Diagnosing the role of non-water factors in water governance situations: assessing the external governance of water

by

Fabiola Alvarado Revilla

A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Doctor of Philosophy
in
Social and Ecological Sustainability (Water)

Waterloo, Ontario, Canada, 2021

EXAMINING COMMITTEE MEMBERSHIP

The following members served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External Examiner	Dr. Anita Milman Associate Professor Department of Environmental Conservation University of Massachusetts Amherst
Supervisor	Dr. Rob de Loë Professor School of Environment, Resources and Sustainability University of Waterloo
Internal-external Member	Dr. Olaf Weber Professor School of Environment, Enterprise and Development University of Waterloo
Member	Dr. Jennifer Clapp Professor School of Environment, Resources and Sustainability University of Waterloo
Member	Dr. Sarah Wolfe Associate Professor School of Environment, Resources and Sustainability University of Waterloo

AUTHOR'S DECLARATION

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the 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.

STATEMENT OF CONTRIBUTIONS

In the School of Environment, Resources and Sustainability, two forms of presentation of the doctoral dissertation are permitted: (1) a standard dissertation monograph, and (2) a manuscript option centered on three or four published or publishable learned journal-type manuscripts on related matters, packaged with introductory and concluding chapters that integrate the purposes/research agenda and findings/implications, with the required result forming a conceptual whole. This thesis used the manuscript option. Specific requirements relating to the manuscript option, which have been met, are as follows:

- The manuscript-based dissertation must reflect a consistent overall conceptual foundation and research agenda and the parts must be integrated to form a coherent package. The whole must be related to the overall purposes of the School of Environment, Resources and Sustainability (SERS) doctoral program, and the individual components of the dissertation must originate from the doctoral research.
- The manuscripts must be dominated by the intellectual effort of the student. While members of the advisory committee and others involved in the research may, as appropriate, be listed as secondary authors on individual manuscripts, the manuscripts must be written by the student, and the student must be the first author on each manuscript.
- Where multiple authorship occurs, there must be a preface statement in the thesis outlining the roles of the respective authors, and clarifying the extent and nature of the contribution of the student. Co-authors must sign the statement to indicate that they are in agreement with the evaluation of the roles and contributions of the various authors.
- In no case can a co-author serve as an external examiner for the thesis.

Findings from this dissertation are reported in three co-authored manuscripts (Chapters Two, Three and Four). These chapters have been prepared for submission to refereed journals.

I testify that I am the primary author of the manuscripts in my dissertation, and that the work was dominated by my intellectual efforts.

Fabiola Alvarado Revilla (Student)

Co-authorship for R.C. de Loë (Advisor) was determined based on meeting the following criteria:

- Substantial contributions to the conception and design of the work, and to interpretation of data;
- Contributing to editing and revising the work critically for important intellectual content;
- Final approval of the versions of the chapters that will be published as refereed journal articles;
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

I testify that Fabiola Alvarado-Revilla is the primary author of the manuscripts in this dissertation, that the work was dominated by her intellectual efforts, and that I have met the four tests outlined above.

Rob C. de Loë (Advisor)

University of Waterloo

ABSTRACT

The issue of the scale at which water governance should be organized to best address water challenges is one of the main ongoing debates in the literature. Traditionally, governance of water problems has been approached and framed from a water-centric perspective. This means that water governance arrangements are commonly organized around boundaries corresponding to hydrological features such as the watershed or basin despite the causes of water problems spanning levels and jurisdictions across these boundaries. However, drivers, actors, and institutions at various scales outside the water sector (i.e., non-water factors) are increasingly driving water governance processes and outcomes in an interconnected world. Instances of non-water factors are demographic drivers, energy policies, and institutional investors in the financial sector. Non-water factors can have important implications for water sustainability, by enabling or hindering solutions to water challenges. How we frame and bound water governance situations determines what issues are prioritized, how they are addressed, the actors involved in decision-making, and the resulting governance arrangements. Thus, it is necessary to rethink how we frame and bound water governance responses to increasingly complex water problems. Crucial in this effort is improving our ability to make boundary judgments that allow those engaged in water governance to appropriately consider significant external factors. Thus, the purpose of this research is to advance our ability to assess the boundaries of water governance responses by recognizing the external dimensions of water governance situations and the types of non-water factors that shape them. By doing so, this research aims to help improving water governance responses to water challenges. Specific attention to non-water factors' role in water governance can help better understand water governance processes and outcomes, and thus enable innovative governance arrangements to address water challenges.

The study explored non-water factors' role in three case studies of water governance situations defined around water policy objectives in the context of the Canadian province of Ontario. This thesis follows on the steps of other scholars that have used public policy cases to study external factors to water governance. The three policy objectives are the reduction of industrial, commercial, and institutional water demand from the municipal supply (municipal policy); water conservation and efficiency (provincial policy); and the financial sustainability of municipal water systems across the province (provincial level, applicable to municipalities). I collected data through semi-structured interviews, document review, and attendance to relevant events. I used a qualitative content analysis method. The purpose was realised by achieving three interrelated objectives: (i) build a diagnostic framework that accounts for the role of non-water factors in water governance situations, and helps identifying opportunities these factors can provide for improving governance responses to water problems; (ii) diagnose the range of non-water factors at play in real-world water governance situations at different sub-national levels, by using the diagnostic framework developed here; (iii) examine a specific non-water sector's relationship with water governance situations, and identify the sector's factors relevant for this situation by applying the diagnostic framework.

