual participation with institutional and societal water management goals.

Public involvement also ensures that citizens’ interests are included in decision-making, which makes policies more likely to succeed by lessening future dissent and increasing public participation in implementation (de Loë, Di Giantomasso, & Kreutzwiser, 2002; Timmer, de Loë, & Kreutzwiser, 2007). This is accomplished through public education, outreach, and consultation (e.g. educational strategies, distributing educational material, public meetings, open houses public liaison committees).

The above literature discloses two salient capacity indicators for the community awareness and participation theme. These indicators are presented in **Table 7**. The municipal water institution has the dual responsibilities of involving the public in decision-making and making sure that the public is well-informed.

**Table 7: Preliminary indicators for community awareness and participation**

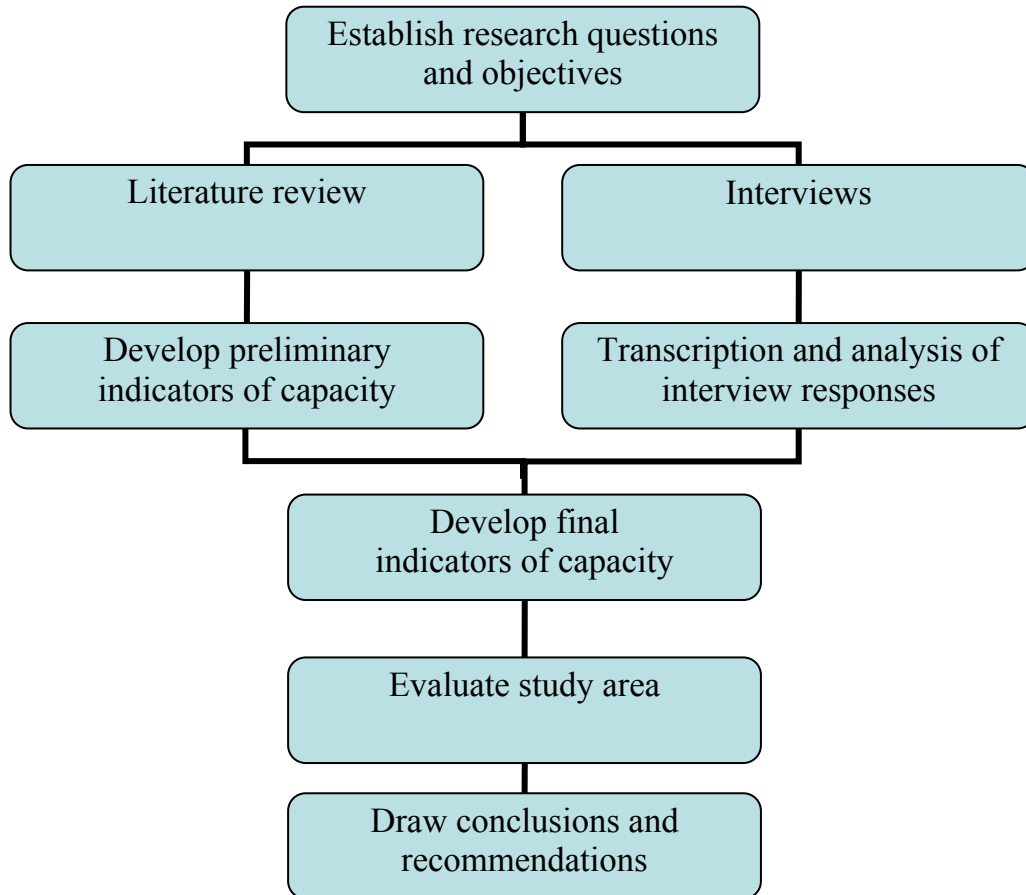
<b>Theme</b>	<b>Indicators of capacity</b>	<b>Indicator questions</b>	<b>Rationale</b>
Community awareness and involvement	Water institution actively involves public in decision-making.	Does the water institution meaningfully involve the public in its decision-making?	Increases consumer participation in water conservation plans/programs, increases likelihood of success, allows access to local community knowledge base, and lessens the likelihood of future dissent against water conservation.
	Water institution conducts public education and outreach program(s) for water conservation.	Does the water institution conduct public education and outreach about water conservation?	

The literature review summarized in Tables 2 through 7 identified twenty-four preliminary indicators of institutional capacity for water soft path implementation in municipalities. These preliminary indicators were later combined with information gained in interviews (section 4.1) to form a framework of final indicators (see section 4.2). The methodology for this study, including these interviews, is explained in the following chapter.

## CHAPTER THREE: METHODOLOGY

This section describes the methodology that was followed in this study to answer the research questions. A broad overview of the research process is displayed in **Figure 3**.

**Figure 3: Broad overview of research process**



To maximize the usefulness of the results of this research study, this researcher aimed to bridge the so-called ‘theory-practice gap’ between the literature and real-world practice (see **section 2.1** for discussion about this topic) by conducting two main lines of research: one theoretical and one based on practice. It is assumed in this study that a substantial ‘theory-practice gap’ exists for the soft path approach because it is very new (see **section 3.6**).

The first line of research included a literature review and was the ‘theory’ portion of the study. From this literature review, preliminary indicators were developed for judging the institutional capacity of municipalities to adapt to the soft path approach.

The second line of research included inductive, qualitative interviews with water management practitioners. These interviews comprised the ‘practice’ portion of the study.

Upon completion, the data gained from both lines of research was merged. The responses from the interviews were used to modify the preliminary criteria developed in the literature review. The merged data comprised both theory and practice, thus negating a ‘theory-practice gap’ in this study.

The results of the above process comprise a framework of indicators that are necessary to implement the soft path approach in a municipal setting and what must change to accomplish this. This framework was then applied to the case study and conclusions were drawn as to how the soft path approach could be implemented there.

### ***3.1 Case study***

#### **3.1.1 Case study characterization**

The case study contains two tiers of municipal government (see **Appendix A**). There are five ‘lower-tier’ municipalities (the Town of Aurora, Town of Markham, Town of Newmarket, Town of Richmond Hill, and the City of Vaughan) and these comprise a portion of an ‘upper-tier’ municipality (the Regional Municipality of York, commonly known as ‘York Region’). Each tier of municipal government has different roles and different elected representatives. Lower-tier municipalities are concerned with delivering local services.

Upper-tier municipalities are concerned with delivering region-wide services. The case study is bounded by the City of Toronto to the south, the Regional Municipality of Peel to the west, the Regional Municipality of Durham to the east, and the remainder of York Region to the north.

As the case study is in the Greater Toronto Area (GTA), this area is subject to intensive population growth and urban development. Between 2001 and 2006, the case study increased in population by an estimated 24.9% (see **Table 8**), compared to just 6.6% for the whole of Ontario (Statistics Canada, 2007). The population has continued to grow rapidly until December 31, 2009, which is the most recent population estimate available at the time of writing (RMY, 2010a; see **Table 8**).

**Table 8: Estimated population and population change in case study municipalities**

<b>Municipality</b>	<b>2001*</b>	<b>2006*</b>	<b>Dec. 31, 2009**</b>
Aurora	40167	47629	53686
Markham	208615	261573	304060
Newmarket	65788	74295	83048
Richmond Hill	132030	162704	183237
Vaughan	182022	238866	283886
<b>TOTAL</b>	<b>628622</b>	<b>785067</b>	<b>907917</b>
<b>Population Change</b>	---	<b>156445</b>	---
<b>Population Change (%)</b>	---	<b>24.9</b>	---

*Data sources:* \* Statistics Canada, 2007; \*\* RMY, 2010a.

*Note:* Population change figures have not been calculated for December 31, 2009 because the population estimates come from different sources and have slightly different 2006 population figures. Thus a population comparison between these sources would not compare “apples to apples.” All that is necessary to be gleaned from the December 31, 2009 figures is that population has continued to grow rapidly since 2006.

Furthermore, this area will continue to grow in the future because the *Growth Plan for the Greater Golden Horseshoe* identifies four “urban growth centres” in this area and these are slated to dramatically increase in population and population density (MPIR, 2006). These “urban growth centres” are: Markham Centre, Newmarket Centre, Richmond Hill/Langstaff



Centre, and Vaughan Corporate Centre (MPIR, 2006, Schedule 4). These areas are targeted to have a minimum density of “200 residents and jobs per hectare” by 2031 or earlier (MPIR, 2006, section 2.2.4.5). To accommodate these provincially-mandated growth targets, York Region implemented the *York Region 2031 Intensification Strategy* in 2009 and this includes a target of accommodating 40% of all new residential units between 2006<sup>11</sup> and 2031 within existing built-up areas (RMY, 2009a). This target, in turn, has been incorporated in the *York Region Official Plan*, adopted in December 2009 (RMY, 2009b). The intensification targets for the municipalities in the case study are presented in **Table 9**.

**Table 9: 40% intensification targets in case study municipalities (2006-2031)**

<b>Municipality</b>	<b>Intensification targets (# of residential units)</b>
Aurora	3100
Markham	31590
Newmarket	5250
Richmond Hill	14700
Vaughan	29300
<b>TOTAL</b>	<b>83940</b>

*Data source: RMY, 2009a*

A significant physiographic feature called the Oak Ridges Moraine covers much of the case study, including parts of all five lower-tier municipalities (see **Figure 4**). The Oak Ridges Moraine is a remnant feature of former glacial activity and has a significant aquifer that is the source for many streams flowing north to Lake Simcoe and south to Lake Ontario (Chapman & Putnam, 1984). The Oak Ridges Moraine has historically been under threat from

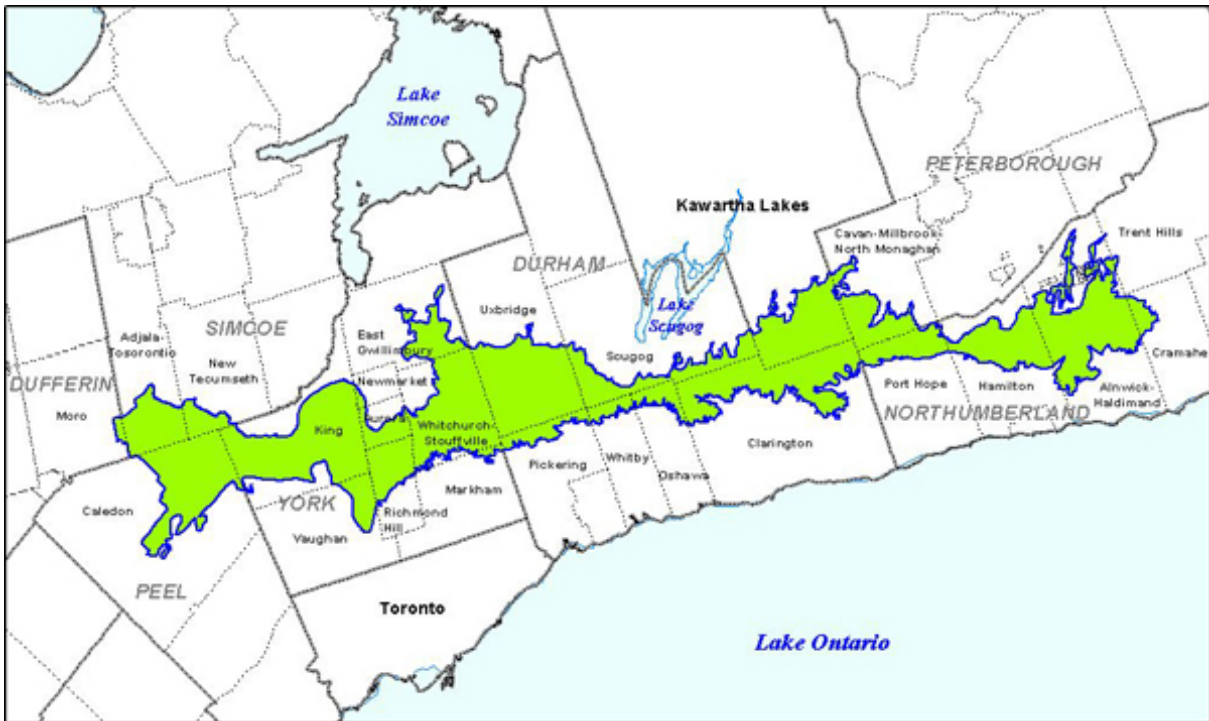
---

<sup>11</sup> To clarify: The intensification targets began symbolically in 2006 because that’s the year that the Growth Plan for the Greater Golden Horseshoe was implemented, even though the York Region 2031 Intensification Strategy was created afterwards as a response to the former plan.

encroaching urban development, which causes significant damage to the aquifer by reducing groundwater infiltration and recharge of the aquifer by covering the land with impervious surfaces (e.g. roads, buildings) and contaminating the groundwater (e.g. road salts, septic systems, lawn fertilizers) (Bocking, 2005).

The Oak Ridges Moraine is protected from development by the *Oak Ridges Moraine Conservation Act, 2001* and the *Oak Ridges Moraine Conservation Plan, 2002* (MMAH, 2002). The *Oak Ridges Moraine Conservation Plan* aims to preserve the ecological and hydrological integrity of the moraine. Among the policies within the plan, the plan requires that urban development is capped at a maximum of 8% of the land area of the moraine. Additionally, municipalities are required to prepare water budgets, water conservation plans, watershed plans, and water-use forecasts in order to (among other goals) identify, quantify, and characterize flows of surface water and groundwater to determine how much water can be safely taken for human use without detrimentally impacting the ecology and hydrology of the moraine.

**Figure 4: Map of the Oak Ridges Moraine**



Source: MMAH, 2002.

### 3.1.2 Water management in case study

York Region has a two-tier municipal structure, and the delegation of management of drinking water is divided between York Region and its lower-tier municipalities. The water and wastewater services are planned and managed by York Region itself, through its Environmental Services Department. York Region manages water and wastewater through its *Water and Wastewater Master Plan*, was most recently updated in November 2009 (RMY, 2009c). The Region sells water and wastewater services to the lower-tier municipalities, who in turn, sell them to consumers (e.g. residents, businesses).

The study area does not have sufficient local water resources, understood as both surface water and groundwater, that can be safely tapped to support annual growth and

subsequent urban development (Wekerle et al., 2007). To handle this water deficit, most of the drinking water is imported from neighboring municipalities, including the City of Toronto to the south and the Regional Municipality of Peel to the west (RMY, 2004).

The York Water System (YWS) is an integrated water distribution network that supplies water to the case study municipalities and limited areas within surrounding municipalities<sup>12</sup> (RMY, 2009c; see map in **Appendix B**). The vast majority of this water (including 80% of all water supplied throughout York Region) is sourced from Lake Ontario through long-standing agreements with the City of Toronto and Regional Municipality of Peel. That which does not come from Lake Ontario is supplied by the Yonge Street Aquifer System to parts of Aurora and Newmarket.

After the water is used by consumers, it becomes wastewater and is then handled by the York-Durham Sewerage System (YDSS) (RMY, 2004; see **Appendix C**). In 1965, the Province of Ontario decided that local tributaries and rivers (the Don, Humber, and Rouge Rivers) could no longer support any more inputs of treated effluent from wastewater treatment plants and that another solution to disposing of wastewater had to be found. By the 1970s, the solution implemented was to build the YDSS. This system of pumps and trunk sewers transports the wastewater all the way to the Duffin Creek Water Pollution Control Plant in Pickering, where it is treated and released into Lake Ontario.

---

<sup>12</sup> The areas in surrounding lower-tier municipalities that are served by the York Water System are not part of the case study. Statistics (e.g. population) could only be procured for municipalities as a whole and only limited portions of these surrounding municipalities are served by the York Water System. Therefore, it was decided to exclude these areas from analysis.

The YWS and YDSS were vastly expensive to build and they need constant expansion and maintenance to meet rapid urban expansion and population growth. As of November 2009, on-going water projects for the YWS had a total capital cost of \$425,100,000 and on-going water projects for the YDSS had a total capital cost of \$432,900,000 (RMY, 2009c). Beyond these on-going projects, the estimated capital costs of proposed future water and wastewater projects for the YWS and YDSS between 2009 and 2031 are \$1,760,600,000 and \$4,421,100,000 respectively, based on a conceptual level of design (RMY, 2009c).

Water conservation and efficiency are coordinated by York Region through its *Water Efficiency Master Plan*, which was most recently updated in April 2007 (RMY, 2007c). This document details water conservation and efficiency measures, strategies, and goals that are undertaken by York Region. The “business-end” of these plans, including the marketing and implementation of water conservation and efficiency, is conducted through York Region's *Water for Tomorrow* program (RMY, 2010b). The details of these plans and programs are examined in the evaluation of the case study (see **Chapter Six**).

### **3.1.3 Justification of case study**

There are six primary reasons why this area has been chosen as a case study.

1. This area has a significant vested interest in water conservation due to the demands of intensive population growth and lack of new in-situ sources of water supply.

2. To accommodate this growth, drinking water must be imported from neighbouring municipalities. This results in added expense and forcing the area to be reliant on other municipalities for their water.
3. This area has a single, integrated water distribution and pumping system (York Water System). This area is also part of a larger integrated wastewater pumping and treatment system (the York-Durham Sewerage System). As such, research is simplified because the area can be studied as a single organism.
4. The Oak Ridges Moraine must be protected from exploitation.
5. York Region of York water efficiency personnel have expressed considerable interest in the soft path approach for water management and its potential for increasing water conservation and efficiency.
6. On a more practical note, the case study is within a two-hour driving distance from the University of Waterloo and, as such, was relatively close-by to travel to for research purposes.

### ***3.2 Qualitative interviews***

Besides reviewing the theoretical literature, it is important that the research be grounded in water management and planning practice so that the results are practical and useful ‘on-the-ground’ in Canadian municipalities that are interested in implementing the soft

path approach. To accomplish this, interviews were conducted with water management and planning professionals to seek their professional opinions.

### **3.2.1 Participants' selection**

Although it was originally intended to only interview individuals within the case study, it quickly became clear that there were very few such professionals available to be interviewed within this area because these professionals were thinly spread out among municipalities across the Greater Toronto Area. Furthermore, it was decided by this researcher that a larger range of knowledge and opinions could be gathered if interview participants were selected from outside the case study to provide context. For these reasons, interview participants were sought from around the Greater Toronto Area, to provide a sufficient number of interview participants to gain a range of opinions.

Potential interview participants were chosen by *purposive sampling*<sup>13</sup> and by *snowball sampling*<sup>14</sup> of water management and planning professionals in local government, agencies, and private firms, in and around the study area. Key informants were also sought from the provincial government and a non-government organization. The interview participants included municipal water efficiency personnel, private-sector consultants for water policy and

---

<sup>13</sup> Purposive sampling: “[T]he investigator selects participants because of their characteristics (*Good informants/participants* are those who know the information required, are willing to reflect on the phenomenon of interest, have the time, and are willing to participate” (Richards & Morse, 2007, p. 195; italics in original text).

<sup>14</sup> Snowball (or nominated) sampling: “[P]articipants already in the study recommend other persons to be invited to participate” (Richards & Morse, 2007, p. 195).

water infrastructure planning, a provincial government water policy advisor, and a researcher from a non-government organization for water conservation.

Although there was no set minimum or limit to the number of interview participants, the goal was to find as many participants as possible. Fifteen potential interview participants were contacted and of these, ten individuals agreed to participate. Those that did not participate did so because they were unavailable for interviewing or their position did not allow them to be interviewed due to ethical or privacy concerns.

Potential participants were contacted firstly by an e-mail to request their consent and participation for an interview. A template of this Consent Form is available in **Appendix E**. If they did not respond within two weeks, a second e-mail was sent with a copy of the original Consent Form.

The interviews were conducted face-to-face with individual participants, usually in a private room at their workplace. In a few cases, participants chose to be interviewed in other locations that was convenient for them, was reasonably private (so as not to be overheard by others), and quiet enough to be voice-recorded for later transcription and analysis purposes.

### **3.2.2 Interview structure**

The interviews were conducted using a semi-structured format. Semi-structured interviews use prepared questions to guide the interview process but these questions are also open-ended to allow interview participants a maximum of freedom to answer as they see fit (Stake, 2010; Rubin & Rubin, 2005). The benefit of this methodology is that it permits a deeper level of communication, allowing the researcher to access the interview participants' opinions and feelings. If a participant lost track of the phenomenon of interest or went on a



personal tangent unrelated to the questions asked, probing questions were asked by the interviewer to refocus the interview (e.g. Can you please elaborate on...?, Can you give any more examples of...?, What is your opinion about...?). Participants were also occasionally asked individualized questions that related specifically to their own experiences or knowledge or their organization, if it was deemed useful to the research. Interviews were recorded for later transcription.

The intent of the interviews was to conduct a *grounded theory* approach to answering the research questions, in addition and separate from the literature review. In grounded theory, a researcher “does not begin a project with a preconceived theory in mind (unless his or her purpose is to elaborate and extend existing theory)” (Strauss & Corbin, 1998, p. 12). The purpose of this research study is to extend a theory (the soft path approach to water management), so it fits into the latter category.

Strauss and Corbin (1998) continue their discussion about grounded theory: “the researcher begins with an area of study and allows the theory to emerge from the data” (p. 12). The open-ended nature of the interview questions follows this procedure by allowing the interview participants a maximum of flexibility about how to answer the questions without the interference of the questioner. Furthermore, the framework of questions asked in the interviews was prepared before the literature review was completed and the literature review did not inform the construction of the questions asked.

Thirteen primary questions were asked in the interview, divided into three parts (see interview questions in **Appendix D**). The order of the questions was chosen to start broadly and move steadily into finer detail, eventually to discuss the soft path approach. This order

allowed the participants to get in the right state of mind by making them think broadly about all the relevant issues and concerns in the water management field, in order to provide context and frame the questions to come.

The intentional open-ended nature of the questions meant that questions were often not mutually exclusive and the analysis that followed the interviews did not treat them as mutually exclusive either (see **section 3.3** for how the questions were analyzed). Subject matter often overlapped between questions, allowing participants to think critically and revisit their previous answers. Participants were given opportunities to refine or expand on previous answers. Importantly, the soft path approach is not mutually exclusive itself, as it seeks to expand and build on conventional water management efforts (Brooks et al., 2007; see **section 2.2.3** for discussion). For these reasons, all interview questions about water conservation and efficiency methods were treated as part of the soft path approach even though it is not explicitly discussed until the latter part of the interview (see **section 3.3** for more detail).

The first part of the interview (Questions 1-4) was about the past and present of water management. These questions asked the participant to describe their individual and organizations roles and responsibilities in water management and then to discuss the most effective methods and largest barriers for water conservation and efficiency. The goal of these questions was to allow the participant to review all their past knowledge of water management generally and to think about the successful and unsuccessful methodologies within this field.

The second part of the interview (Questions 5-7) was about the future of water management. Participants were asked to envision their municipality several decades in the

future and to decide how they would like to see water management changed by then and what water management issues they expect to see. The goal of these questions was to allow the participant to think what could and should be changed in the water management field. This type of future thinking parallels the soft path approach of backcasting and helps prepare the participants for speaking about the soft path approach itself.

The third part of the interview (Questions 8-10) was specifically about the soft path approach. Participants were asked about the feasibility of the soft path approach, what changes would be required to accomplish it, and how these changes would fit into their previous future vision of their municipality.

It was anticipated that not all of the interview participants would be familiar with the soft path approach because it is relatively new (this is identified as one of the limitations of the research listed in **section 3.6**). Indeed, there was a wide range of knowledge about the soft path approach among participants. Some participants knew a great deal about it, some knew selected details of it, and others had only heard about it.

When a participant did not know about the soft path approach or did not know it sufficiently to discuss it in detail, it was at the researcher's discretion to introduce the soft path approach to them. Rather than give a lengthy and complicated definition of the soft path approach, it was decided that it would be easier to introduce the four principles that distinguish the soft path approach from conventional water planning and management (see **section 2.2.3**), as identified in Brandes, Brooks, and Gurman (2009). By listing and briefly explaining these principles, the researcher was able to start a discussion with the participant and elicit their opinions on them. These four principles are repeated below:

1. “treating water as a service rather than an end in itself;
2. making ecological sustainability a fundamental criterion;
3. matching the quality of water delivered to that needed by the use;
4. planning from the future back to the present”

(Brandes, Brooks, & Gurman, 2009, p. 11).

By providing this definition of the soft path approach when necessary, the interview structure veers slightly from the grounded theory approach. Providing a definition may constrict a participant's way of thinking about the soft path approach as well as how they answer the questions. Thus, this procedure might introduce a slight bias in the resulting data by constraining the discussion to within the boundaries of this preconceived definition of the soft path approach, rather than allowing the participant to define it themselves according to their own notions and opinions. Nonetheless, it was decided that it would still be necessary to provide a definition of the soft path approach because this is the area of study and it would be unethical and unhelpful to hide this fact.

This dilemma was handled in three ways. Firstly, the questions about the soft path approach that might require a definition were left until near the end, so that the previous questions would be unaffected because the definition would not have been stated yet. Secondly, if an interview participant asked for a definition of the soft path approach before these specific questions were asked, this researcher would politely refuse to provide it and state that a definition could be provided later in the interview.

Third, the answers to the specific soft path questions that were provided by participants that had been given a definition were analyzed in a special way. The four listed principles themselves were not recorded in the analysis because they were not original to the participant. Only the elements of the discussion about what specific ways a principle could be implemented were part of the latter analysis. For instance, if a participant thought that the third principle (matching the quality of water delivered to that needed by the use) was feasible, then the principle itself would not be part of the analysis. If, however, the participant went on to discuss *greywater systems* as a method to accomplish this principle, then *greywater systems* would be included in the analysis. **Section 3.3** provides additional details about the analysis methodology.

The fourth and final part of the interview (Question 11-13) allowed the participants to review or refine any previous answers and add any additional comments. The purpose of this was to incorporate any potential information that, in the participants' judgment, did not fit into the previous interview structure.

### ***3.3 Analysis of interviews***

After the interviews were completed, they were manually transcribed verbatim into computer word processor files based on the voice recordings. Each of the ten interview transcripts was independently labeled with a letter (A through J) for later identification and to maintain the anonymity of the interview participants. Interview participants A and B were York Region water management staff and interview participants C-J worked for other organizations. In some cases, members of the latter group have been involved with York Region water governance in a consulting role.

The verbatim transcripts were then analyzed according to a methodology called the *responsive interview model*, as described by Rubin and Rubin (2005). This type of methodology was also used to qualitatively analyze personal interviews by Finn (2009), and this study also provided guidance for the analysis in this study.

The *responsive interview model* methodology occurs in two phases (Rubin & Rubin, 2005). The first phase of the responsive interview model involves analyzing the transcripts to “find, refine, and elaborate concepts, themes, and events [and topical markers]; and then code the interviews to be able to retrieve what the interviewees said about the identified concepts, themes, and events” (p. 201). “A *concept* is a word or term that represents an idea important to your research problem; *themes* are summary statements and explanations of what is going on; *events* are occurrences that have taken place; ... and *topical markers* are names of places, people organizations, pets, numbers ... or public laws” (p. 207; italics in original). The interview analysis in this research study was only concerned with concepts and themes because describing events was not required to answer the research questions and topical markers were suppressed to keep the anonymity of the interview participants.

Analysis began by identifying all the concepts that were mentioned by each interview participant in their responses to the interview questions, as recorded in the verbatim transcripts. Care was taken to ensure that only the concepts originally stated by the interview participants were included in the analysis and that concepts introduced by the researcher were excluded (see discussion on *grounded theory* in **section 3.2.2**). The resulting concepts were compiled into a single word processor file for comparison.

The concepts at this stage must be coded (Rubin & Rubin, 2005). “*Coding* involves systematically labeling concepts, themes, events, and topical markers” (p. 207; italics in original), so that this data can be retrieved and examined from among all the interviews. Each label is known as a *code*.

Not all concepts necessarily qualify as codes because, among other reasons that are too numerous to mention here, different interview participants sometimes say contradictory things and have different opinions on the same issues (Rubin & Rubin, 2005). As such, a method is required to sort through the concepts to pick only the important ones that would make valid codes. One methodology to accomplish this (and the methodology chosen for this research study) is to codify only the concepts that were mentioned by more than one interview participant (Rubin & Rubin, 2005). If a concept was mentioned by more than one interview participant, it was deemed to be significant enough to become a code.

When compiled into one word processor file, the concepts from among all the interviews were marked with the number of interview participants that independently mentioned each concept. A concept was dropped if it was only mentioned by one interview participant. If a concept was mentioned by more than one interview participant, it was deemed valid and declared a code.

Each code was also marked according to which interviews they were mentioned in, using the previously mentioned interview labels (A through J). This allowed the researcher to easily go back to the transcriptions and make sure that the codes were being used within their proper contexts.

In the second phase of responsive interview model analysis, the codes are sorted “to figure what the coded data mean” (Rubin & Rubin, 2005, p. 224). This is accomplished by searching for “patterns and linkages between the concepts and themes” (p. 224), sorting and grouping these concepts and themes, and describing them in a narrative structure.

Building on the methodology described in Rubin and Rubin (2005), Finn (2009) used four stages to aggregate the data and find emergent themes. The first step of this model is the same as the first stage described by Rubin and Rubin (2005) and which has been previously described. The final three steps comprise the second stage of analysis described in Rubin and Rubin (2005) and involved three rounds of coding to aggregate the data into groups.

It was decided that the full four steps of Finn (2009) were not necessary to aggregate the concepts into themes. The number and nature of the codes only necessitated three levels of aggregation (Levels I to III). At these three stages, the codes from the previous stage were copied and pasted into a new word processor document. The codes were then sorted into groups with similar characteristics. Each grouping comprised a new code for that level.

At the final stage of aggregation (Level III), salient themes emerged and these themes are equivalent to the themes identified in the literature review. It was decided to group as many codes as possible under the themes identified in the literature review at this stage (see **sections 2.3.3 – 2.3.3.6**) in order to make it easier to identify final indicators later on, when the themes of the literature review were combined with those of the interviews (see **section 3.4**). When a code did not fit comfortably in one of the identified themes, new code groupings (and themes) were created.



Narratives were created for each of the themes to compare and contrast the responses of interview participants. The interview transcripts were rechecked throughout the process of writing this narrative to ensure that these comparisons and contrasts were used within their proper context and to ensure that the researchers' personal views and perceptions were not interfering with the interpretation of the data.

### ***3.4 Developing final indicators***

As previously discussed, this research study aims to bridge the 'so-called 'theory-practice gap' that exists in the field of planning (see **section 2.1** for discussion). This bridging was accomplished through the *triangulation* of information from two different types of data sources: (1) the literature review and (2) the interviews.

Flick (1998) describes triangulation as: "the combination of appropriate research perspectives and methods that are suitable for taking into account as many aspects of a problem as possible" (p. 50). Triangulation allows the researcher to see and examine complex phenomena from different perspectives, thus minimizing the bias (as much as possible) that would be created if only one perspective were examined and getting closer to the way things actually are in real-life.

Once both the preliminary indicators from the literature review and the codes from the interviews were developed<sup>15</sup>, final indicators were triangulated from both sources. By

---

<sup>15</sup> Please note that the literature review preliminary "indicators" and the interview "codes" refer to the same type of information, and they are treated as such in this study once they are combined into final indicators (see **section 4.2**). There are two reasons why they have been given different labels in this study: (1) to differentiate the source of each (literature review or interviews) and thereby to avoid confusion between the two sources when

triangulating information from more than one data source, the literature research (theory) *and* interviews (grounded research), the framework of final indicators is a salient and useful source of information.

The evaluative framework developed by Kean (2008) and used in the literature review (see **sections 2.3 - 2.3.3.6**) is reused for displaying the final indicators because it is easy to read and use. Each line displays an indicator of capacity and also includes the theme under which it fits, the indicator question, a rationale, and (for cross-referencing purposes) the source of this indicator (either the literature review indicators or interview codes, or both). All preliminary indicators and most<sup>16</sup> codes have been included since they have all (by this stage) been determined to be significant. The result, displayed in **Table 11**, comprises the framework of final indicators.

The final indicators are measurable descriptions of the institutional capacity that are required for Canadian municipalities to implement the soft path approach. The framework of final indicators may be considered the “results” of this study (disregarding the case study evaluation) because it comprises this study’s main substantive contribution to water management theory.

---

discussing them, and (2) the terminology for these labels are what are used other studies upon which the methodology for this study is based, “indicators” (Kean, 2008) and “codes” (Finn, 2009).

<sup>16</sup> Some interview codes have been excluded from the final indicators for a specific reason. This is explained and justified in **section 4.2**.

### ***3.5 Evaluation of study area***

Yin (2003) states that “the case study method allows investigators to retain the holistic and meaningful characteristics of real-life events” (p. 2). The case study is a common method of evaluating organizational theories, including: “theories of bureaucracies, organizational structure and functions, excellence in organizational performance, and interorganizational partnerships” (p. 31). The author also notes that a case study is beneficial when it:

- “copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result...
- ...relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result...
- ...benefits from the prior knowledge of theoretical propositions to guide data collection and analysis” (p. 13-14).

Based on the framework of final indicators of institutional capacity, the case study was evaluated based on whether or not and to what extent it meets these final indicators. This case study serves three main purposes: (1) to strengthen the framework of final institutional capacity indicators as a body of theory by demonstrating that it can be meaningfully applied to real-life examples; (2) to demonstrate an example of how the framework could be used to evaluate a municipality; and (3) to evaluate the case study itself.

The method of evaluating the case study is an analytic technique known as *explanation building* (Yin, 2003). In this technique, initial theoretical statements or propositions are stated (in this case study, this role is assumed by the indicators), which is then applied to a case study to see if the case study fits the criteria of this statement or proposition, and a narrative is written that explains why or why not this criteria fits or not.

The case study evaluation proceeded theme by theme and answered the indicator questions in a narrative form. Explanations were given regarding if, how, and why the indicator has or has not been achieved in the case study. If an indicator has been achieved in the case study, this element of the implementing the soft path approach is also achieved and should be continued in the future. If an indicator has not been achieved, this was noted and a recommendation was given to implement it as part of the soft path approach. Sources of information that were used to justify these decisions include literature published by York Region and information gained from York regional water management staff.