The main finding is that the framework developed here is useful and relevant to understanding a variety of non-water factors influencing water governance situations at different scales. Furthermore, the framework was useful and relevant to identify the non-water factors that have the potential to open opportunities for improving water governance arrangements to address

water challenges. An important finding is that non-water factors can explain water governance processes and outcomes, as non-water factors influenced the situations in which water governance activities, including policy making, occurred. Thus, understanding the external dimension of water governance situations is relevant for better steering water governance arrangements towards water sustainability. For instance, climate change and population growth drive the formulation of water use reduction policies in Ontario, while the economic development goal shapes their implementation to favour water efficiency, rather than water conservation measures. The findings also revealed cases in which a seemingly water policy actually served a non-water objective, raising the question of what a "water policy" actually entails.

Findings also revealed that water decision-makers in the governance case studies do consider the impact of non-water factors over their policy objectives to various extents and in various ways, and increasingly harness them to address their objectives. While water actors are aware of co-benefits, they do not seem to systematically approach or take advantage of them. A potential explanation is that their consideration of non-water factors is not due to an explicit decision to look into non-water factors as a source of opportunities, but rather a result of their work within multi-objective organizations, such as municipalities or provinces. In other words, water officials and institutions in municipal and provincial governments contribute to the broader objectives of their organizations and are accountable to them, rather than to the "water sector" as a whole. Sustainable finance is an instance of a field that water actors are increasingly paying attention to, although understanding of interconnections is at very early stages. Findings highlight areas where water policies and sustainable finance are increasingly converging, thus opening potential new avenues for contributing to addressing water challenges.

The insights from this thesis contribute to several strands of the water governance literature, and to the institutional analysis literature. This thesis mainly contributes to literatures calling for further understanding external factors in water governance; and for improving the ability to draw boundaries for more effective water governance solutions. Thus, this study's significant original contribution to knowledge is advancing the understanding of the external dimension of water governance. I argue that a diagnostic framework built around the concept of such dimension is a useful way to account for the role of non-water factors and their potential in addressing problems targeted by specific water governance situations. Furthermore, I argue that the external dimension consists of two types of non-water factors. The first type are socio-economic objectives and organizational objectives, which water actors in a specific situation are able to influence to various extents. The second type are drivers of change (e.g., climate change), which water actors in a specific situation can only adapt or respond to. The main difference between these two types is the actors' ability to influence: ability deriving from a mandate, or without a mandate (i.e., unintended consequences). This approach is novel because it brings together concepts and frameworks not used in conjunction before: it takes an overlooked aspect of a widely used water governance definition, and develops it with other scholar- and practitioner- generated water governance concepts, and institutional analysis frameworks. A related contribution is devising an analysis process tailored to assess the sustainable finance aspects relevant to water governance situations. Finally, this thesis also contributes to the institutional analysis literature, by paying more attention to external drivers, and systematically reflecting on the boundaries of environmental governance systems and situations. While findings relate to specific water governance situations around water use reduction and financial sustainability of water systems in Ontario, they are relevant to other water governance situations more broadly.

ACKNOWLEDGMENTS

The advice, support, and encouragement of many people have been invaluable in this journey, I can only attempt to acknowledge them all. I am deeply grateful to my advisor, Rob de Loë, for his continued support, patient guidance, insights, laughs, and confidence in me. I learnt so much from you; thank you for giving me this opportunity. I would also like to thank my committee, Jennifer Clapp, Sarah Wolfe, and Olaf Weber, for their insights, support and helpful and constructive feedback. I am also grateful to my external examiner, Dr. Anita Milman for the constructive and helpful feedback during the defense process. I am grateful to those who agreed to be interviewed for this study, for their willingness to participate, their insights and their time; and to those that helped me along the way, particularly Katherine Balpataky and Eric Meliton.

My husband and I moved to Canada to embark on my doctoral studies, and here we met wonderful people. Thanks to my friends and colleagues of the Water Policy and Governance Group at Waterloo for your company, especially Parastoo for all the help with the trips to Waterloo. Thanks to the Virtual Writing Café colleagues at Waterloo, writing together made an incredible difference in pandemic times. In the Faculty of Environment, thanks to Olena and Guneet for the interesting water and sustainable finance conversations. I am very grateful to Karine, Gerardo, Patty, Ranvijay, Nataliia and Viktor, we feel lucky to call you friends and you have been my family away from home. Shu Yi, Laura, Emily and Julia, thanks for the laughs and stimulating conversations. *Mil gracias* to my parents, Teresa and David, and my brother Ivan, for the unconditional support, positivity and energy that keep me going. Thank you for instilling me with confidence. Thank you so much to my husband, Max, for always believing in me and encouraging me to reach my goals; thank you for embarking in this adventure with me — I cannot imagine how this would have been possible without your love and support. Thank you all!

DEDICATION

To Max, Teresa and David.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

Introduction

1.1 Problem rationale

Concern for appropriately bounding governance systems, and the scale at which water governance should be organized to best address water problems, is long-standing in water governance scholarship (Woodhouse and Muller 2017). For example, Blomquist and Schlager (2005, 105) argue that "boundaries that define the reach of management activities determine who and what matters. Inside the boundaries, individuals and groups may participate in decision making and have their interests, values, and concerns addressed. Those who fall outside the boundaries have fewer and indirect ways of participating." Traditionally, governance of water problems has been approached and framed from a water-centric perspective. Water governance arrangements are commonly organized around boundaries corresponding to hydrological features such as the watershed or basin despite the causes of water problems spanning levels and jurisdictions across these boundaries (Molle 2006, de Loë and Patterson 2017b). How water problems or objectives are framed can lead to different water governance arrangements to solve or achieve them (Dennis and Brondizio 2020). It is thus necessary to rethink how we frame and bound water governance responses to increasingly complex water problems (Blomquist, Calbick, and Dinar 2005, Moss and Newig 2010, Huitema and Meijerink 2014).