The case study evaluation was informed by published literature, interviews with York regional water management staff (interviews A and B), and by an interview with a water management practitioner outside of York Region (interview I). Note that these interviews are some of the same interviews that were used to inform the construction of interview codes (see **section 3.3** for the interview coding methodology and **section 4.1** for the codes themselves), which in turn informed the framework of final indicators. One might expect circular reasoning<sup>17</sup> in this methodology if the same information was used to fallaciously presume the

---

<sup>17</sup> Circular reasoning: A logical fallacy in argumentation when one or both of the following descriptions are true: (1) “if one premiss, or part of a premiss is either equivalent, or perceived to be so closely equivalent to the conclusion, that there is no advance” (Walton, 1987, p. 182), or (2) “if some premiss depends on the conclusion,

plausibility of the proposition (the case study) by its premise (the framework of final indicators).

However, circular reasoning is avoided in this study because the parts of the interview schedules of interviews A, B, and I that were used to inform the codes (and subsequent final indicators) were different from the parts of the interview schedules that were used to evaluate the study area. This prevented the same information from being used twice. As a reminder, **section 3.2.2** noted that participants were occasionally asked individualized questions (beyond the main questions that informed the interview codes; listed in **Appendix D**) that related specifically to their own experience, knowledge or organization. The parts of the case study evaluation that were informed by interviews A, B, and I were gained from information in responses to these individualized questions only.

### ***3.6 Limitations of research***

The researcher has identified two potential research limitations. These limitations are described below, along with an action plan to handle them:

*The soft path approach is very new.*

All literature on the soft path approach for water management is less than a decade old, so it is relatively new as a theory. This is a double-edged sword. To an optimist, this ‘newness’ means that this research is ‘cutting edge,’ exciting, and very relevant to current

---

or cannot be established other than by the presuming the conclusion as prior evidence for the conclusion” (p. 182).

affairs. To a pessimist, this newness means that there is not very much literature on the subject and this may limit the extent of the literature review (soft path theory is particularly lacking because there is a relatively small number of peer-reviewed journal articles pertaining to it).

This researcher addressed this concern by conducting an on-going literature review throughout the entire research process in order to stay up-to-date. Furthermore, the interviews were used to complement the literature review.

*The research depends on knowledgeable research participants.*

Owing to the ‘newness’ of the soft path approach, several interview participants were not aware of it or had very little knowledge of it. This could have impeded the usefulness of their responses, but this did not deter this researcher from interviewing them. If an interview participant did not know about the soft path approach, this researcher used a special tactic to introduce them to it (see **section 3.2.2**).

### ***3.7 Ethical considerations***

The researcher followed ethical guidelines, as specified by the Office of Research Ethics, University of Waterloo. This included undergoing an Ethics Review process before engaging interview participants to ensure that procedures were fair and unbiased to all involved. Great care was taken to ensure that these participants were/are kept completely anonymous in the research. Participants were thanked in writing for their help. Participants were also given the option of being sent the transcription of their interview and being sent a summary of the results of this research study.

When designing this study, this researcher struggled with whether or not to keep the interview participants anonymous. It was eventually decided that the interviews should remain anonymous so that the reader cannot find out who was interviewed. The benefits of assuring the participants of anonymity were that they would be more willing to consent to an interview and that they would be more likely to reveal more and higher quality information, including personal opinions and insights that they would not otherwise want to be quoted as saying. However, making the participants anonymous means that this study cannot reveal who said what statements or who had what opinions, and this is sometimes awkward.

## CHAPTER FOUR: ANALYSIS

### 4.1 Interview analysis

According to the process that is detailed in **section 3.3**, the compiled data from interviews was analyzed to identify the concepts spoken by the interview participants. These concepts were, in turn, coded and regrouped into themes. These themes are displayed in **Table 10**, along with breakdowns of the component codes that have informed them. As with the themes of the literature review, these themes are not mutually-exclusive and there is much overlap between them. The purpose of this section is to describe these themes and codes in a narrative structure in order to convey their meanings and purposes. The discussion begins with a broad discussion of the themes themselves, followed by descriptions of the codes that inform each theme.

**Table 10: Breakdown of interview codes**

Level I codes (interview sources <sup>18</sup> )	Level II codes	Level III codes (Themes)
Hiring municipal staff for water conservation/efficiency (A, B, E, G, J)	Staffing	Human resources
Climate change research (A, I) Research and testing of water products, e.g. market, lab, field (E, F, J) Research into health issues of greywater reuse (C, G, H)	Research	Information resources
Financial bottomline (F, H) Funding for water conservation/efficiency (A, B, F, J)	Funding	Financial resources
Water rates for conservation, not raising revenue (A, B, F, J)	Water rates	

---

<sup>18</sup> According to a process described and justified in **section 3.3**, a concept must come from two or more interviews to qualify as a “code.” Concepts were excluded if they were mentioned in only one interview.



Water rates that reflect true cost of water provision (B, D, E, F, H, I, J)		
<p>Overcoming differing bureaucracy/philosophies/silos of municipal departments , e.g. engineering, finance (C, F, H, J)</p> <p>Perception needed that water conservation/efficiency as important as building infrastructure (A, C)</p> <p>Perception needed that water conservation/efficiency is a source of new water (A, B, C)</p> <p>Role-modeling water conservation/efficiency/ sustainability by government (B, G, J)</p> <p>Water conservation/efficiency recognized as priority/integral in planning (A, B, C, E, F, H, J)</p> <p>Climate change adaptation (A, I)</p> <p>Holistic/comprehensive approach to water management (B, C)</p> <p>Long-term master planning incorporates water conservation/efficiency (A, B, C, D, J)</p> <p>Overcoming only short-term outlook in municipalities (C, D)</p> <p>Auditing for high water users (A, H)</p> <p>ICI water programs, on individual basis (A, B, C, F, I)</p> <p>Innovative developments should be given planning approval priority (C, G)</p> <p>Mandatory high-efficiency appliances in new development (E, F, I)</p> <p>Policy development (A, H, I, J)</p> <p>Stronger LEED standards for water conservation/efficiency (C, D)</p> <p>Outdoor water use change (A, C, H, I)</p> <p>Preventing inter-basin transfers of water (D, I)</p> <p>Reducing summer peak demand (B, C)</p> <p>Sizing infrastructure appropriately according to demand (A, B)</p> <p>Updating building code for water efficiency standards (E, F, I)</p> <p>Upper levels of government – policy, regulation, guidance, and coordination (B, C, H, I, J)</p>	<p>Changing municipal priorities and perceptions</p> <p>Long-term planning</p> <p>Policy and regulation</p>	<p>Policy and legal environment</p>
<p>Partnerships with lower-tier municipalities (A, B)</p> <p>Partnerships with other municipalities (B, G, I)</p> <p>Partnerships with other professionals (B, G, J)</p> <p>Partnerships with other water organizations (D, E, I)</p> <p>Partnerships with private-sector (C, I)</p>	Partnerships	Political environment
<p>Linking water conservation/efficiency with other environmental issues, e.g. air/water quality, energy, carbon (B, J)</p> <p>Overcoming perception of water superabundance (A, H)</p>	<p>Changing public perceptions about water</p>	<p>Community awareness and involvement</p>

<p>Overcoming perception of the right/entitlement to unlimited water (B, E, F, I)</p> <p>Overcoming perception that conservation means a lower standard of living or less growth (G, I)</p> <p>Public education for behaviour change (A, B, D)</p> <p>Public education to help individuals realize the need for conservation/efficiency (B, E)</p> <p>Public education to help individuals realize their true effect on water system (B, F, I, J)</p> <p>Public recognition of true value of water (B, D, E, F, H, I)</p> <p>Community-based social marketing (B, D, F, G)</p> <p>Connecting with individuals, homeowners, and neighborhoods (B, D)</p> <p>Events to promote water conservation/efficiency (B, D)</p> <p>Public education material &amp; distribution (A, B, C, G, I)</p>	<p>Methods of social marketing</p>	
<p>Greywater systems (D, G)</p> <p>High-efficiency fixtures (C, E, I)</p> <p>High-efficiency washing machines (A, C, E, G)</p> <p>High-efficiency showerheads (A, B, C)</p> <p>High-efficiency toilets (A, B, C, E, F, G, H)</p> <p>Hot water recirculation (C, E)</p> <p>Toilet flappers refitting (A, B)</p> <p>Automatic irrigation controls/sensors (A, I)</p> <p>Rainwater cisterns/harvesting (C, G, J)</p> <p>Leak detection systems and repair programs (A, F, H, I)</p>	<p>Indoor technologies</p> <p>Outdoor technologies</p> <p>System-wide technologies</p>	<p>Technological solutions</p>
<p>Do easy to implement things first, e.g. “pick the low hanging fruit first” (A, E, F)</p> <p>Methods that require little/no behaviour modification (E, F)</p> <p>More emphasis on social sciences in water sector (D, J)</p>	<p>Practical considerations</p>	<p>Practical considerations</p>

As previously stated, it was decided (see **section 3.3**) to group as many codes as possible into the six themes identified in the literature review in order to ease the comparison between the information gleaned from these two sources. A limitation of this strategy is that some of these themes are not well-represented in the number of codes that inform them because participants preferred to speak about other topics. These six themes, having already

been defined (see **sections 2.3.3 - 2.3.3.6**), include: human resources, information resources, financial resources, policy and legal environment, political environment, and community awareness and involvement. Most, but not all, codes fit into these six themes.

The information that did not fit into these six themes consisted of two broad types of information. Many participants spoke at length about specific current technological solutions for water efficiency that they had either implemented successfully, thought would be feasible and effective if implemented, or had strong feelings that it would not be effective and/or feasible. The latter are purposefully excluded in this study because solutions that are deemed ineffective and/or unfeasible would not be helpful towards water conservation and efficiency.

Another type of information that participants provided was practical advice and tactics about conducting water conservation and efficiency. These two new themes have been labeled: technological solutions and practical considerations. These types of “down-to-earth” and “nitty-gritty” information provided this study with valuable insights of the day-to-day machinations of implementing water conservation and efficiency programs.

#### **4.1.1 Human resources**

##### *Staffing*

Very few participants spoke about human resources in water conservation and efficiency. Those that did often only mentioned an aspect of this theme alone. Since two or more individual participants were required to mention something for it to become a code, several potential codes in this category were dropped.

The only exception to this rule was that a few participants had discussed hiring more staff to conduct water conservation and efficiency programs. These participants had either

recently hired more staff or wished to hire more in the future because of the increasing workload and complexity of water conservation programs. Some participants also specifically noted that they preferred hiring in-house staff over outsourcing work to external consulting firms. These participants were displeased with the quality of work from previous experience with outsourcing and they would rather have full control of programs without relying on outsiders.

#### **4.1.2 Information resources**

##### *Research*

Despite the fact that only three codes made it into this theme, information resources were discussed by several participants. A number of participants discussed the lack of knowledge and the need for more research in the water sector. The lack of a complete case study of the soft path approach being implemented in real-life was thought to be a major impediment to implementing the soft path approach by many people. Without a real-life example of the soft path approach working, many participants felt weary trying it themselves for fear that it would fail and their municipality would have wasted precious time and resources as well as having to endure public disgust.

The uncertainties of future climate change also loomed heavily in many participants' minds. Many participants spoke about the need for more research into the potential effects and coping strategies for a changing climate.

Other participants spoke about the need for more testing of water-efficient appliances before they make it to the market. In the past, several water-efficient appliances had poor

performance and this had given such appliances a bad name despite the fact that many newer appliances had fixed these problems.

Another area of wanted research was into the health issues of greywater systems (see **section 4.1.7** for an explanation of greywater systems). Although many participants were in favour of greywater systems and felt that they had a large potential to lower water usage, it seems that there are many past examples of these systems being installed improperly.

Furthermore, they were worried about the legal implications if individuals became ill because of bodily contact with greywater (e.g. in a toilet).

### **4.1.3 Financial resources**

#### *Funding*

The economics of water conservation and efficiency programs was a major issue for many participants. The first type of these concerns was the financing of programs. Maintaining a financial bottomline is important to implementing programs because of limited municipal budgets. As such, these programs have to be as efficient as possible to get the maximum benefit per dollar spent and had to find new sources of funding whenever possible.

#### *Water rates*

Most participants wanted to increase water rates for consumers. This would take the form of a progressive water rate that increases for ever-larger blocks of water usage. A basic quantity of water usage would be inexpensive to allow people to have an amount of water needed for human existence and the rate would increase more-than-proportionately thereafter. In so doing, the heaviest water users would be penalized and low water users would be rewarded, thus creating an incentive for individuals to use less water.

Participants frequently stated that drinking water in Ontario is very expensive to provide but is heavily subsidized to users. Consequently, municipalities have very little money left for conservation and efficiency. Convincing city or regional councilors to raise water rates is often very difficult because the voting public is strongly opposed to this and many of these councilors want to be re-elected in the future. Despite these difficulties, many participants thought that there would be more money available for water conservation and efficiency programs if water rates ever reflected the true cost of water provision. One well-spoken interview participant stated the following on the topic of increasing water rates:

“I’d say one [of the largest barriers to water conservation and efficiency] is the perception that uhh water is a god-given right and that uhh it’s very difficult for municipalities to raise the money they need for their programs through increased water rates because it’s politically not acceptable, even though water’s incredibly inexpensive. Umm, I usually tell people: the water you get from your tap is free, they’re giving it to you for free. You can go down to the lake and take a bucket and you can get the water and nobody’s going to stop you. Get it from the sky if you want, from the rain. But if you want us to treat it, provide it through the pipes, meter it, uhh collect your sewage and treat it, we have to charge you for that. So we’re not charging you for the water, we’re charging for everything else”  
(Interview participant E).

#### **4.1.4 Policy and legal environment**

##### *Changing municipal priorities and perceptions*

This first category of policy and legal frameworks has to do with changing the way that municipal staff implement and view water conservation and efficiency.

Many participants lamented the fact that other departments and professionals in their organization did not understand the need for water conservation and efficiency because of

differing professional “silos” and philosophies. This is a generalization, of course, but these participants have had a great deal of difficulty trying to convince fellow workers, and even their superiors, that water conservation and efficiency is safe and cost-effective. A common example of this was that of engineers, who (some participants claim) only want to build new water supply infrastructure. Another example given was that of the finance department, who have difficulty seeing beyond one fiscal year (the benefits of water conservation and efficiency require a longer time horizon to be realized).

Participants also discussed the need to overcome perceptions of municipal staff that impede water conservation and efficiency. For instance, some participants hoped that water conservation and efficiency would be recognized by staff as being just as important as building new water supply infrastructure. Furthermore, it was also wished by some participants that water conservation and efficiency was recognized as an integral part of planning by staff and made a priority.

Participants also noticed that other staff did not recognize water conservation and efficiency as a source of new water, just like building new water supply infrastructure. If individuals thought of it in this way, they might be more willing to embrace water conservation and efficiency.

Some participants thought that it is very important that government departments, including municipalities, role-model water conservation and efficiency as well as sustainability in their own operations, instead of only requiring others to do so. In doing so, governments would show that such efforts are feasible and other organizations would be encouraged to follow in these footsteps.

### *Long-term planning*

A second category of codes in this theme has to do with conducting long-term planning for water conservation and efficiency in a municipality. One issue that some participants discussed was the need for water conservation as a means to adapt to the potential effects of future climate change. According to participants, it is expected that southern Ontario is likely to have longer, drier summers in the future. If this happens, and if this results in drought, water conservation efforts now may mitigate the likelihood or severity of water shortages in the future.

Several participants suggested that water conservation and efficiency should be fully incorporated into long-term water master planning, in the same way that master planning is conducted for water supply infrastructure that will not be built for decades into the future. In so doing, the municipality might be able to break free of its tendency to see only to the end of the next fiscal year for water conservation and efficiency. It would also give the municipality the means to take a more holistic and comprehensive approach to water management.

### *Policy and regulation*

A third category of codes in this theme has to do with developing policy and regulation for municipal water conservation and efficiency programs. Not all of these are necessarily under the direct control of municipalities themselves but, at the very least, would significantly increase a municipality's capacity for water conservation and efficiency. The suggested policy and regulation are listed below:



- Water usage of individual high water users (e.g. households) could be audited by municipal staff and recommendations given for where and how water efficiency could be increased.
- Water programs for the Industrial-Commercial-Institutional (ICI) sector should be conducted or become more aggressive. Unlike residential programs, these usually have to be performed at an individual scale (one factory, business, or institution at a time) to be realistically successful because they often have very different water needs (e.g. for specific industrial processes).
- New development should be mandated to have only high efficiency appliances to save water and energy.
- Stronger standards for water efficiency should be incorporated into the Leadership in Energy and Environmental Design (LEED) certification system.
- Municipalities should direct efforts to encourage or require reducing outdoor water use because this is where a large of water is used and/or wasted (e.g. unnecessary lawn irrigation).
- Inter-basin transfers of water between watersheds should be prevented because of the potential ecological effects that this would impose and the vast energy and cost that

would be required to accomplish this. (Some municipalities in southern Ontario are considering inter-basin transfers for future drinking water supplies.)