Drivers, actors, and institutions at various scales outside the water sector are increasingly driving water management and governance processes and outcomes in an interconnected world. These "external factors" include global megatrends such as climate change, population growth patterns, and economic trends, along with dynamics in diverse policy realms, such as energy, food, and trade, amongst others. They are important because they are driving water use, and the ability to achieve desired water-related outcomes (Rogers and Hall 2003, UNWWAP 2009, Gupta et al. 2013). The existence of these external factors is unsurprising because many decisions and actions impacting water take place in the wider political economy of a country, or the world (Allan 2005, Mollinga, Meinzen-Dick, and Merrey 2007). Ultimately, in a globalized economy local water problems can be linked to drivers at multiple scales, including global (Vörösmarty et al. 2013). Thus, external factors can have important implications for water sustainability (Pahl-Wostl et al. 2010, Godden, Ison, and Wallis 2011, Pahl-Wostl et al. 2013), by enabling or hindering solutions to water problems.

Water governance scholars and practitioners have recognized that in an increasingly globalized world, traditional governance approaches to solving water challenges are proving ineffective. A water-centric perspective is, in part, limiting progress on SDG6 (UN-Water 2018b, 2020). Recognition of cross-sector interlinkages in specific contexts is crucial for accelerating progress on SDG6 and addressing water problems in general, by helping to identify co-benefits, lay the ground for cross-sector coordination, and overcome institutional fragmentation (UN-Water 2020). Engaging with actors, institutions and drivers outside the water sector may afford opportunities to better govern water problems, for example, by harnessing the value that water has for actors in other sectors to achieve their own objectives (Gober 2013, Cosgrove and Loucks 2015, de Loë and Patterson 2017b). To illustrate, water is crucial in achieving objectives in many other sectors, and it underpins most sustainable development goals (UN-Water 2016, 2018a). Reflecting growing awareness of these relationships, water governance scholars have identified the need to account more comprehensively for the role of external actors, drivers and institutions that influence changes in water governance processes and outcomes, often with the goal of improving the effectiveness of specific water governance arrangements towards sustainability (Ingram 2008, Wiek and Larson 2012, Gober 2013, de Loë and Patterson 2017b, Tortajada and Biswas 2018, Biswas 2019). Crucial in these efforts is improving the ability to make boundary judgments that allow those engaged in water governance to appropriately consider significant external factors (de Loë and Patterson 2017b).

Scholars and policy-makers have long recognized that to address water problems, it is necessary to account for their cross-scale and multi-level connections by integrating different interests over water (Rahaman and Varis 2005, Bullock et al. 2009, UNWWAP 2009, Brandes and O'Riordan 2014, Seegert et al. 2014). The water governance literature offers concepts that can provide a foundation for addressing the need to better understand the role of external factors in shaping water governance in order to contribute to solving water problems. In particular, water governance scholars informed by political economy and political ecology literature, developed concepts such as the "problemshed", which situate water governance processes and outcomes in their broader political economy contexts. As such, this, and other concepts represent a relevant foundation for this study (further developed in Section 1.3.1). While these are powerful notions for scholarly analysis, their use in practical governance processes, including policy-making settings, has been limited, and efforts to operationalize them are ongoing (e.g., Daniell and Barreteau 2014, Mollinga 2020). In terms of the definition of water governance, a widely used definition (Özerol et al. 2018) is "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society" (Rogers and Hall 2003, 16). Rogers and Hall (2003) also describe water governance as consisting of two dimensions: the internal and external governance of water, where the internal dimension captures the functions internal to the water sector, and the external includes influences from various other policy areas. However, this distinction is overlooked in the literature.

Diagnostic approaches are increasingly being used to assess the boundaries of water governance situations (e.g., Garrick et al. 2013, Hinkel et al. 2015). Diagnostic approaches aim to improve the efficacy of solutions to environmental problems, compared to "panaceas" (e.g., prescription of public or private ownership of resources), by enabling deep understanding of the local context for developing tailored solutions (Ostrom and Cox 2010). Scholars in the Bloomington School of Institutional Analysis have produced and applied a variety of diagnostic frameworks, notably the Institutional Analysis and Development Framework (IAD) (Ostrom 2011), and the Social-Ecological Systems Framework (SESF) (Ostrom 2007), to analyse environmental governance situations. The IAD and the SESF are intended as maps to diagnose specific policy problems and potential solutions, i.e., they enable a diagnostic approach to policy analysis (Ostrom and Cox 2010, Heikkila and Andersson 2018). These frameworks include variables to account for external drivers. However, not enough attention has been paid to these external factors, despite their being crucial to understand systems' functioning (McGinnis 2019). Furthermore, McGinnis (2019) recognizes that it is necessary to systematically reflect on the boundaries of environmental governance systems and situations to improve the rigour of institutional analysis. Zooming in and out of the situation to identify external factors relevant to a specific situation is an appropriate procedure in this regard, as suggested and operationalized by de Loë and Patterson (2017a), and as argued by McGinnis (2019).