- Efforts should be directed to reduce the peak demand for water that occurs on the hottest days of summer. Water supply infrastructure has to be sized to handle this potential peak demand even though it is usually only required for a limited time in the year. If the summer peak demand can be lowered, water infrastructure needs will be less and/or stretched further, making the system more cost-effective and efficient.
- Water supply infrastructure should be sized appropriately according to demand for water. There is a tendency in some municipalities to “play it safe” and build infrastructure at a scale that is well beyond what is required. This is a vast and unnecessary expense that results in the infrastructure being used inefficiently.
- The Ontario government should update the building code by including more stringent water efficiency standards.
- Upper levels of government (federal and provincial governments) should take on a larger role in water conservation and efficiency. This may include developing stronger policy and regulation that mandates more water conservation and efficiency as well as providing guidance and coordination among municipalities to help them implement this policy and regulation.

#### **4.1.5 Political environment**

##### *Partnerships*

Participants discussed the need to form partnerships with other organizations. Doing so helps to coordinate water conservation and efficiency efforts as well as to gain access to new sources of knowledge. Partnerships were suggested with: lower-tier municipalities, other municipalities, other water professionals (both within the organization and outside of it), other water organizations (e.g. water research centres, environmental groups), and with the private sector (e.g. those who build appliances that use water).

#### **4.1.6 Community awareness and involvement**

##### *Changing public perceptions about water*

Participants frequently stated that the public often does not have an understanding of how much water they use and how valuable it is. To change this, public education is needed to change public perceptions and behaviors towards water

One method that was suggested for changing public thinking about water is to link water conservation and efficiency with other environmental issues to which many people already have some knowledge or understanding. Participants suggested linking water conservation with water quality, air quality, energy, and carbon use.

As an example of linking water with other issues, some participants suggested the “Water-Energy Nexus.” The Water-Energy Nexus is proposed by the Polis Project on Ecological Governance and aims to link water issues with energy and climate change issues in policy proposals and public dialogue (Maas, 2010). In Ontario, 12% of electricity and 40% of natural gas (these figures exclude the power generation sector) are consumed by “pumping,

treating, and heating water” (p. 18). In this way, water use reduction would also reduce energy usage and thereby diminish carbon emissions that cause climate change.

Participants also talked about overcoming the common public perception that Canada has a superabundance of water that is inexhaustible (as discussed in **section 1.1**). This perception of inexhaustible supply leads many to think that they have an entitlement or right to use and waste as much water as they want; this is another perception that must be overcome.

Public perceptions about the word “conservation” must be changed as well, according to some participants. To many members of the public, conservation is falsely assumed to mean living with less, a lower standard of living, and putting limitations on economic and population growth. Some participants suggested using the word “efficiency” instead of conservation when speaking to members of the public, as this word does not carry negative connotations.

Participants stated that public education is needed to change these perceptions as well as to change personal behaviors of individuals towards water. This education must include information about why water conservation and efficiency is needed, it must help individuals to realize their effect on the water system, and it must help individuals to understand the value of water.

### *Methods of social marketing*

Social marketing was discussed by many participants as a method to change perceptions and educate the public about water. Participants emphasized that an aggressive social marketing campaign should be conducted at the community scale and should connect with individuals, homeowners, and neighborhoods. A social marketing campaign should include community events to promote water conservation and efficiency. Educational material (e.g. pamphlets & guides on using less water in a home) should also be made available and distributed widely in communities.

#### **4.1.7 Technological solutions**

##### *Indoor technologies*

Many participants were very keen to list water efficient appliances and technologies that could be installed to lower water usage. This includes high-efficiency fixtures and appliances (e.g. showerheads, toilets, washing machines) that could be installed within new homes and businesses or to replace existing fixtures and appliances in existing homes. Existing low-efficiency appliances can also be modified to become more efficient (e.g. replacing toilet flappers).

Greywater systems were suggested by some participants as a potential way to recycle water for household uses that do not require fully-treated potable water and where it would not affect human health. Greywater is defined as “the wastewater collected separately from sewage flow from clothes washers, bathtubs, showers, and sinks, but does not include wastewater from kitchen sinks, dishwashers, or toilets” (Odeh, 2003, p. 182) and may be used for “groundwater recharge, landscaping, and plant growth” (p. 182).

Hot water recirculation was also mentioned as a method of reducing indoor water use. CRD (2006) states that “these systems use small pumps and looped hot water piping to continuously recirculate hot water between a conventional hot water tank and points of use such as faucets, baths and showers so that hot water is immediately available” (p. 1) and “it is not necessary to run water through taps before it is warm enough to be used” (p. 1).

#### *Outdoor technologies*

Changing automatic lawn irrigation systems and controls was cited as a step to save water. Two problems with these systems were discussed by participants. Firstly, many irrigation systems come on automatically at regular intervals (e.g. once per day) regardless of the weather. This means that an automatic irrigation system may come on when it is unneeded (e.g. during a rainstorm). Secondly, manufacturers preset these irrigation systems to come on at specific times (e.g. 2 a.m.) and these times are often not changed by the customer. This has resulted in municipal water systems being strained at specific times during the day or night. It would be more efficient for the system as a whole to spread this over the day rather than all at once because it requires less infrastructure to do so.

Participants also suggested collecting rainwater from rooftops into cisterns for use in the lawn and garden. Water could be directed into the cistern by using the existing rain gutters, and so would require very little monetary input by the homeowner. Municipalities could encourage the use of cisterns by providing them free-of-charge or offering a rebate. This would result in less treated drinking water being used in the lawn and garden (which does not require fully treated water anyway).

### *System-wide technologies*

Participants stated that detecting and repairing leaky pipes would make a water system more efficient because more of the treated drinking water would make it to consumers and less would be lost en-route. In this way, less drinking water would need to be supplied to serve the same amount of consumers or more consumers could be served by the same system without requiring expansion.

#### **4.1.8 Practical considerations**

##### *Practical considerations*

As water management professionals, the interview participants were able to provide a wealth of practical advice about how to successfully implement water conservation and efficiency programs. Much of this advice was stated by only one person because, by its very nature, this advice is often specific and individualized to each context. Since two or more participants had to state something for it to be included in this analysis, much of the advice was not coded. However, there are a few statements that more than one participant stated and these are included as codes. A separate theme has been created for these nuggets of wisdom because they are deemed to be important, but do not fit well into other themes.

One significant piece of advice was to do the easy-to-implement things first. This was expressed by more than one participant as the insightful phrase: “pick the low hanging fruit first” (Interview participants A and E). Even though some of the goals and objectives of water conservation and efficiency take a long time horizon to see results, require making tough choices, and are very difficult to implement (e.g. social marketing), there are still many other

methods that can achieve significant results in a relatively short time period and are easy to implement (e.g. technological solutions). Water managers should not lose sight of this fact.

Beginning a new water conservation program with relatively easy-to-implement methods with fast results can significantly increase the credibility of the program and demonstrate the benefit of water conservation to those who would not otherwise support it. This provides impetus for expanding the program to include the more difficult and longer-term methods that are required to achieve true sustainability.

A second piece of advice from participants flows from the last one. Methods for water conservation and efficiency that require little or no behaviour modification by end-users are more likely to be successful early on and should be chosen first. It is human nature that people generally do not want to change their habits and convincing them to do so is very difficult. The same is true for the way that individuals use water. High-efficiency household appliances and fixtures were commonly cited by many participants as being among the easiest water efficiency methods to implement because they save water without requiring individuals to change their habits. One interview participant noted that these habits are often hard to break because they are intergenerational and people have been doing it their whole life without being aware of their water usage:

“So, when it’s hot you grew up where you watered the lawn and so a lot of people think that’s the thing to do, they don’t understand that it’s not. Umm, so you have those habits something like when umm when you watch your father shaving he’ll leave the tap on so when your shaving you’ll leave the tap on too, to rinse your razor. Uhh, a lot of that kind of habits, traditions if you will, being passed down we have to kind of break and make people aware”  
(Interview participant F).



A final piece of advice gained from multiple participants was that more emphasis must be placed on the social sciences in the water sector. Perhaps unsurprisingly, this advice came from the social scientists that were interviewed (e.g. environmentalists, planners) and not from the engineers that were interviewed. This speaks to the differing silos and philosophies that exist between professions (see **sections 2.3.3.5 & 4.1.4** for more detail). Many participants (including engineers) stated that the water sector was dominated by engineers. The social scientists felt drowned out by engineers whom (they say) only seemed to want to build water supply infrastructure and, critically, did not seem to understand that water conservation can be an equally safe and reliable source of new water, often at a much lower cost. As such, it was felt by many social scientists that engineers needed more training in water conservation and that more trained social scientists were needed in the water management field.

## ***4.2 Final indicators***

**Table 11** displays the framework of final indicators of institutional capacity that would need to be present in a municipality to implement the soft path approach for water conservation. This framework is this study's main substantive contribution to the theory of water management. It is intended for this information to be used by municipal water institutions to identify needs and opportunities to implement the soft path approach for water conservation. To assist in this regard, the information is displayed in a tabular format to make it easier to read and follow by breaking it down into clear, digestible elements.

Final indicators have been constructed from a combination all of the preliminary indicators developed in the literature review (see **sections 2.3 - 2.3.3.6**) and most<sup>19</sup> of the codes developed in the analysis of qualitative interviews with water conservation and efficiency personnel (see **sections 4.1 – 4.1.8**). Since all the indicators and codes have already been thoroughly described and justified, no further description or explanation is given.

**Table 11** is divided into eight themes, which are developed and described in **sections 4.1 – 4.1.8**. Within each theme, there are a number of indicators and each indicator has also been phrased into the form of a question. As a reminder, a “yes” response to an indicator means that capacity is present for that indicator and a “no” response means that capacity is not present. By answering these questions, an individual will be able to determine what elements of institutional capacity are present in a municipality to implement the soft path approach and what elements of institutional capacity are required.

---

<sup>19</sup> Some interview codes from the “policy and legal environment” theme have been excluded because they cannot be directly controlled by a municipality (i.e. LEED standards, building codes, provincial and federal policy). However, a municipality can still have a say in these things through partnering with the water organizations and other levels of government that *are* responsible for these elements. Consequently, these elements are implicitly part of the various partnerships outlined in the “political environment” theme.

**Table 11: Framework of final indicators for institutional capacity**

Themes	Indicators of capacity	Indicator questions	Source(s) of indicators <sup>20</sup>	Rationale
Human resources	Full-time, specialized municipal staff for conducting water conservation programs.	Does municipality have full-time water conservation staff?  Does staff possess education, knowledge, skills, and training for water conservation?	LR, I	Full-time, specialized staff is needed to oversee water conservation programs.
	Further education and training opportunities.	Does staff have the access and ability to have further education and training while on the job?	LR	Water conservation policy and practice are constantly changing and staff need to keep up-to-date to stay relevant.
Information resources	Staff has access to data, including: current and future water demand and population, by sector and region.	Does staff have current and future water demand and population data?	LR	This type of data is the basis of what is needed for water conservation programs.
	On-going monitoring is conducted at regular intervals to ensure information and data is up-to-date and accurate.	Does staff monitor the success of water conservation programs?  Is data kept up-to date?	LR	
	Staff and other stakeholders share information and data with each other.	Do stakeholders openly share information and data with each other?	LR	These greatly increase the knowledge base of staff, thereby contributing towards institutional capacity.
	Staff have the ability to keep up-to-date with the latest research & developments in the water sector, development and testing of water products and technology (e.g. market, lab, field), and climate change research.	Does staff keep up-to-date with latest research & developments in the water sector?  Does staff keep up-to-date with new water products and technology?  Does staff keep up-to-date with the potential effects of future climate change?	LR, I	

<sup>20</sup>Indicators that were developed in the literature review (see sections 2.3 - 2.3.3.6) are marked as “LR”. Indicators that were developed from the interview codes (see sections 4.1 - 4.1.8) are marked as “I”. Indicators are come from both these sources are labeled “LR, I”.

Themes	Indicators of capacity	Indicator questions	Source(s) of indicators	Rationale
Financial resources	Water institution maintains a financial bottomline to ensure that it is efficient and cost-effective.	Does water institution maintain have a financial bottomline?	I	Water institution should make the most of every dollar available to maximize water conservation.
	Water institution has dedicated funding to water conservation.	Does water institution have dedicated funding for water conservation?	I	Dedicated, reliable budgets allow water institution to conduct long-term planning.
	Water institution maintains a balanced and sustainable budget for water conservation.	Is the annual budget stable and predictable from year-to-year?	LR, I	Dedicated, reliable budgets allow water institution to conduct long-term planning.
	Water institution is able to access external funding.	Are sources of external funding available?	LR	Allows water institution to conduct more water conservation activities.
	Life-cycle assessments are performed for water supply and demand projects/programs.	Are life-cycle assessments performed for all water supply and demand projects/programs?	LR	Needed to understand the true financial benefits of water conservation versus new water supply infrastructure.
	Water rates reflect the full cost of water provision (including conservation, treatment, distribution, maintenance, and source water protection).	Do water rates reflect the full cost of water provision?	LR, I	Water rates usually do not reflect the full cost and this severely curtails the capacity of a water institution to conduct water conservation.
	Incentives are available to consumers (residents, businesses, etc.) to reward water conservation.	Are there incentives for consumers to use less water?	LR	Incentives increase water conservation because they affect the consumers bottomline.

Themes	Indicators of capacity	Indicator questions	Source(s) of indicators	Rationale
Policy and legal environment	Municipality has a stated goal of sustainability.	Does municipality have a stated goal of becoming sustainable?  Do municipal departments attempt to role-model sustainability?	LR, I	Desiring sustainability is a first step towards water conservation and this can act as a role model for others to follow.
	Water conservation is a long-term (beyond one year) priority for the municipality.	Has municipality designated water conservation as a priority?  Has municipality set long-term goal(s) for water conservation?	LR, I	Long-term planning is required for the soft path approach (e.g. backcasting) but it is often difficult for municipalities to think beyond the fiscal year.
	Municipality has a water conservation plan/program, which is being actively implemented.	Does municipality have an active water conservation plan/program?  Is long-term master planning undertaken for water conservation?	LR, I	To be implemented successfully, water conservation requires a coordinated plan or program.
	Water conservation is integrated into other planning activities.	Does municipality incorporate water conservation into land-use planning?  Does municipality incorporate water conservation into economic planning?	LR	Municipalities can require or incentivize the making of water conservation plans in new development to use less water.
	Water conservation is coordinated among different municipal departments (although one department may lead efforts).	Are various municipal departments knowledgeable and supportive of water conservation programs and plans?  Do various municipal departments have input into water conservation programs and planning?	I	Departmental coordination is needed to overcome the “silos,” bureaucracies, and philosophies of different municipal departments and professional backgrounds.
	Backcasting is used as a planning tool.	Does municipality use the backcasting method to set goal(s) for future water use and conservation?	LR	Backcasting is a key planning tool in the soft path approach to identify a sustainable water future.

Themes	Indicators of capacity	Indicator questions	Source(s) of indicators	Rationale
	Water conservation has equal status in planning as building new water supply infrastructure.	<p>Is water conservation seen as a safe and reliable “source of new water,” just like new infrastructure?</p> <p>Is the same, or more, effort put into water conservation as for water supply infrastructure?</p> <p>Is municipality willing to substitute water conservation for new water supply infrastructure (e.g. “no new water”)?</p>	LR, I	This is a key indicator as to whether a municipality is really interested in sustainability and understands the true benefits of water conservation.
Policy and legal environment <b>(continued)</b>	Water conservation program(s) and planning incorporate(s) a variety of effective strategies and techniques that have not been widely adopted (to date).	<p>Does program include strategies for climate change adaptation?</p> <p>Is water use auditing performed for high water users?</p> <p>Does program incorporate the ICI sector, on an individual basis?</p> <p>Are innovative developments (with regard to water conservation) given planning approval priority?</p> <p>Are high-efficiency appliances and fixtures mandatory in new developments?</p> <p>Does program incorporate strategies for reducing outdoor water use?</p>	I	A wide variety of practical strategies and techniques would add capacity to existing water conservation program(s) and planning.

Themes	Indicators of capacity	Indicator questions	Source(s) of indicators	Rationale
Policy and legal environment <b>(continued)</b>	Water conservation program(s) and planning incorporate(s) a variety of effective strategies and techniques that have not been widely adopted (to date). <b>(continued)</b>	Are inter-basin water transfers banned?  Does program have strategies to reduce summer peak demand?  Is water infrastructure sized appropriately for demand?		A wide variety of practical strategies and techniques would add capacity to existing water conservation program(s) and planning.
Political environment	Municipality has strong leadership for water conservation.	Does municipality have one or more strong leaders that publically advocate for water conservation?	LR	Strong leadership is a key component of successful water conservation by increasing direction, vision, flexibility, and teamwork.  Collaboration among partners allows a water institution to access a larger base of individual perspectives and expertise, allows coordination of water conservation plans/programs, and increases the likelihood that water conservation is successful.
	Water institution collaborates its activities with other municipalities (horizontal linkages).	Does water institution collaborate with other municipalities?	LR, I	
	Water institution collaborates with local community organizations (horizontal linkages).	Does water institution collaborate with local community organizations?	LR, I	
	Water institution collaborates its activities with non-government, professional, and private sector organizations (horizontal linkages) (e.g. LEED).	Does water institution collaborate with non-government organizations?	LR, I	
	Water institution collaborates with private-sector organizations (horizontal linkages).	Does water institution collaborate with private-sector organizations?	I	
	Water institution collaborates its activities with other levels of government (vertical linkages) (e.g. input into provincial building codes).	Does water institution collaborate with other levels of government?	LR	

Themes	Indicators of capacity	Indicator questions	Source(s) of indicators	Rationale
Community awareness and involvement	Water institution actively involves public in decision-making.	Does the water institution meaningfully involve the public in its decision-making?	LR	Increases consumer participation in water conservation plans/programs, increases the likelihood of success, allows access to local community knowledge base, and lessens the likelihood of future dissent against water conservation.
	Water institution conducts public education and outreach program(s) for water conservation.	Is there education and outreach about water conservation?  Is community-based social marketing conducted?  Is education and outreach able to connect with individuals, homeowners, and neighborhoods?  Are there community events to promote water conservation?  Is educational material available and distributed?	LR, I	
	Education and outreach efforts address public perceptions about water that inhibit conservation.	Is the importance and need for water conservation addressed?  Does it help individuals to understand their effect on the water system?  Does it help individuals to understand the true value of water (e.g. social, ecological)?  Is water conservation linked with other environmental issues (e.g. air/water quality, energy, carbon)?  Is the myth of water superabundance challenged?		



Themes	Indicators of capacity	Indicator questions	Source(s) of indicators	Rationale
Community awareness and involvement <b>(continued)</b>	Education and outreach efforts address public perceptions about water that inhibit conservation. <b>(continued)</b>	<p>Is the perception challenged of the right or entitlement to unlimited water use?</p> <p>Is the perception challenged that conservation means a lower standard of living and/or less growth?</p> <p>Does it provide examples of practical ways that individuals/homeowners can change their behaviors to reduce water usage?</p>	I	Increases consumer participation in water conservation plans/programs, increases the likelihood of success, allows access to local community knowledge base, and lessens the likelihood of future dissent against water conservation.
Technological solutions	Indoor water conservation technologies are included in water conservation program(s) and planning.	<p>Are high-efficiency appliances (e.g. toilets, washing machines) included?</p> <p>Are high-efficiency fixtures (e.g. showerheads, faucets) included?</p> <p>Is retrofitting existing appliances/fixtures included?</p> <p>Are greywater systems included?</p> <p>Are hot water recirculation systems included?</p>	I	Technological solutions to water conservation have been used in many municipalities with great success.

Themes	Indicators of capacity	Indicator questions	Source(s) of indicators	Rationale
Technological solutions (continued)	Outdoor water conservation technologies are included in water conservation program(s) and planning.	Are automatic irrigation systems mandated to include controls and sensors to reduce unnecessary watering?  Has retrofitting existing automatic irrigation systems been included?  Have rainwater cisterns and rainwater harvesting been included?	I	Technological solutions to water conservation have been used in many municipalities with great success.
	System-wide water conservation technologies are included in water conservation program(s) and planning.	Are leak detection systems included?  Is there a leak repair program?	I	
Practical considerations	Easy-to-implement and short-term things should be the first priority of water conservation program(s) and planning.	Do plans and programs include things that are easy to implement?	I	It is acknowledged that the soft path approach requires many changes that are seemingly very difficult to achieve and require a very long time to implement (e.g. water use behaviour modification). By doing the easy and short-term methods first, water conservation programs can gain traction as well as acceptance from the public and politicians. This can pave the way for more aggressive longer-term strategies and tactics. <i>Cautionary note:</i> This does not mean that aggressive and longer-term methods should be ignored!
	Water conservation program(s) and planning should begin with methods that require little or no behaviour modification.	Do plans and programs include methods that require little or no behaviour modification?	I	

Themes	Indicators of capacity	Indicator questions	Source(s) of indicators	Rationale
Practical considerations <b>(continued)</b>	Social sciences should have the same emphasis as engineering in water management.	Do plans and programs place an emphasis on the social sciences?	I	The water sector is traditionally dominated by engineers, but more emphasis on the social sciences is needed for conservation.

As previously stated, it is intended that the framework presented in **Table 11** is to be used by municipal water institutions to identify needs and opportunities to implement the soft path approach for water conservation. Chapter 5 provides an example of how this may be performed by using the framework to evaluate a case study.

## CHAPTER FIVE: CASE STUDY EVALUATION

### *5.1 Indicator themes*

The indicator questions (developed in **section 4.2**) are stated and answered below to see if the case study has the institutional capacity to implement the soft path approach. Indicators are grouped according into themes, beginning with the indicator questions themselves and followed by explanations.

Since many indicators are achieved in the case study and many are not, it is not possible to make a blanket judgment as to whether or not the case study has the institutional capacity to implement the soft path approach. Furthermore, it is sometimes difficult or impossible to even answer yes or no for specific indicators due to the complexity of the situation and limited knowledge. For these reasons, each indicator question is answered in the following manner:

- YES – the indicator is present in the case study
- NO – the indicator is not present in the case study and needs to be pursued to improve the institutional capacity for the implementation of the soft path approach
- YES and NO – the situation is too complex to give a simple yes or no (more explanation is given)
- UNK. – presence of indicator is unknown due to a lack of information (more explanation is given)

### 5.1.1 Human resources

Does municipality have full-time water conservation staff?	YES
Does staff possess education, knowledge, skills, and training for water conservation?	YES
Does staff have the access and ability to have further education and training while on the job?	YES

As part of its Environmental Services Department, York Region has several full-time staff members responsible for implementing water conservation and efficiency and more staff has recently been hired (Interview participant A). These staff members, who are primarily trained as civil engineers, continue to expand their knowledge by attending professional conferences and speaking with other water managers in other municipalities (Interview participant B). Furthermore, they keep up-to-date with water conservation and efficiency methods through literature and internet research (RMY, 2007c).

### 5.1.2 Information resources

Does staff have current and future water demand and population data?	YES
Does staff monitor the success of water conservation programs?	YES
Is data kept up-to date?	YES
Do stakeholders openly share information and data with each other?	YES

York Region maintains water demand and population data and has projections for the future, both of which are used in water management. In the most recent update to their *Water and Wastewater Master Plan* (November 2009), York Region has used projections for future water demand and population as a basis for the order and staging of planned water infrastructure expansions until the year 2051 (RMY, 2009c).

Staff members have hired private firms to conduct extensive monitoring to determine if the Region's water conservation and efficiency programs are effective. Reports that contain this data are shared and freely available to everyone on the Region's website. Methods of gathering data include telephone surveys, focus groups, and audits of residential indoor and outdoor water use (RMY, 2007c). The purpose of this data gathering is to gain baseline data of how water is used within homes, residents' knowledge of the Region's water efficiency program, and to follow-up in homes that had been retrofitted with water efficient appliances and fixtures as part of the Region's water efficiency program (RMY, 2007c). This research has concluded that York Region as a whole has saved a sustained average of 20.33 ML/day of water usage in a six-year capital program between 1998 and 2004 (this had originally been 22.7ML/day, but has dropped off slightly since the end of the program in 2004)<sup>21</sup> (RMY, 2007c).

Does staff keep up-to-date with latest research & developments in the water sector?	YES
Does staff keep up-to-date with new water products and technology?	YES

Staff members keep up-to-date with the latest developments in the water sector, including new products and technologies for water efficiency, and these are incorporated into planning efforts (e.g. RMY, 2007c). Furthermore, staff attend conferences for water management and efficiency, are often approached by private firms marketing new water

---

<sup>21</sup> Please note that these figures are for York Region as a whole and, as such, includes all the lower-tier municipalities in the region, not just the case study municipalities.

efficiency products and technologies, and keep in close contact with other water management professionals (Interview participant B).

Does staff keep up-to-date with the potential effects of future climate change? YES and NO

Staff members were aware of climate change but did not have the expertise or the knowledge with which to fully plan for it beyond continuing to make water use more efficient, if climate change results in less water availability (Interview participant A). Staff members were aware that climate change might result in longer, drier summers, but were not aware of specific climate change projections for the area (Interview participant A). Nonetheless, positive steps have been taken as demonstrated by the fact that water conservation programs include targets for the reduction of carbon dioxide (RMY, 2007c; see **section 5.1.4** for specifics).

### **5.1.3 Financial resources**

Does water institution maintain have a financial bottomline?	YES
Does water institution have dedicated funding for water conservation?	YES
Is the annual budget stable and predictable from year-to-year?	YES
Are sources of external funding available?	NO

York Region sets aside specific funds for water conservation and efficiency according to the programs implemented and these funds are stable for the length of these programs. External funding has not been sought. For instance, the previously mentioned six year capital program was allotted \$10.1 million over the course of the six years with an additional \$2.3 million for maintenance activities afterwards (RMY, 2007c). After this program was

completed, another capital program was implemented over ten years (2007-2017) with a budget of \$30,788,110 (RMY, 2007c).

Are life-cycle assessments performed for all water supply and demand projects/programs? NO

Life-cycle assessments for water programs are not performed in the case study. Only the financial costs are considered for the building of water infrastructure (e.g. RMY, 2007c). There is no mention in any reports or in any of the interviews that staff consider the environmental or social costs associated with gathering the material for the construction of this infrastructure, nor is there any mention of these costs when the infrastructure must be demolished at the end of operational life.

Do water rates reflect the full cost of water provision? NO

Staff members who were interviewed stated that water rates are heavily subsidized in York Region and do not reflect the full cost of provision, although exact figures were not stated. The case study has an interesting twist because York Region itself does not have control over water rates. Lower-tier municipalities set water rates and sell water to residents and businesses (see **section 3.1.2**). As noted by participants (Interview participants A and B), since water conservation and efficiency is performed by York Region, there is a disconnection between the Region (who wants to decrease water usage to make water supply systems more efficient and more cost-effective on a per capita basis) and the lower-tier municipalities (who want to increase water usage to increase their revenue).



Staff members were open to the concept of raising water rates to reflect the full cost of provision and to fund increased water conservation. The *York Region Official Plan* also contains a policy (albeit vague) to this effect: “It is the policy of Council...To investigate full-cost pricing of water, in cooperation with local municipalities...” (RMY, 2009b, p. 91). However, staff members were doubtful that full-cost pricing was politically feasible. Furthermore, staff thought that there should be some form of protection for low-income earners who cannot afford full-cost water rates, if such rates were implemented.

Are there incentives for consumers to use less water? YES

York Region’s *Water for Tomorrow* program provides financial incentives for water conservation and efficiency by providing mail-in rebates for homeowners who install high-efficiency appliances and fixtures and by heavily subsidizing the cost of rain barrels (Interview participant B).

#### **5.1.4 Policy and legal environment**

Does municipality have a stated goal of becoming sustainable? YES  
 Do municipal departments attempt to role-model sustainability? YES  
 Has municipality designated water conservation as a priority? YES

York Region has implemented a policy for sustainability through its *Sustainability Strategy* (RMY, 2007d) and these strategies include nine guiding principles (see **Figure 5**). York Region has also implemented these sustainability policies into its *Water and Wastewater Master Plan* by evaluating water management projects according to the “triple bottom line”,

which measures success by looking at three main goals: healthy communities, economic vitality, and a sustainable natural environment” (RMY, 2009c, p. 6)

**Figure 5: York Region’s guiding principles of sustainability**

- Principle 1:** Provide a long-term perspective on sustainability.
- Principle 2:** Evaluate using the triple bottom-line elements of environment, economy and community.
- Principle 3:** Create a culture of continuous improvement, minimizing impact, maximizing innovation and increasing resiliency.
- Principle 4:** Identify specific short-term achievable actions that contribute towards a sustainability legacy.
- Principle 5:** Set targets, monitor and report progress.
- Principle 6:** Foster partnerships and public engagement.
- Principle 7:** Create a spirit of stewardship, shared responsibility and collaboration.
- Principle 8:** Raise the level of sustainability awareness through education, dialogue and reassessment.
- Principle 9:** Promote sustainable lifestyles and re-evaluation of our consumption and expectations.

Source: RMY, 2007d, p. 8

Has municipality set long-term goal(s) for water conservation?	YES
Does municipality have an active water conservation plan/program?	YES

York Region has set and met water conservation goals in the past (i.e. the six year capital program, mentioned previously). This first initiative began with the *Long Term Water Project Master Plan* in 1997 and precipitated the *Water for Tomorrow* program in the following year (Interview participants A and B). *Water for Tomorrow* is an on-going program to provide rebates and incentives for households, institutions, and businesses to install water efficient appliances and fixtures as well as to market water conservation to residents through community workshops and events, seminars, school visits, personal lawn and garden visits, and by distributing educational material on water conservation (RMY, 2010b). This program

also markets practical ways in which individuals can reduce water usage at home, at work, at school, and in their community (RMY, 2010b).

A second, ten-year, water conservation initiative began in 2007 as a result of the *Water Efficiency Master Plan Update* (RMY, 2007c) and is also implemented under the on-going *Water for Tomorrow* program. The goal for this program is to save an additional 23.4 ML/day of water and is much more aggressive than the first initiative because it proposes many more water efficiency methods (RMY, 2007c).

Is long-term master planning undertaken for water conservation?

YES

Two master planning efforts have been implemented so far. The first was a six year capital program that ended in 2004 (RMY, 2007c). A second master plan was implemented in 2007 and will be active until 2017 (RMY, 2007c).

Does municipality incorporate water conservation into land-use planning?

NO

Does municipality incorporate water conservation into economic planning?

NO

Although water conservation and efficiency efforts are included in the York Region Official Plan (RMY, 2009b), there are no policies that explicitly state that land-use planning, growth management, or economic development should consider water conservation. For instance, there are no policies that require water efficient appliances or fixtures in new developments. To date, water conservation and efficiency efforts have been focused on existing homes, institutions, and businesses (Interview participants A and B).

Are various municipal depts. knowledgeable and supportive of water conservation programs and plans? UNK.

Do various municipal depts. have input into water conservation programs and planning? UNK.

Unfortunately, staff members who were interviewed were not willing to discuss other departments in York Region for reasons of professional courtesy and respect. This researcher was otherwise not able to ascertain the roles of departments other than Environmental Services in water conservation and efficiency.

Does municipality use the backcasting method to set goal(s) for future water use and conservation? NO

Backcasting is not used as a planning method in the case study. When interviewed, staff did not have an understanding of backcasting or how it could be implemented.

Is water conservation seen as a safe and reliable “source of new water,” just like new infrastructure? YES

The *Long Term Water Project Master Plan* (1997) recognized water conservation as a source of new water itself (Interview participants A and B).

Is the same, or more, effort put into water conservation as for water supply infrastructure? NO

Is municipality willing to substitute water conservation for new water supply infrastructure? NO

Although master planning is performed for both water supply infrastructure (e.g. RMY, 2009c) and water conservation and efficiency (RMY, 2007c), they are not equal. The former plans out to the year 2051 and includes billions of dollars in capital investment to

provide for future growth (see **section 3.1.2**). The latter only plans to the year 2017 and only allocates just over \$40 million (see **section 5.1.3**). Based on this juxtaposition, the focus of York Region's water management is clearly on building new water supply infrastructure rather than conserving significant amounts of water.

Does program include strategies for climate change adaptation?

YES and NO

The reduction of greenhouse gas emissions is included in water conservation programs. The first water conservation initiative (1998-2004) reduced emissions of carbon dioxide (CO<sub>2</sub>) by an estimated 14 375 tonnes per year as a result of decreased water usage (RMY, 2007c). The second initiative (2007-2017), which is underway now, has a target of reducing carbon dioxide emissions by a further 21 891 tonnes per year (RMY, 2007c). However, the water conservation programs that have so far been implemented do not contain any other specific policies for climate change adaptation.

Is water use auditing performed for high water users?

YES

As mentioned previously, water use auditing is conducted under the *Water for Tomorrow* program. Auditing for high water users and retrofit programs are available for both the industrial, commercial, and institutional (ICI) sector and the residential sector (RMY, 2010b).

Does program incorporate the ICI sector, on an individual basis? YES

Auditing for the highest ICI sector water users is conducted and retrofit programs are available (RMY, 2010b). Since members of the ICI sector have more individualized needs than the residential sector, these efforts are conducted on an individual basis (Interview participant A).

Are innovative developments (with regard to water conservation) given planning approval priority? NO

Are high-efficiency appliances and fixtures mandatory in new developments? NO

York Region does not evaluate new developments according to their water efficiency, nor are water efficiency measures required. Instead, the *Water for Tomorrow* program only focuses on existing homes, institutions, and businesses.

Does program incorporate strategies for reducing outdoor water use? YES

The *Water for Tomorrow* program conducts community events to market outdoor water use reduction as well as lawn and garden visits to individual homeowners who request it, to help them decide how to reduce outdoor water use (RMY, 2010b).

Are inter-basin water transfers banned?