The argument that water problems are mainly governance problems, and that improving governance is a pre-condition for better water management, is well established amongst practitioners and scholars (UN World Water Assessment Programme 2003, Pahl-Wostl 2009, Akhmouch 2012, Akhmouch and Nunes-Correia 2016, Menard, Jimenez, and Tropp 2018). Thus, if water problems are mainly governance problems, and if water problems are becoming more complex and challenging to solve in an increasingly interconnected world, it is important to better understand how external factors affect water governance processes and outcomes in order to contribute to solving water problems, and achieving water sustainability.

This study thus addresses the following research question: how can we account for relevant external factors driving specific water governance situations? I tackle this question by developing and applying a diagnostic framework tailored to characterizing external factors at play in water governance situations, in a way that enables the identification of external factors that represent opportunities (e.g., leverage points) to improve the efficacy of water governance arrangements in tackling water problems. Instances of external factors are actors, institutions and drivers, located, or originating outside the water sector, e.g., energy policies, demographic drivers, institutional investors in the financial sector. The novelty of this approach lies on taking an overlooked aspect of a widely used water governance definition, and developing it with other water governance concepts, institutional analysis diagnostic frameworks, and other concepts discussed in the literature review (Section 1.3). I argue that a diagnostic framework built around the concept of an external dimension of a water governance situation is a useful way to account for the role of external factors and their potential in addressing problems targeted by specific water governance situations. Explicit consideration of external factors, I argue, is a valuable addition for water governance practitioners' toolkit in the path towards water sustainability.

1.2 Purpose and objectives

The purpose of this research is to advance our ability to assess the boundaries of water governance responses by recognizing the external dimensions of water governance situations and the types of non-water factors that shape them. By doing so, this research aims to help improving water governance responses to water problems. The purpose is realised by achieving the following three interrelated objectives:

1. Build a diagnostic framework that provides a map to account for the role of non-water factors in water governance situations, and to identify opportunities these factors can provide for improving the effectiveness of water governance responses to water problems, by drawing on institutional analysis and water governance literatures.
2. Diagnose the range of non-water factors at play in real-world water governance situations at different sub-national levels (municipal and provincial), by using the diagnostic framework developed in Objective 1.
3. Examine a specific non-water sector's relationship with water governance situations, and identify the sector's factors relevant for this situation by applying the diagnostic framework developed in Objective 1.

The following table explains how these objectives are achieved across the chapters in this thesis.

Table 1: Research objectives achieved by thesis chapter

Research objectives	Chapter Two	Chapter Three	Chapter Four
1. Build a diagnostic framework to study the role of non-water factors in water governance situations	✓	✓	✓
2. Diagnose the range of non-water factors at play in water governance situations at sub-national levels	✓	✓	
3. Examine a specific non-water sector's relationship with a water governance situation			✓

1.3 Foundations for understanding external factors in water governance and their implications for water sustainability

This section reviews the literature around three main interrelated concerns that provide the background for the subsequent empirical work into the role of external factors in water governance. First, this section reviews concepts in the wider governance and environmental governance literature, including polycentric and multi-level governance, which informed understanding of the interactions involved in water governance across scales and sectors. Second, this section examines the suitability of institutional analysis frameworks to address this study. Finally, it discusses water sustainability in the broader context of sustainable development and the green economy.

1.3.1 Accounting for drivers of water governance in an interconnected world

The water governance literature, both scholarly and practitioner-led, recognizes water's various interconnections with other sectors and systems. The aim in this sub-section is to identify the notions most appropriate to form the foundation on which to build a conceptual framework to account for the role of external factors in water governance. Thus, this section contributes to Objective 1 of this research. The section starts by defining governance terms, and then discusses concepts in the literature addressing water interconnections. Section 1.4 presents the conceptual framework developed using this literature.

Environmental governance is "the set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes" (Lemos and Agrawal 2006, 298). Thus, environmental governance includes mechanisms such as command and control, top-down approaches (i.e., regulations), economic instruments (e.g., taxes, subsidies, carbon markets), and hybrid approaches (e.g., public-private partnerships, co-management); these are used to address environmental problems, which are commonly understood as externalities arising from the use of environmental goods (Lemos and Agrawal 2009, Vatn 2015). In that sense, environmental governance is often shorthand for governance for sustainable development (e.g., Kemp, Parto, and Gibson 2005, Delmas and Young 2009). Public policies are a key instrument used by governments in efforts to steer collective action towards sustainability (Meadowcroft 2007, Lange et al. 2013). However, with the growing participation of non-state actors in policy-making processes, policy outcomes can be better understood as the “result of governing processes that are no longer fully controlled by the government, but subject to negotiations between a wide range of public, semi-public and private actors” (Sørensen and Torfing 2007, 3). From this perspective, policy-making and governance, environmental governance or governance for sustainability in particular, are closely intertwined: a governance system determines who is involved and what issues are prioritized across the policy-making process; while the resulting policies add to the institutional body structuring a governance system (Howlett 2009, Craft and Howlett 2012).