NO

York Region is considering applying to the Province of Ontario to request expanding the York Water System (with water sourced from Lake Ontario) across a watershed boundary to areas in the northern parts of the Oak Ridges Moraine (where waters flow north to Lake Simcoe) (Interview participant I). Although the wastewater flow will be returned back to Lake Ontario, pursuant to York Region's policy of supporting "the Great Lakes water balance by returning flow to Lake Ontario" (RMY, 2009c, p. x), this is still a very controversial proposal.

Does program have strategies to reduce summer peak demand?

YES

York Region has implemented a Summer Water Conservation Bylaw which restricts outdoor water use (RMY, 2010b). These by-laws vary slightly for different lower-tier municipalities, but they generally restrict lawn watering in homes to between 6am to 10am and 6pm to 10pm and other restrictions exist for the ICI sector.

Is water infrastructure sized appropriately for demand?

NO

Interviewed staff members noted that recent infrastructure construction had consistently outpaced water demand. Although specific figures were not shared, participants noted that water pipes were so oversized in some areas that water has sat stagnant over the past two years. This required flushing of the pipes to maintain water quality standards (and flushing requires water itself).

### 5.1.5 Political environment

Does municipality have one or more strong leaders that publically advocate for water conservation? YES

York Regional Council has adopted the goal of sustainability through York Region's *Sustainability Strategy* (RMY, 2007d). This document includes a policy to "engage the business community on techniques to reduce water usage and energy consumption" (p. 17). This document also champions the *Water for Tomorrow* program which includes extensive public engagement.

Does water institution collaborate with other municipalities?	YES
Does water institution collaborate with local community organizations?	YES
Does water institution collaborate with non-government organizations?	YES
Does water institution collaborate with private-sector organizations?	YES
Does water institution collaborate with other levels of government?	YES

Due to the necessity of keeping participants anonymous (see **section 3.7**), specific names cannot be mentioned here, nor can the names of the organizations that they represent. Even so, the interview participants, both within the case study area and around the GTA, were all very close colleagues and knew each other quite well, even among different municipalities, different private-sector firms, non-government organizations, and different levels of government. As colleagues, they saw each other at conferences, collaborated on projects, shared information, and otherwise generally maintained close professional contact.



### 5.1.6 Community awareness and involvement

Does the water institution meaningfully involve the public in its decision-making?	YES
Is there education and outreach about water conservation?	YES
Is community-based social marketing conducted?	YES
Is education and outreach able to connect with individuals, homeowners, and neighborhoods?	YES
Are there community events to promote water conservation?	YES
Is educational material available and distributed?	YES

All these elements are included in the *Water for Tomorrow* program (RMY 2007c; RMY, 2009c; RMY, 2010b; also, see **section 5.1.4** for more detail).

Is the importance and need for water conservation addressed?	YES
Does it help individuals to understand their effect on the water system?	YES
Does it help individuals to understand the true value of water (e.g. social, ecological)?	YES
Is water conservation linked with other environmental issues (e.g. air/water quality, energy, carbon)?	YES
Is the myth of water superabundance challenged?	YES

The *Water for Tomorrow* program advocates for both the importance of water conservation for healthy watersheds, groundwater, and lakes as well as to save money and become more efficient (RMY, 2010b). The program also speaks to residents to make them aware of the immense effort that is required to provide clean drinking water, including: where drinking water comes from, how it is treated, and what happens to it after it goes down the drain (RMY, 2010b). There is also a heavy emphasis in this marketing strategy on the links between water conservation and reducing energy consumption and greenhouse gases (RMY, 2010b).

Is the perception challenged of the right or entitlement to unlimited water use? NO

Is the perception challenged that conservation means a lower standard of living and/or less growth? NO

Unfortunately, there are no policies or programs in the case study that specifically address changing these perceptions.

Does it provide examples of practical ways that individuals/homeowners can change their behaviors to reduce water usage? YES

The *Water for Tomorrow* program provides this information (see **section 3.1.4** for more details).

### **5.1.7 Technological solutions**

Are high-efficiency appliances (e.g. toilets, washing machines) included? YES

Are high-efficiency fixtures (e.g. showerheads, faucets) included? YES

Is retrofitting existing appliances/fixtures included? YES

Rebates are provided through the *Water for Tomorrow* program for residents, institutions, and businesses for new high-efficiency appliances and fixtures and retrofitting existing ones (RMY 2007c; RMY, 2009c; RMY, 2010b).

Are greywater systems included?

NO

RMY (2007c) notes that greywater systems were investigated for inclusion into York Region's *Water Efficiency Master Plan*. However, greywater systems were excluded because: "[g]rey water reuse systems are generally not very well accepted in Ontario due to fear of cross contamination and hygiene reasons. The biggest barriers against this measure are regulatory and cost effectiveness" (Appendix F).

Are hot water recirculation systems included?

NO

Hot water recirculation systems were also investigated for inclusion into York Region's *Water Efficiency Master Plan* (RMY, 2007c). Hot water recirculation systems were excluded because: "based on the data collected during the residential audits, only a very small percentage of homes in York Region would justify the need for hot water recirculation. As such this measure . . . could not be justified to design and implement a program based on hot water recirculation" (p. 21).

Are automatic irrigation systems mandated to include controls and sensors to reduce unnecessary watering? YES

Has retrofitting existing automatic irrigation systems been included?

YES

Rebates for homeowners, instructions, and businesses for irrigation head replacement, automatic rain gauges, and soil sensors for irrigation systems have all been included in York Region's *Water Efficiency Master Plan* and are implemented through the *Water for Tomorrow* program (RMY, 2007c).

Have rainwater cisterns and rainwater harvesting been included? YES

Rebates for residential rain barrels have been included in York Region's *Water Efficiency Master Plan* (RMY, 2007c) and they are distributed to residents every spring through the *Water for Tomorrow* program (RMY, 2010b).

Are leak detection systems included? YES

Is there a leak repair program? YES

An extensive leakage identification and repair initiative has been implemented under York Region's *Water Efficiency Master Plan* and this is expected to account for 29% of overall water savings (RMY, 2007c).

### **5.1.8 Practical considerations**

Do plans and programs include things that are easy to implement? YES

Do plans and programs include methods that require little or no behaviour modification? YES

The water conservation programs implemented by York Region provide many incentives, rebates, and strategies to implement easy and non-behavior changing methods that they have been used before with great success, including toilet flapper and fixture retrofits as well as leak detection and repair (RMY, 2007c).

Do plans and programs place an emphasis on the social sciences? YES

The *Water for Tomorrow* program includes a large emphasis on social marketing to individuals, homeowners, and businesses (RMY, 2007c; RMY, 2010b).

## ***5.2 Conclusions and recommendations***

As the case study demonstrates, it is possible to successfully use indicators to determine elements of institutional capacity that are present or lacking in a municipality to implement the soft path approach. Although some of the indicator questions could not be clearly answered due to lack of information, it was still possible to gain a good idea of the various strengths and weaknesses of the case study with regard to institutional capacity. These strengths and areas for improvement are listed below:

### *Strengths*

#### **Human resources:**

- Full-time water conservation staff are present who are skilled and knowledgeable.

#### **Information resources:**

- Water conservation staff have access to a full suite of data and information resources and keep up-to-date with research and developments in the water sector.

#### **Financial resources:**

- Dedicated and stable funding is provided for water conservation programs.

#### **Policy and legal environment:**

- Sustainability is a stated goal.
- Water conservation is a priority, with long-term goals and programs.
- Water conservation is identified as a “new source of water.”

- Water auditing is conducted.
- The ICI sector is incorporated into water conservation program.
- The reduction of outdoor water use is included in program.
- Program aims to reduce summer peak demand.

### **Political environment**

- Leaders advocate for water conservation.
- Extensive collaboration is performed with other actors in water sector.

### **Community involvement and awareness**

- Extensive community-based social marketing is undertaken that connects with individuals, homeowners, and businesses.
- Social marketing efforts emphasize the need for water conservation.
- Water conservation is linked with energy and climate change issues.
- Practical methods for water conservation are presented.

### **Technological solutions**

- Rebates are provided for high-efficiency appliances and fixtures.
- Rebates are provided for installing high-efficiency irrigation systems and retrofitting existing ones.
- Rebates are provided for rain barrels
- Leak detection and repair is conducted.

## **Practical considerations**

- Easy-to-implement methods and methods that require little or no behavior change are included. These will help to build short-term success and the traction needed for long-term and more aggressive solutions.
- A large emphasis is placed on community-based social marketing for water conservation.

## Areas that need improvement

### **Information resources:**

- Research is needed on the local effects of climate change.

### **Financial resources:**

- Life-cycle assessments should be performed for water projects.
- Water rates should reflect the full cost of water provision.

### **Policy and legal environment:**

- Water conservation should be master planned as far into the future as water supply infrastructure.
- Water conservation should be incorporated into land-use and economic planning.
- Backcasting should be incorporated into planning.
- Policies are needed for climate change adaptation.
- Innovative developments should be given planning approval priority.
- High-efficiency appliances and fixtures should be made mandatory in new developments.

- Inter-basin water transfers should be banned.
- Water infrastructure should be sized appropriately for development.

### **Community involvement and awareness**

- The perception of entitlement to unlimited water use must be addressed.
- The perception that water conservation means a lower standard of living must be addressed.

### **Technological solutions**

- Greywater systems and hot water recirculation systems should be reconsidered for implementation.



## CHAPTER SIX: CONCLUSIONS

This study aimed to answer the following three interrelated research questions: (1) What is the institutional capacity required to implement the soft path approach? (2) What would a move to the soft path approach require as an operable procedure? (3) Are existing institutions compatible with and/or equipped to handle the soft path approach?

To answer these research questions, it was first necessary to define and elucidate certain concepts. This was performed by way of a literature review in **Chapter Two**. The *soft path approach*, the theory upon which this study is based, was discussed and placed within the context of other water management approaches: supply management and demand management. The sensitizing concept *institutional capacity* had to be defined to answer the research questions. This was performed by reviewing, contrasting, and weaving together ‘capacity’ literature and a working definition of institutional capacity was derived in this process.

This study had a secondary aim to bridge the gap between theory and practice by conducting two separate lines of inquiry. First, preliminary indicators were developed of the institutional capacity for municipalities to implement the soft path approach. This was performed through a review of water management literature (**section 2.3.3**). This line of inquiry was intended to capture ‘theory.’

Second, interviews were conducted with water management practitioners (see **section 4.1**) to capture ‘practice.’ The knowledge gained in these interviews (practice) was used to modify the preliminary indicators from the literature review (theory), thus including both

theory and practice and bridging the gap between them. The methodology for these lines of inquiry is detailed in **Chapter Three**.

The merging of the preliminary indicators and the knowledge gained from the interviews consists of eight interrelated themes of final indicators: human resources, information resources, financial resources, policy and legal environment, political environment, community awareness and involvement, technological solutions, and practical solutions. This framework of final indicators is presented in **Table 11**.

A case study (water management in southern York Region, Ontario) was evaluated according to the framework of final indicators. This evaluation is detailed in **Chapter Five**. It demonstrated that the framework could be meaningfully applied to a real-life situation and, in doing so, to strengthen the framework itself. Using the framework allowed this researcher to identify what elements of the case study needed or did not need improvement for soft path implementation.

The framework of final indicators comprises this study's main contribution to water management theory. It is intended for the framework to be used by practitioners in municipal water management institutions as a method of increasing the capacity of their institutions to implement the soft path approach for water conservation. In doing so, their drinking water and wastewater systems would become more efficient and sustainable for future generations.

The framework of final indicators is presented in tabular format to make it easy for municipal water management practitioners to read and follow by breaking it down into clear, digestible elements. The indicators are grouped into themes and each indicator is presented with one or more indicator question(s) as well as a rationale to justify why the indicator is

important. The indicator question(s) are intended to help a practitioner think about the indicator and determine whether or not the indicator is present in their municipal water management institution.

The indicator questions are constructed so that they may be answered as either ‘yes’ or ‘no.’ A ‘yes’ response to an indicator question means that this capacity is present in the institution and future efforts should focus on continuing this capacity indicator and improving it when possible. A ‘no’ response means that this capacity is not present in the institution and greater effort should be expended to meet and improve upon this capacity.

### ***6.1 Envisioning a new water future***

The framework of indicators for soft path implementation (**Table 11**) is intended to be useful to municipal water managers in a tangible way to help shift the paradigm towards sustainable water and wastewater systems. When one thinks of how much work there is to be done and how ‘intractable’ some day-to-day water management issues seem to be (e.g. changing individual perceptions and behaviors, convincing colleagues and municipal councilors), it is easy to throw up one’s hands in the air, give up trying new things, and make oneself believe that there is nothing more that can be done. However, this study assumes that such issues are not intractable, that difficult issues can be resolved, and that there are many ways to resolve them. Indeed, this study has found that there are many actions that can be implemented to address water management issues that impede sustainability.

There are many short-term and practical strategies that have been proven to provide a substantial reduction in overall water usage but have not yet been implemented to maximum effect. These solutions include, for example: water system leak detection and repair, water use

auditing, and the retrofitting of high-efficiency appliances and fixtures in homes, businesses, and institutions. Solutions like these work because they require little or no behavior modification from consumers. These solutions provide traction and legitimacy to a water conservation program and are a good place to start shifting the paradigm towards sustainability of water systems.

These water conservation solutions have been applied to the residential sector (although this can be further expanded) but more emphasis is needed on implementing them in businesses and institutions where they have only been implemented to a limited extent. Furthermore, these strategies will achieve their greatest effect if municipalities work closely with consumers to incentivize the process of reducing their water usage. The municipality can subsidize the cost of replacing and retrofitting appliances and fixtures as well as provide support to assist the consumer's decision-making about which appliances and fixtures to use and how to reduce water usage generally.

Another way to shift the paradigm is water conservation advocacy through community-based social marketing that refocuses the public conversation about water: from 'how' water is used to 'why' water is needed in the first place. Marketing water conservation must balance at least three objectives. First, such marketing must personalize water conservation to individual homeowners and businesses by showing how using less water will decrease their water bills and help them to save money. Saving money is a strong incentive for individuals to reduce water usage.

A major impediment to this is the subsidization of municipal water, preventing many individuals from realizing the full cost of the water that they consume. Therefore, a second

marketing objective must be to make known this ‘true’ cost of water. Even though water bills do not reflect the true cost of water, this cost is still borne by residents and businesses through municipal taxation. The cost is therefore ‘hidden’ from view, but must still be paid. As the old maxim states: “there’s no such thing as a free lunch.” Moreover, another strong case can be made that society is paying too much for water, since more aggressive water conservation can make existing water systems more efficient and less expensive on a per capita basis.

A third objective of social marketing should counter the myth of superabundance, which causes many Canadians to overestimate the amount of water available. Although not all municipalities in Canada are experiencing water shortages, many are (see **section 1.1**) and future climate change may threaten water supplies elsewhere. Water conservation in the present can reduce the impact of water shortages in the future and make Canadian municipalities more prepared for future uncertainties, including climate change. If climate change causes future water shortages, it will be less of a shock to conserve water now, before a crisis occurs.

Municipal institutions themselves should also change the way that they conduct water management. A successful water conservation program requires dedicated, full-time, and qualified staff. These staff must have access to data that is up-to-date and regularly monitored for accuracy so that they can give informed and effective recommendations to decision-makers.

Municipal water management should also occur on a longer time horizon. Confining thinking to only one fiscal year must end because the benefits of water conservation are primarily realized on a longer timescale. Water supply infrastructure is commonly master

planned several decades into the future and water conservation measures can be master planned on this same timescale and should be coordinated with the former. The water conservation measures implemented in such a master plan must be considered together to avoid a clunky, piecemeal approach that is only focused on one strategy at a time. Water conservation master planning should be coordinated with other planning efforts (e.g. land-use planning, economic development) for the same reason.

Within this master planning framework, water conservation should be considered a “source of new water” just like new water supply infrastructure. It is important to stress to decision-makers that implementing water conservation measures as an alternative to water supply infrastructure does not mean limiting future population and economic growth because water conservation can provide for the needs of this new growth, often at a much lower cost.

Shown alongside, these master plans would make apparent the sustainable economic, environmental, and social benefits of implementing water conservation measures as an alternative to building new (and usually far more expensive) water supply infrastructure. This would make a powerful case for water conservation that water managers could bring to municipal decision-makers, including municipal councilors, staff members, and the public, to convince them of the importance, cost-efficiency, and benefits of water conservation.

A possible objection to aggressive water conservation could be raised by builders and land developers because it would cost them more to construct new homes and buildings. The greywater reuse and rainwater collection for indoor use, in particular, would cause added expense for builders and land developers because these methods require new plumbing. It might be an obvious point to respond to this objection by stating that municipalities could

subsidize the cost of water conservation implementation to offset this added expense. However, a more proactive method would be to give planning approval priority to innovative and sustainability-conscious builders and land developers that install and implement water conservation technologies and strategies into their new developments.

Municipalities often have the authority to approve, require changes, or reject land developments. Seeking this approval is often a long, strenuous, and costly process for builders and land developers. Moving the innovative developments (that include water conservation) “up the stack” would shorten this approval process and make it easier and less costly for builders and land developers. In this way, builders and land developers would be given a strong incentive to implement water conservation.

The ultimate incentive to reduce water usage is to implement full-cost pricing of water. Full-cost pricing means that drinking water is not subsidized by municipal taxation and the full cost of drinking water provision is reflected in consumer’s water bills, including the costs of water treatment, distribution, maintenance, and source water protection. Doing so gives consumers more accurate price signals of when to change water supply and demand and prompts them to reduce water wastage.

Full-cost pricing of water is a very aggressive and heavy-handed measure. Unlike most of the other measures proposed in this study, it would be very difficult to implement due to political opposition. A politician who decides to implement such a measure may not be reelected. In this researcher’s opinion, it is doubtful that a municipality could implement this measure alone without a forced mandate from a higher tier of government (i.e. the province) or unless there is an immediate water supply crisis in a municipality that requires drastic

actions. Nonetheless, many interview participants in this study wished that full-cost pricing of water was possible (see **Table 10**) because of how much drinking water is wasted by consumers and the unnecessary and economic, social, and environmental costs to society that this wastage creates.

If full-cost pricing is not tenable, aggressive water conservation efforts may be curtailed due to the revenue loss that water conservation may create. The case study brought forward an interesting dilemma in which it is possible to have a situation in which a municipality wants to increase (*not* decrease) water usage to increase municipal revenue (see **section 5.1.3**). This situation occurred because water management responsibilities were fragmented among many municipal water management institutions and the situation could be largely avoided by amalgamating all responsibilities into one institution that has full control of both water supply and demand management.

Ultimately, selling water for revenue gain is a short-sighted strategy. The revenue gained by selling water in the short-term can be offset by the cost-efficiencies and overall money saved in the long-term by implementing water conservation efforts. Furthermore, benefits do not come without costs. Increasing water demand may require yet more expensive infrastructure and/or water conservation efforts in the future.<sup>22</sup> Thus, the short-term benefits create long-term costs and, because the future is uncertain, it is possible that the municipality may have less ability to address this problem in the future (e.g. due to the future effects of climate change).

---

<sup>22</sup> Preferably the latter!



Although the above argument considers only the economics of using water as a revenue source, a sustainability framework also requires decision-makers to think about the social and environmental considerations that different options create or solve. Although every situation will be slightly different, water management practitioners should take all these factors into consideration when evaluating the merits of water conservation efforts.

Moving forward, changing the way that individuals think about and use water is, admittedly, a difficult task because perceptions and habits are often deeply ingrained. However, the environmental, social, and economic costs of water overuse that these perceptions sustain are too great to ignore. Furthermore, the tangible benefits of water conservation and sustainability that can be brought forth by implementing the soft path approach are undeniable. Incentives for water conservation are an effective way to realize these benefits. The benefits *of* water conservation and the incentives *for* water conservation must be clearly explained to both political decision-makers and the voting public because the soft path approach requires strong leadership and knowledgeable communities to make it successful.

## ***6.2 Future research***

This research sought to determine the indicators of institutional capacity that are required to implement the soft path approach at the municipal scale. Future research could develop capacity indicators of how to implement the soft path approach on the provincial and federal scales because the participation of these levels of government is critical to its success. Additional research is needed that provides more case studies of how to implement the soft path approach at all scales. These case studies would give more traction to the soft path

approach because they would provide more examples of how it can be implemented, including the benefits and challenges therein, thereby increasing the acceptance of the soft path approach and increasing the body of knowledge about it.

## REFERENCES

- Agthe, D.E., Billings, R.B. & Buras, N. (2003). Introduction. In D.E. Agthe, R.B. Billings & N. Buras (Eds.), *Managing urban water supply* (pp. 1-10). Dordrecht, The Netherlands: Kluwer.
- Alexander, E.R. (1997). A mile or a millimeter? Measuring the 'planning theory – practice gap.' *Environment and Planning B: Planning and Design*, 24(1), 3-6.
- Allmendinger, P. & Tewder-Jones, M. (1997). Mind the gap: planning theory-practice and the translation of knowledge into action – A comment on Alexander (1997). *Environment and Planning B: Planning and Design*, 24(6), 802 – 806.
- Baumann, D.D., Boland, J.J. & Hanemann, W.M. (1998). *Urban water demand management and planning*. New York: McGraw-Hill.
- Biro, A. (2007). Half-empty or half-full? Water politics and the Canadian national imaginary. In K. Bakker (Ed.), *Eau Canada: The future of Canada's water* (pp. 321-333). Vancouver, BC: UBC Press.
- Biswas, A.K. (1996). Capacity building for water management: Some personal thoughts. *Water Resources Development*, 12(4), 399-405.
- Bocking, S. (2005). Protecting the rain barrel: Discourses and the roles of science in a suburban environmental controversy. *Environmental Politics*, 14(5), 611-628.
- Bott, R., Brooks, D., & Robinson, J. (1983). *Life after oil: A renewable energy policy for Canada*. Edmonton: Hurtig.
- Brandes, O.M., Brooks, D.B. & Gurman, S. (2009). Why a water soft path, and why now. In D.B. Brooks, O.M. Brandes & S. Gurman (Eds.), *Making the most of the water we have: The soft path approach to water management* (pp. 3-21). London, UK: Earthscan.
- Brandes, O.M. & Ferguson, K. (2004). *The future in every drop – The benefits, barriers, and practice of urban water demand management in Canada*. Victoria, BC: POLIS Project on Ecological Governance, University of Victoria.
- Brandes, O.M. & Maas, T. (2009). Thinking beyond pipes and pumps: Water soft paths at the urban scale. In D.B. Brooks, O.M. Brandes & S. Gurman (Eds.), *Making the most of the water we have: The soft path approach to water management* (pp. 115-123). London, UK: Earthscan.

- Brandes, O.M., Maas, T., Mojolsness, A. & Reynolds, E. (2007). *A soft path for water case study – The town of Oliver, BC*. Ottawa, ON: Friends of the Earth Canada.
- Brooks, D.B. (2005). Beyond greater efficiency: The concept of water soft paths. *Canadian Water Resources Journal*, 30(1), 83-92.
- Brooks, D.B., de Loë, R., Patrick, B. & Rose, G. (2007). *Water soft paths for Ontario: Feasibility study*. Ottawa, ON: Friends of the Earth Canada.
- Brooks, D.B. & Holtz, S. (2009). Getting quantitative: The Canadian water soft path studies. In O.M. Brandes, D.B. Brooks & S. Gurman, (Eds.), *Making the most of the water we have: The soft path approach to water management* (pp. 87-101). London, UK: Earthscan.
- Brooks, D.B. & Peters, R. (1988). *Water: The potential for demand management in Canada*. Ottawa, ON: Science Council of Canada.
- Brooks, M.P. (2002). *Planning theory for practitioners*. Chicago: American Planning Association.
- Chapman, L.J. & Putnam, D.F. (1984). *The physiography of southern Ontario* (3<sup>rd</sup> ed.). Toronto, ON: Ontario Geological Survey, Ontario Ministry of Natural Resources.
- Chung, G., Lansley, K., Blowers, P., Brooks, P., Ela, W., Stewart, S. & Wilson, P. (2008). A general water supply planning model: Evaluation of decentralized treatment. *Environmental Modelling & Software*, 23, 893-905.
- CRD (Capital Region District) (2006). *Demand management research brief – On-demand hot water systems*. Victoria, BC: Author.
- de Loë, R.C., Di Giantomasso, S.E. & Kreutzwiser, R.D. (2002). Local capacity for groundwater protection in Ontario. *Environmental Management*, 29(2), 217-233.
- de Loë, R. & Kreutzwiser, R. (2007). Challenging the status quo: The evolution of water governance in Canada. In K. Bakker (Ed.), *Eau Canada: The future of Canada's water* (pp. 85-103). Vancouver, BC: UBC Press.
- ESRI (Environmental Systems Research Institute) (2008). *ArcCanada version 3.0* [Data file]. Redlands, CA: Author.
- Finn, S.A. (2009). *The multiple barrier approach to safe drinking water for First Nations communities: A case study*. Unpublished masters thesis, University of Waterloo, Waterloo, Ontario, Canada.

- Flick, U. (1998). *An introduction to qualitative research*. Thousand Oaks, CA: Sage.
- FOEC (Friends of the Earth Canada) (2009). *Developing water soft paths in Canadian municipalities – Guidebook for municipal staff*. Ottawa, ON: Author.
- Forester, J. (1989). *Planning in the face of power*. Berkeley, CA: University of California Press.
- Franks, T. (1999). Capacity building and institutional development: Reflections on water. *Public Administration and Development*, 19, 51-61.
- Gleick, P.H. (2003). Global freshwater resources: Soft-path solutions for the 21st century. *Science*, 302, 1524-1528.
- Grant, J. (2005). Rethinking the public interest as a planning concept. *Plan Canada*, 45(2), 48-50.
- Grindle, M.S. & Hilderbrand, M.E. (1995). Building sustainable capacity in the public sector: What can be done? *Public Administration and Development*, 15(5), 441-463.
- Harris, N. (1997). Orienting oneself to practice: a comment on Alexander. *Environment and Planning B: Planning and Design*, 24(6), 799-801.
- Harvelt, F. & Okun, D.A. (1991). Capacity building for water resources management. *Water International*, 16, 176-183.
- Healey, P. (1998). Building institutional capacity through collaborative approaches to urban planning. *Environment and Planning A*, 30, 1531-1546.
- Holtz, S. (2009). Water policy: Changing course for the soft path. In D.B. Brooks, O.M. Brandes & S. Gurman (Eds.), *Making the most of the water we have: The soft path approach to water management* (pp. 75-84). London, UK: Earthscan.
- Holtz, S. & Brooks, D.B. (2009). In the beginning: Soft energy paths. In D.B. Brooks, O.M. Brandes & S. Gurman (Eds.), *Making the most of the water we have: The soft path approach to water management* (pp. 37-49). London, UK: Earthscan.
- IMF (International Monetary Fund) (2010, April). *World economic outlook – Rebalancing growth*. Washington, DC: Author.
- Ivey, J.L., de Loë, R.C., Kreutzwiser, R. & Ferreyra, C. (2006). An institutional perspective on local capacity for source water protection. *Geoforum* 37, 944-957.

- Ivey, J.L., Smithers, J., de Loë, R.C. & Kreutzwiser, R.D. (2004). Community capacity for adaptation to climate-induced water shortages: Linking institutional complexity and local actors. *Environmental Management* 33, 36-47.
- Jordaan, S., Stevens, C.M. & Brooks, D.B. (2009). Removing institutional barriers. In D.B. Brooks, O.M. Brandes & S. Gurman (Eds.), *Making the most of the water we have: The soft path approach to water management* (pp. 149-163). London, UK: Earthscan.
- Kean, L.E. (2008). *Climate change adaptation capacity in Ontario conservation authorities: A case study evaluation*. Unpublished masters thesis, University of Waterloo, Waterloo, Ontario, Canada.
- Livingston, M.L. (2005). Evaluating changes in water institutions: Methodological issues at the micro and meso levels. *Water Policy*, 7, 21-34.
- Lovins, A.B. (1976). Energy strategy: The road not taken. *Foreign Affairs*, 55(1), 186-218.
- Lovins, A.B. (1977). *Soft energy paths: Toward a durable peace*. Cambridge, MA: Friends of the Earth/Ballinger.
- Maas, C. (2010, April). *Ontario's water-energy nexus: Will we find ourselves in hot water...or tap into opportunity?* (Research Report 10-01). Victoria, BC: POLIS Project on Ecological Governance.
- McGuire, M., Rubin, B., Agranoff, R. & Richards, C. (1994). Building development capacity in nonmetropolitan communities. *Public Administration Review*, 54(5), 426-433.
- Medd, W. & Marvin, S. (2008). Making water work: Intermediating between regional strategy and local practice. *Environment and Planning D: Society and Space*, 26, 280-299.
- Mitchell, B. (2005). Integrated water resource management, institutional arrangements, and land-use planning. *Environment and Planning A*, 37, 1335-1352.
- Mitchell, B. & Pigram, J.J. (1989). Integrated resource management and the Hunter Valley Conservation Trust, NSW, Australia. *Applied Geography* 9(3), 196-211.
- MMAH (Ministry of Municipal Affairs and Housing) (2002). *Full map of the Oak Ridges Moraine Area - Land use designation map (Ontario Regulation 140/02)*. Toronto, ON: Author.
- MNR (Ministry of Natural Resources) (2008). *Natural resources and values information system* [Data file]. Toronto, ON: Author.

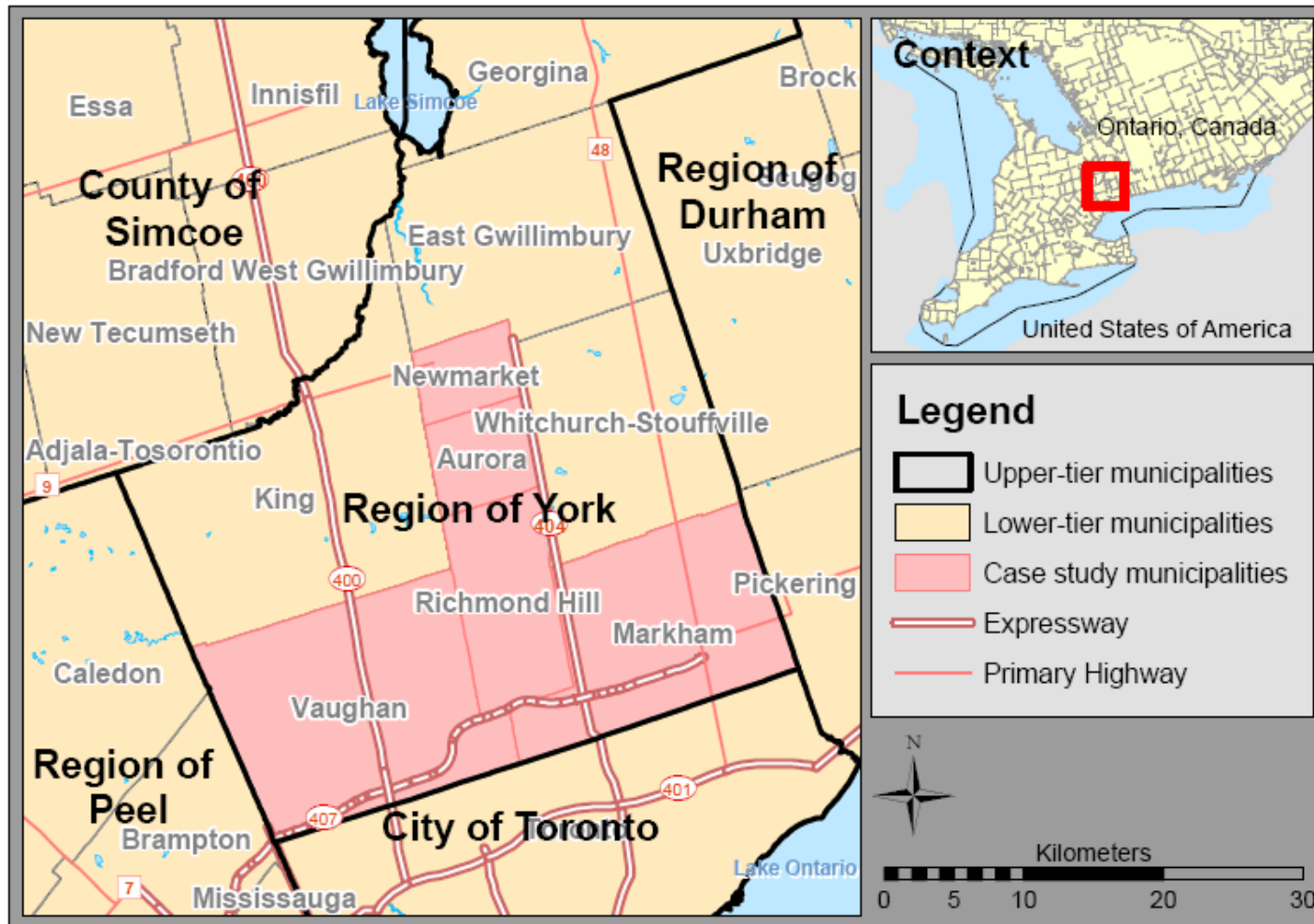
- MPIR (Ministry of Public Infrastructure Renewal) (2006). *Growth plan for the Greater Golden Horseshoe*. Toronto, ON: Queen's Printer for Ontario.
- Odeh, R. Al-J. (2003). Greywater reuse: Towards sustainable water management. *Desalination, 156*, 181-192.
- Prasifka, D.W. (1984). Water supply management enters a new era. *Civil Engineering, 54*(3), 45-47.
- Pres, A. (2008). Capacity building: A possible approach to improved water resources management. *Water Resources Development, 24*(1), 123-129.
- Richards, L. & Morse, J.M. (2007). *Readme first for a user's guide to qualitative methods* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.
- RMY (Regional Municipality of York) (2004). *Long term water project master plan update*. Newmarket, ON: Author.
- RMY (Regional Municipality of York) (2007a). *Water servicing plan - York water system*. Retrieved May 20, 2010, from <http://www.york.waterwastewatermasterplan.ca/>
- RMY (Regional Municipality of York) (2007b). *YDSS overview*. Retrieved May 20, 2010, from <http://www.york.ca/>
- RMY (Regional Municipality of York) (2007c). *Water efficiency master plan update – Final report*. Newmarket, ON: Author.
- RMY (Regional Municipality of York) (2007d). *York Region sustainability strategy – Towards a sustainable region*. Newmarket, ON: Author.
- RMY (Regional Municipality of York) (2009a). *York Region 2031 intensification strategy*. Newmarket, ON: Author.
- RMY (Regional Municipality of York) (2009b). *York Region official plan*. Newmarket, ON: Author.
- RMY (Regional Municipality of York) (2009c). *York Region water and wastewater master plan update*. Newmarket, ON: Author.
- RMY (Regional Municipality of York) (2010a). *York Region population estimate – December 31, 2009*. Retrieved May 20, 2010, from <http://www.york.ca/>
- RMY (Regional Municipality of York) (2010b). *Water for tomorrow*. Retrieved May 20, 2010, from <http://www.waterfortomorrow.ca/>