Two concepts, multi-level and polycentric governance, are widely used to describe, and to provide a normative frame for, environmental governance, particularly in terms of dealing with complex interactions and externalities (e.g., Heikkila, Villamayor-Tomas, and Garrick 2018). Multi-level governance emphasizes the dispersion of decision-making authority to levels up and down the national state, across nested general-purpose (type I) jurisdictions or specialized, overlapping (type II) jurisdictions (Hooghe and Marks 2003, 2010). Polycentric governance points to multiple decision-making centers, including public, private and voluntary, with overlapping jurisdictions which interact under a framework of rules (Ostrom, Tiebout, and Warren 1961, Ostrom 2012, Aligica and Tarko 2012), resembling Hooghe and Marks’ (2003) type II jurisdictions. In summary, a polycentric system of governance is multi-level, multi-sectoral, and multi-functional (McGinnis 2011a). Thus, polycentricity captures well the presence of multiple policy areas whose decisions affect water, identified in the opening section of this chapter, and the dynamics described by UNWWAP’s (2009) water box and Rogers and Hall (2003) water governance definition, discussed later in this sub-section. Polycentric governance applied to the environment is dominated by the work of the Ostrom school on common-pool resources. The next sub-section discusses institutional analysis frameworks that emerged from this school, that were found suitable to realise the purpose of this study.

A widely used definition of water governance (Özerol et al. 2018) is “the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society” (Rogers and Hall 2003, 16). Furthermore, water governance “includes the ability to design public policies and institutional frameworks […] [and] water policy and the process for its formulation must have as its goal the sustainable development of water resources” (Rogers and Hall 2003, 16). Various types of interactions in water governance are cross-sector, cross-scale and multi-level. Integrated Water Resources Management (IWRM) attempted to bring together different water-using sectors at the watershed scale. However, scholars and practitioners have criticized IWRM for falling short of grasping and integrating the complex interactions that link local water resources to forces at other scales and/or indirectly related to water (Bullock et al. 2009, Cohen and Davidson 2011, Cooley et al. 2013, de Loë 2013). Thus, IWRM is gradually and quietly being discarded by policy-makers (Biswas and Tortajada 2010). An alternative concept, the water-energy-food nexus (Hoff 2011) has been better received by practitioners in other sectors (Gupta et al. 2013). However, critics argue that nexus thinking does not pay enough attention to governance issues, remains a water-led project (de Loë and Patterson 2017b), and its analysis tends to focus on interactions at the watershed scale (e.g., Asian Development Bank 2013, Villamayor-Tomas et al. 2015, Grafton et al. 2016). Scholars have proposed various options for governing water that account for cross-sectoral connections. For instance, some authors advocate for governing water as a cross-cutting issue rather than a sector, to enable it to better tackle cross-sector interdependencies (Gupta et al. 2013). Another proposed instance is to govern green water, i.e., the water embedded in agricultural products, separately from blue water; this option focuses on managing the impacts of food and agriculture in water (Rockström, Falkenmark, Allan, et al. 2014, Clarke-Sather 2015). While all of these options address cross-sector interconnections, their scope is limited to sectors whose impacts over water, e.g., water use or pollution, need to be managed.

The watershed as a geographical scale, while appropriate for capturing various water-using actors located within the watershed, does not necessarily capture other types of dynamics that arise beyond the watershed. In this context, the concept of scale in water governance requires a closer look. There are various types of scales at play in water governance, including spatial (e.g., local, global), temporal, administrative (e.g., jurisdictions), management (e.g., plans, programs), stakes/issues (type of issues, e.g., water as a sector or a cross-cutting issue) and institutional (Daniell and Barreteau 2014). One of the most widely used scales is the spatial one. Some advocate for the global or the local as appropriate scales for governing water. Global water governance, advocates argue, is necessary because there are global drivers affecting local water resources and governance, mainly the climate (affecting water availability), and global economic dynamics (affecting water use) (Vörösmarty et al. 2015). Advocates of the local (e.g., the watershed scale) argue that water problems manifest in local conditions, so local authorities are better positioned to come up with solutions tailored to their context and implement them (Hering et al. 2015). In practice, the global and the local can be co-constituted in a process of "glocalization", where rescaling takes place (following Swyngedouw 1997, 2000, Norman, Bakker, and Cook 2012 discussions in geography).

Scholars tend to recommend a scale according to characteristics of the problem (Gupta and Pahl-Wostl 2013), assuming scale as an ordering principle. Furthermore, scale can be understood as relational and a process: as the outcome of non-linear and complex relationship between social processes (Sayre 2009). Scale as a social construct provides an alternative perspective on the scope of water governance, long dominated by positivist assumptions, as demonstrated by the watershed approach. Cook, Cohen, and Norman (2015) suggest seeing water governance as a negotiated process between different interests, rather than taking place at an appropriate scale (i.e., rescaling, politics of scale). Choosing a scale means making visible some patterns and hiding others because some processes can only be seen (and managed) at a certain resolution and extent of observation (Gibson, Ostrom, and Ahn 2000). Thus, rescaling redefines what and who is included in the process and the resulting scales (Norman, Bakker, and Cook 2012). Daniell and Barreteau (2014) argue that multi-level, cross-scale, and rescaling interactions in water governance can be explained by flows of externalities (i.e., unintended consequences) from one level to others. These flows are of various types, including physical (e.g., water flows, pollution flows, food trade); political and social control (e.g., political reform, legitimacy, that sway the allocation of decision-making power); and financial (e.g., investment flows, budget transfers). For instance, a water-sharing program in Indonesia supported by international donors (financial flows) promoted an adjustment in the jurisdiction responsible for the sharing program (variation in the jurisdictional scale), which in turn impacted the volume of water being shared (physical flows) (Sjah and Baldwin 2014).

Tracing such interactions across scales makes a "problemshed" approach more appropriate for understanding water governance (Daniell and Barreteau 2014). The problemshed (Allan 2005, Mollinga, Meinzen-Dick, and Merrey 2007) is a socially constructed scale that aims to internalize externalities, where the reach of a problem defines the space(s) and the network of actors involved. A problemshed framing of water problems allows seeing them in their wider socio-political context, even as a manifestation of wider problems, which makes it relevant in the context of this research. For instance, the concept of virtual water trade understands the global trade system as a problemshed (Allan 2005). The concepts of scale and problemshed in water governance are informed by political economy and political ecology literatures, and as such they situate water governance processes and outcomes in their broader political economy contexts. The literature using a problemshed framing criticizes hydro-centric approaches to water governance and management (Mollinga 2020): “political economy provides the framework that frees us from the hydro-centric watershed” (Allan 2005, 199). Whilst the concept has gathered attention by scholars, in practice it is challenging to build institutions around problemsheds, and efforts to operationalize the concept are ongoing (e.g., Daniell and Barreteau 2014, Mollinga 2020).

Discussions of “scale” ultimately raise the issue of what is “internal” or “external” to water governance. Understanding scale as constructed makes the internal/external divide more fluid. The problemshed concept in particular provides a more flexible approach to scale because it varies according to specific water problem situations under study (e.g., Davidson and de Loë 2014). This concept is compatible with other two concepts that pay attention to internal/external dynamics in water governance: the UNWWAP’s (2009) water box conceptual framework, and the two dimension of water governance defined by Rogers and Hall (2003). The UNWWAP (2009) devised the “water box” framework, where forces outside the “water box” are classified into broader socio-economic objectives (e.g., economic development), and global drivers of change (e.g., climate change). Decisions made in relation to other socio-economic objectives can affect dynamics within the water box. The water box concept is part of literature produced by United Nations initiatives that highlight the cross-sectoral significance of water and how to simultaneously secure water sustainability and water’s contribution to sustainable development (e.g., UNEP IRP 2012) (see section on water sustainability in the green economy in this literature review). The “water box” framework as such has not been deployed in the scholarly literature. Rogers and Hall (2003) definition of water governance mentioned earlier is only part of their full definition. Rogers and Hall (2003) also describe water governance as consisting of two dimensions: the internal and external governance of water. The internal dimension captures the functions internal to the water sector, and the external includes influences from various other policy areas. This distinction is crucial for this study. However, it has been overlooked in the literature, and Rogers and Hall (2003) do not elaborate on it either.

In summary, the polycentric governance and problemshed notions are appropriate conceptual foundations that usefully reflect the nature of the problem this research addresses, and capture the considerations necessary to address it. While the problemshed concept emphasizes how crucial it is to understand a specific water problem in the wider political economy, polycentricity describes well the dynamics within a problemshed. Specifically, taken together, the internal and external dimensions of the Rogers and Hall (2003) water governance definition and the UNWWAP’s (2009) water box, can be understood as a problemshed where polycentric governance takes place. In that sense, the Rogers and Hall (2003) water governance definition, and the UNWWAP’s (2009) water box framework, provide two specific building blocks used in devising a conceptual framework to account for the role of external factors in water governance. Section 1.4 discusses in more detail these building blocks and how they complement other elements in developing the conceptual framework.

1.3.2 Institutional analysis frameworks for diagnosing environmental governance problems

This review of institutional analysis frameworks for diagnosing environmental governance problems contributes to Objective 1 of this research. This review thus complements the preceding survey of ways in which the water governance literature has grappled with water's complex interconnections with other sectors. While the preceding section provided the foundation for the conceptual framework, the current review identifies the features of institutional analysis most relevant to guide the design and architecture of a conceptual framework that enables accounting for the role of external factors in water governance. The use of institutional analysis frameworks in this study results from the understanding of water governance as a polycentric system, as elaborated in the preceding section. Polycentric governance applied to the environment is dominated by the Ostrom school's work on common-pool resources and diagnostic approaches to policy analysis. This school devised institutional analysis frameworks with the purpose to capture the polycentricity of governance systems and assess their complexity. Furthermore, institutional analysis provides an appropriate set of tools for this study because "institutional complexity is a defining characteristic of modern governance" (Lubell 2013, 1), and because institutionalism is a widely used body of theories and frameworks in environmental and water governance studies (e.g., Costanza et al. 2001, Saleth and Dinar 2004, Young, King, and Schroeder 2008).

Institutionalism has been used to study environmental governance at the global level, paying attention to international regimes (Young 2002), as well as the local level (e.g., Ostrom 2007, 2009, 2011, McGinnis and Ostrom 2014). In both cases, a systems perspective is widely used (e.g., Heikkila, Schlager, and Davis 2011). The predominant school is new institutionalism, which is rooted in rational choice institutionalism in political science and new institutional economics; it is also known as the Douglass North strand. Within new institutionalism, the Bloomington School of Institutional Analysis (also known as the Ostrom Workshop, or the collective action school) greatly influenced the study of environmental governance, particularly of social-ecological systems sustainability, based on its early interest in the governance of common pool resources (e.g., Ostrom 2007). Given its roots, the Bloomington school understands institutions as the rules of the game (common constraints), information and institutions are incomplete, transaction costs are positive, and institutions are mainly consciously constructed (Saleth and Dinar 2004, Vatn 2005a).