- Rubin, H.J. & Rubin, I.S. (2005). *Qualitative interviewing: The art of hearing data* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.
- Saleth, R.M. & Dinar, A. (2005). Water institutional reforms: Theory and practice. *Water Policy* 7, 1-19.
- Saunders, J.O. & Wenig, M.M. (2007). Whose water? Canadian water management and the challenges of jurisdictional fragmentation. In K. Bakker (Ed.), *Eau Canada: The future of Canada's water* (pp. 119-141). Vancouver, BC: UBC Press.
- Schuh, R.G. & Leviton, L.C. (2006). A framework to assess the development and capacity of non-profit agencies. *Evaluation and Program Planning*, 29, 171-179.
- Shrubsole, D. & Draper, D. (2007). On guard for thee? Water (ab)uses and management in Canada. In K. Bakker (Ed.), *Eau Canada: The future of Canada's water* (pp. 37-54). Vancouver, BC: UBC Press.
- Shrubsole, D. & Tate, D. (1994). Paradigms for water management in Canada. In D. Shrubsole & D. Tate (Eds.), *Every drop counts* (pp. 1-11). Cambridge: Canadian Water Resources Association.
- Simonovic, S.P. (2001). Measures of sustainability and their utilization in practical water management planning. In A.H. Schuman, M.C. Acreman, R. Davis, M.A. Marino, D. Rosbjerg & X. Jun (Eds.), *Regional Management of Water Resources* (Publication No. 268; pp. 3-16). Wallingford, UK: International Association of Hydrological Sciences.
- Sprague, J. (2007). Great wet north? Canada's myth of water abundance. In K. Bakker (Ed.), *Eau Canada: The future of Canada's water* (pp. 23-35). Vancouver, BC: UBC Press.
- Stake, R.E. (2010). *Qualitative research – Studying how things work*. New York: Guilford.
- Statistics Canada (2007). *Census 2006* (No. 92-591-XWE). Ottawa, ON: Author.
- Strauss, A. & Corbin, J. (1998). *Basics of qualitative research – Techniques and procedures for developing grounded theory* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.
- Timmer, D.K., de Loë, R.C. & Kreutzwiser, R.D. (2007). Source water protection in the Annapolis Valley: Lessons for building local capacity. *Land Use Policy*, 24, 187-198.
- USEPA (United States Environmental Protection Agency) (1998). *Guidance on implementing the capacity development provisions of the Safe Drinking Water Act amendments of 1996*. Washington, DC: Author.



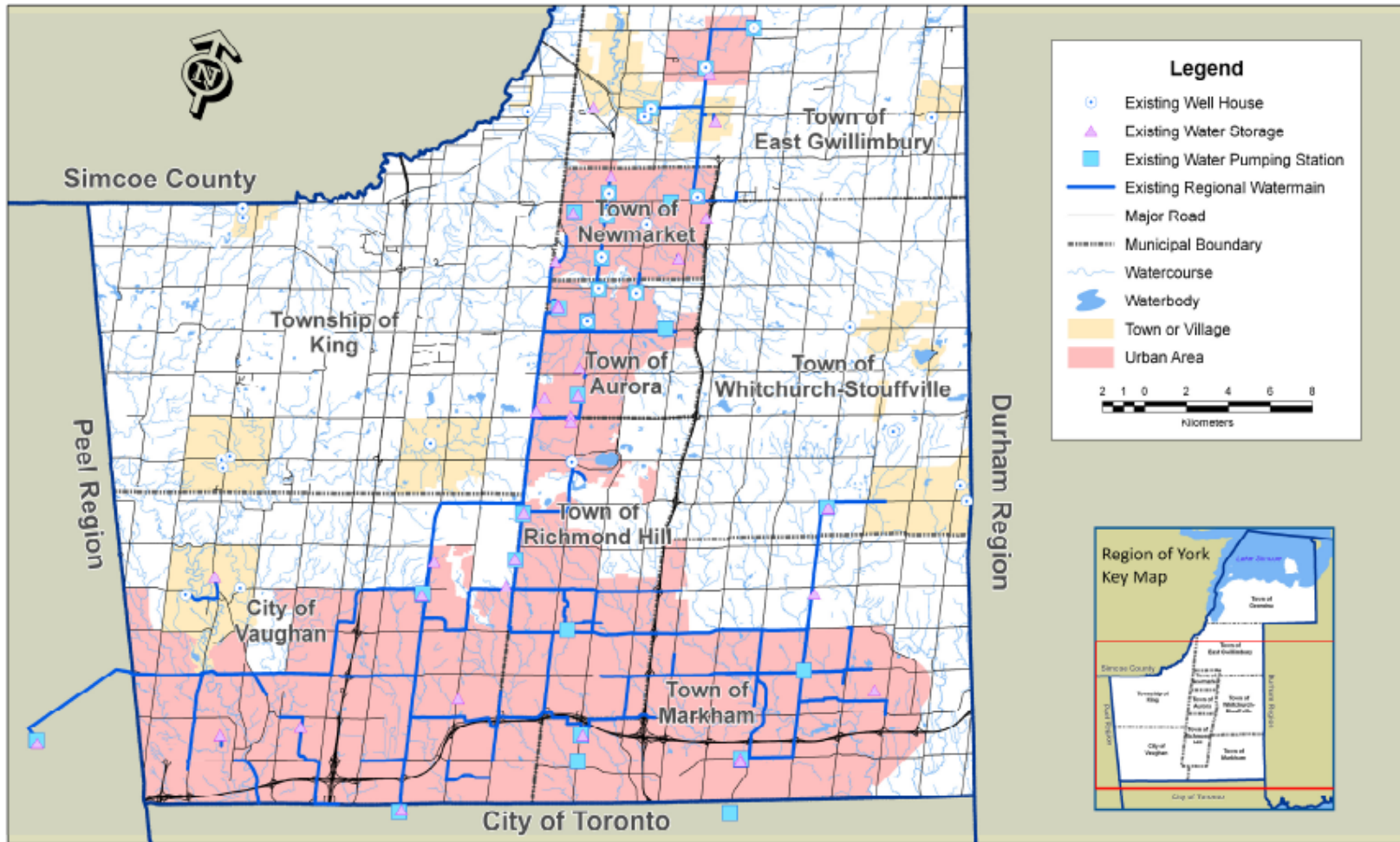
- USEPA (United States Environmental Protection Agency) (2010). *Glossary of terms*. Retrieved July 22, 2010, from <http://www.epa.gov/>
- WWAP (World Water Assessment Programme) (2009). *The United Nations world water development report 3 – Water in a changing world*. Paris: United Nations Educational, Scientific and Cultural Organization.
- Walton, D.N. (1987). *Informal fallacies – Towards a theory of argument criticisms*. Amsterdam: John Benjamins.
- Wekerle, G.R., Sandberg, L.A., Gilbert, L. & Binstock, M. (2007). Nature as a cornerstone of growth: Regional and ecosystems planning in the Greater Golden Horseshoe. *Canadian Journal of Urban Research*, 16(1), 20-38.
- Wolfe, S. (2007). *Collaboration and commitment: Common elements in the southern African and Canadian water demand management programs*. Unpublished doctoral thesis, University of Guelph, Guelph, Ontario, Canada.
- Wolfe, S. (2008). Capacity, capability, collaboration, and commitment: How social networks influence practitioners of municipal water demand management policy in Ontario, Canada. *Environmental Practice* 10(2), 42-52.
- Wolfe, S. & Brooks, D.B. (2003). Water scarcity: An alternative view and its implications for policy and capacity building. *Natural Resources Forum*, 27, 99-107.
- Yin, R.K. (2003). *Case study research – Design and methods* (3<sup>rd</sup> ed.). Thousand Oaks, CA: Sage.

## APPENDIX A: MAP OF CASE STUDY



Data sources: ESRI, 2008; and MNR, 2008.

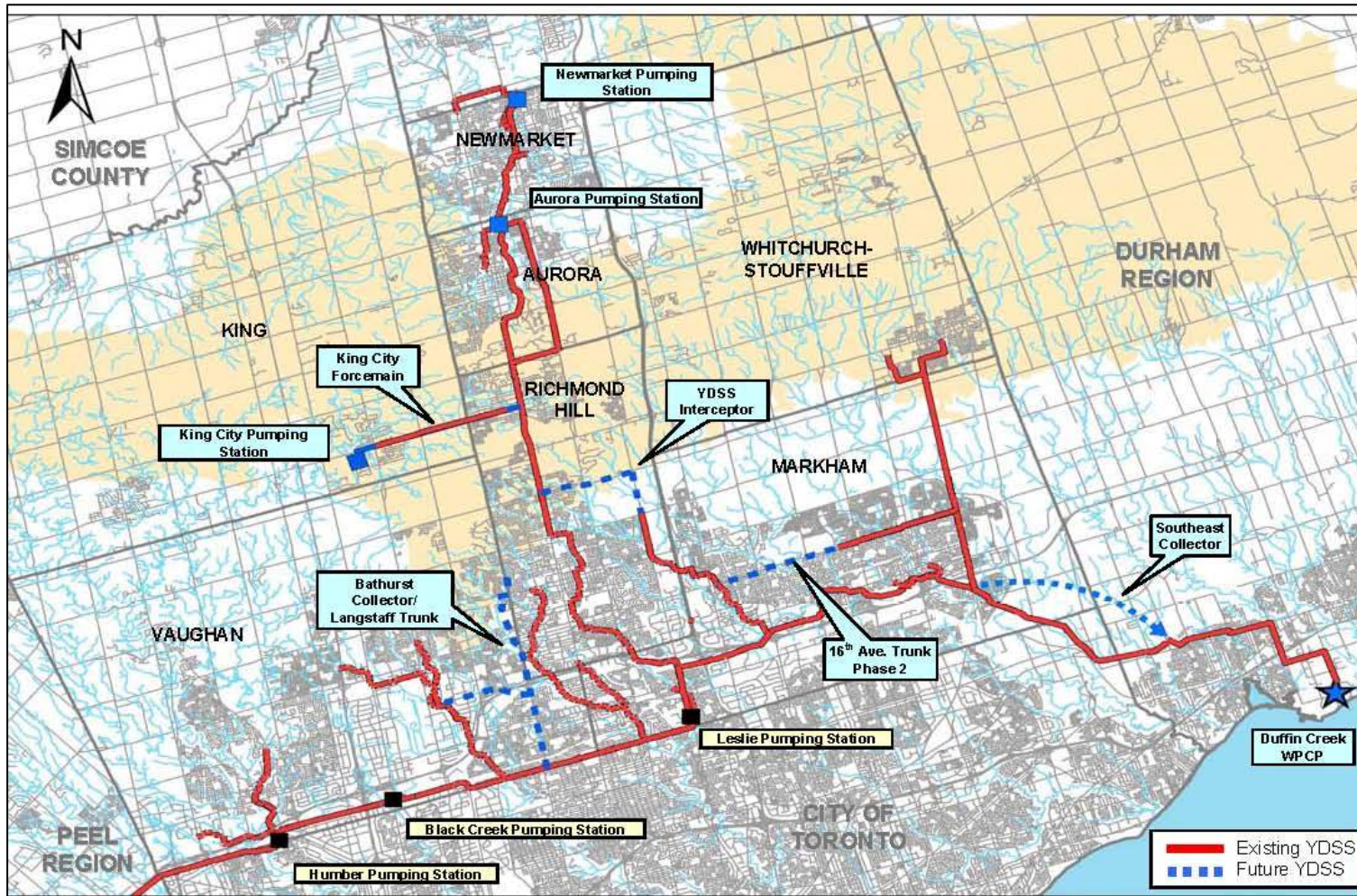
# APPENDIX B: YORK WATER SYSTEM



Source: RMY, 2007a



## APPENDIX C: YORK-DURHAM SEWERAGE SYSTEM



Source: RMY (2007b, p. 3).

## **APPENDIX D: GENERAL INTERVIEW QUESTIONS**

The first few questions are about water management and your role.

1. Can you please describe your roles and duties as a professional in water management?
2. Can you please elaborate on how you and your organization contribute to water conservation and efficiency?
3. In your experience, what do you think are the most effective methods of water conservation and efficiency?
4. In your experience, what are the largest barriers to effective water conservation and efficiency?

The next few questions ask specifically about the future. Please imagine your municipality at some reasonably far future date (e.g. the year 2031).

5. How would you like to see the practice of water management changed?
6. What water issues do you envision?
7. How might these issues have been addressed?

The next few questions are about the soft path approach.

8. Can you please describe your knowledge of the soft path approach?
9. Do you think that the soft path approach is feasible in your municipality?
10. In your opinion, what kind of changes would be required to the way that water management is conducted in your municipality in order to implement the soft path approach? (Please feel free to elaborate with personal examples from your own professional experience.)
11. I previously asked you to imagine how you want water management changed in the future. How might the soft path approach fit into this?
12. Are there any questions that you think I should have asked or anything that you feel is important that has not been stated?
13. Do you have any further questions for me?

## APPENDIX E: CORRESPONDENCE WITH PARTICIPANTS

### *Consent Letter (requesting interview)*

University of Waterloo

Date

Dear **(insert participants name)**:

This letter is an invitation to consider participating in a study I am conducting as part of my masters degree in the School of Planning at the University of Waterloo under the supervision of Professor Paul A. Kay. I would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

As a water management professional, you understand the importance of sustaining our drinking water for future generations. Rising costs, contamination, higher demand, and dwindling supplies are just some of the major threats to providing safe and clean drinking water to Canadians.

The purpose of this study is to examine how a new form of water conservation – the ‘soft path approach’ – can be implemented in Canadian municipalities. Southern York Region is my case study. There are two stages to this study.

In the first phase of this research, I would like to conduct interviews with 12-18 water management professionals in southern York Region. The interview would be approximately 30-60 minutes in length to take place in a mutually agreed upon location. With your permission, the interview will be audio recorded to facilitate collection of information, and later transcribed for analysis.

In the second phase of the study, I would like to send out follow-up questionnaires to the group that participated in the interviews. With your permission, questionnaires will be sent to you by e-mail or by mail (with a self-addressed stamped envelope included for your response). Your involvement in the first phase of the study does not obligate you to participate in the second part. You may indicate your preference at this time.

Participation in this interview is voluntary and you may decline answering any questions that you prefer not to answer. You may also withdraw from this study at any time without any negative consequences by advising the researcher. All information you provide is considered completely confidential. Your name will not appear in any thesis or report resulting from this study, however, with your permission anonymous quotations may be used. Data collected during this study will be retained for 2 years in locked storage in my supervisor’s office. Only researchers associated with this project will have access. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me by email at [wpatch@uwaterloo.ca](mailto:wpatch@uwaterloo.ca). You can also contact my supervisor, Professor Paul A. Kay at 519-888-4567 ext. 35796 or email [pkay@uwaterloo.ca](mailto:pkay@uwaterloo.ca).

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 resulting from your participation in this study, please contact Dr. Susan Sykes of this office at 519-888-4567 Ext. 36005 or [ssykes@uwaterloo.ca](mailto:ssykes@uwaterloo.ca).

I hope that the results of my study will be of benefit to those organizations directly involved in the study, other water management organizations not directly involved in the study, as well as to the broader research community.

I very much look forward to speaking with you and thank you in advance for your assistance in this project.

Yours Sincerely,

William Patch, BES

MES Candidate

School of Planning, University of Waterloo

Thank you letter (mailed after interview)

University of Waterloo

Date

Dear **(Insert Name of Participant),**

I would like to thank you for your participation in this study. As a reminder, the purpose of this study is to identify how to implement the 'soft path' approach to water conservation in Canadian municipalities and York Region is my case study.

The data collected during interviews will contribute to a better understanding of how to make municipal water and wastewater services more effective, more efficient, and more sustainable.

Please remember that any data pertaining to you as an individual participant will be kept confidential. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or if you have any questions or concerns, please contact me at either the phone number or email address listed at the bottom of the page.

As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes in the Office of Research Ethics at 519-888-4567, Ext., 36005.

William Patch, BES

MES Candidate

School of Planning, University of Waterloo

wpatch@uwaterloo.ca