The Institutional Analysis and Development framework (IAD) (Ostrom 2011) is the cornerstone policy process framework of the Bloomington school (Petridou 2014, Orach and Schlüter 2016). The IAD originated from a "general systems approach to policy processes, in which inputs are processed by 'policy-makers' into outputs that have outcomes that are evaluated, with feedback effects" (McGinnis 2011a, 9). The IAD framework aims to reflect a polycentric system of governance with multiple decision-making centres. In this framework, institutions are understood as the "rules of the game" (North 1990), prescriptions that organize repetitive and structured interactions, enabling or constraining them, thus shaping decision-making processes and their outcomes (Ostrom 2005). Institutions include enforceable rules (e.g., regulations, policies) and strategies (e.g., guidelines, plans) (Ostrom 2005). The *action situation* (AS) is the core element of the IAD, and thus of the related frameworks. The AS is the unit of analysis where the interactions focus of research take place. The AS defines two analytical dimensions: within the AS (actors maximizing benefits based on their roles and information available), and external to it (how the material, institutional and cultural context influences the interactions and outcomes). The AS internal components can be changed endogenously in the AS (McGinnis 2016), and also are specified by rules determined in other AS. In that sense, AS whose outcomes shape the components of other AS are in a network of adjacent AS (McGinnis 2011b).

Policy processes and governance are closely intertwined in the IAD , and related frameworks (Weible and Sabatier 2017). In that setting, governance is "the process through which [institutions] that guide behavior within a given realm of policy interactions are formed, applied, interpreted, and reformed" via collective decisions made by state and non-state actors (McGinnis 2011a, 171). In that sense, governance systems allow solving problems through policy-making, that is, through changing or creating institutions that can enable desired interactions and outcomes (Ostrom 2005). Thus, it is important for decision-makers to understand institutions, in order to minimize negative, unexpected outcomes of crafting or changing them, i.e., unexpected outcomes of decision- and policy-making (Ostrom 2005). Thus, the application of IAD and SES frameworks to empirical cases is intended to identify opportunities for policy intervention to change outcomes in the situation under analysis (McGinnis 2019).

Various institutional analysis tools derived from the IAD framework, from within and beyond the Blooming school, inherit many of its foundations. The Ecology of Games Framework (Lubell 2013) and the Management and Transition Framework (Pahl-Wostl et al. 2010) are some of the tools that emerged outside of the school, but with connections to it. Within the school emerged the Social-Ecological Systems framework (SESF) (Ostrom 2009, McGinnis and Ostrom 2014), the Network of Adjacent Action Situations (NAAS) (McGinnis 2011b), and the Combined IAD and SES Framework (CIS) (McCord et al. 2017, Cole, Epstein, and McGinnis 2019). McGinnis (2011b) extended the IAD with NAAS to better capture polycentric governance and externalities by fleshing out the interactions surrounding the focal AS. The SESF adapts the IAD idea to better study the sustainability of social-ecological systems by working with a systems depiction, elaborating the IAD contextual factors into four SESF sub-systems (governance systems, actors, resource systems, and resource units), and explicitly including exogenous shocks from related ecosystems, and social, economic, and political settings. The CIS synthesizes the main concepts of the three other frameworks, and takes a depiction closer to the IAD one, to be used in various policy area studies, including social-ecological systems. The CIS explicitly locates a NAAS at its core, whose interactions affect and are affected by contextual factors (categorized in terms of the SESF four sub-systems), i.e., contextual factors are endogenous. The CIS also considers exogenous shocks. The NAAS and CIS try to overcome an important criticism to the school, which is to focus too much on local dynamics, neglecting other wider interactions (Vatn 2005b, Cleaver and de Koning 2015). For instance, other framework variations have included power and politics more explicitly for diagnosing the impact of such factors in policy situations specifically (Clement 2010, 2012, Epstein et al. 2014). Figure 3 in Section 2.2.1 shows the SESF and the CIS in diagram form.

The IAD, SESF, and deriving frameworks, function as maps to assess and diagnose specific policy problems and potential solutions, i.e., the frameworks are diagnostic tools (Ostrom 2007, Ostrom and Cox 2010, Heikkila and Andersson 2018). The purpose of a diagnostic approach to policy analysis, which is a core characteristic of the institutional analysis literature, is to support the design of policy solutions that are context-specific, instead of prescribing "panaceas" (Ostrom and Cox 2010). In that sense, diagnostic frameworks help navigate the complex institutional context affecting a problem, to better understand its causes, and thus design (or change) institutions tailored to address them. In particular, the SESF enables a diagnostic approach to environmental policy analysis that focuses on identifying the particular elements relevant to a specific problem in a social-ecological system (Ostrom 2007, Ostrom and Cox 2010).

The three frameworks (NAAS, SESF, CIS) offer various opportunities to study internal/external dynamics to the AS, the network of AS, or the SESF's system and sub-systems, and they have been used to pay attention to "external factors" to various extents. In particular, the CIS configuration offers a clearer grounding for tracing actors, drivers, and institutions influencing water governance, even if they originate beyond the water sector and at various scales. This because the CIS depiction emphasizes the differentiation between factors endogenous to the system (if actors and institutions within the system can influence them) and exogenous factors (if they cannot be influenced by actors and institutions within the system, such as global climate patterns, demographic trends, technology trends). This is an important contribution to the conceptual framework developed in this chapter (Section 1.4). Using the CIS for exploring external factors to water governance follows previous studies using Bloomington school frameworks that have paid attention to the role of "external factors". For instance, Perez et al. (2011) used Anderies, Janssen, and Ostrom (2004)'s institutional analysis framework to identify that "external driving forces" related to globalization and population growth, affect actors, resources and infrastructure in a groundwater governance SES, making it more vulnerable. Using the SESF, Torres Guevara, Schlüter, and Lopez (2016) found that external social, economic and political factors to the SES explained the lack of self-organization by actors within an SES, and Delgado-Serrano and Ramos (2015) highlighted the importance of external social, economic, political, and ecological factors in explaining dynamics in an SES. The NAAS has been used to study the interdependencies at the water-food-energy nexus (Villamayor-Tomas et al. 2015); how decisions in interlinked policy areas affected natural gas infrastructure development in the Baltic sea region (Gritsenko 2018); and the factors affecting sustainable urban forest management (Mincey et al. 2013). Specifically regarding the study of unintended consequences in water governance, Daniell and Barreteau (2014) propose adding variables to the IAD and SESF to reflect flows of externalities that can explain multi-level, cross-scale, and rescaling interactions in water governance. The shortcoming of this contribution is that it does not specify how these variables integrate within the IAD or SESF. For instance, it is not clear if those flows take place within an AS and/or amongst AS. However, it highlights the interest among scholars to better characterize multiple types of interconnections in water governance using institutional analysis frameworks.

In summary, the CIS configuration of institutional analysis presents appropriate features to guide the design and architecture of a conceptual framework that allows diagnosing, and thus accounting for, the role of external factors in water governance. In particular, I take from the CIS the distinction between contextual factors and exogenous shocks, where the former can be influenced by interactions in the situation or system of interest, while the latter cannot. This distinction can contribute to flesh out in more detail what the external dimension of water governance situation consists of. Section 1.4 discusses in more detail how the CIS' elements complement other building blocks in developing the conceptual framework of this study.

1.3.3 Water sustainability in the context of the green economy

The purpose of this research, in summary, is to enable accounting for external factors in specific water governance situations. By doing so, this research aims to help find opportunities to improve the efficacy of water governance arrangements to contribute to water sustainability in practice. This section considers the predominant understanding of water sustainability in the context of the green economy. The goal of this is to identify the types of issues that are most suited to shed light over the implications of external factors for water sustainability. By doing so, this section aims to contribute to Objectives 2 and 3 of this research.

As mentioned earlier, it is important to understand how factors in the "external governance of water" shape water decision-making, in order to contribute to the goal of water sustainability (Rogers and Hall 2003). The broad concept of 'sustainability' originates as a response to the limits to growth discussion (i.e., Meadows et al. 1972), which stems from conceiving the Earth as one interconnected system. Sustainability is the long-term goal of the sustainable development process (UNESCO 2016), but both are used almost interchangeably. Sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). This discourse has become generally accepted among environmentalists, corporations and multiple levels of government (Mol and Sonnenfeld 2000). Corporations in particular ascribe to its "ecological modernisation" variation (Carter 2007), under which environmental improvements are seen as economic opportunities (Fisher and Freudenburg 2001). In short, the sustainable development discourse poses economic growth as desirable for the environment, and achieving sustainability is mainly a technical endeavor that the right economic incentives and technology can take care of. Along these lines, the green economy concept, frequently used interchangeably with green growth, is broadly used to represent a pathway to sustainability, according to Loiseau et al. (2016)'s review of green economy and related concepts. The green economy is "low carbon, resource efficient and socially inclusive" that results in "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP 2011). The concept of the green economy is mostly related to "weak sustainability" (Loiseau et al. 2016), which presupposes full substitutability between human and natural capital within the current economic system, rather than to limited substitutability and important changes to the economic system, as posited by "strong sustainability" (Costanza and Daly 1992, Van den Bergh 2001).

Broader, more generalized sustainability debates have influenced how Western society approaches water management, with implications for achieving water sustainability goals. In the context of green growth and ecological modernisation, water efficiency is under the spotlight. For instance, water use efficiency has a specific target of the Sustainable Development Goal on water (SDG6), and also contributes directly to achieving other SDGs, such as sustainable food production, clean industrialization, responsible consumption and production, sustainable cities and communities, as well as sustainable economic growth (SDG 2, 9, 12, 11 and 8, respectively) (UN-Water 2018a). Likewise, the transition to a green economy requires investing in natural capital, including investments in enhancing water efficiency in industrial activities and water supply services (UNEP 2011, UNEP IRP 2012). Water efficiency is particularly important in the industrial sector as a means to decouple economic growth from water use and pollution (UNEP IRP 2016). Finance into water efficiency in economic activities contributes to diminish the exposure of water-using companies to water risks (e.g., OECD 2016, WWF, BCG, and ING

2018). However, water sustainability entails more than efficient water use of industrial and economic activities but also considers ecosystems' needs. Increasing water demand and associated wastewater discharges, together with climate change effects on the hydrological cycle, are negatively affecting water quality and quantity, threatening future water availability for humans and ecosystems, and thus global sustainability (Mekonnen and Hoekstra 2011, Rockström, Falkenmark, Allan, et al. 2014). In this context, water efficiency's contribution to long-term water sustainability, as defined at the outset in this chapter, is being questioned in the context of the multiple interactions of the Anthropocene (Rockström, Falkenmark, Allan, et al. 2014).

Water efficiency is defined as the minimization of the water quantity used for any given task, and it usually relies on technological fixes (Vickers 2001). Water use reduction can also be achieved via water conservation measures. Water conservation is the beneficial reduction in water use, waste or loss, i.e., water conservation measures are those where the benefits of reducing water use are higher than the overall costs of implementing them (Baumann, Boland, and Sims 1984). Water conservation usually requires changes in tasks to reduce water use (Vickers 2001). Various approaches to water management and governance have different emphasis on efficiency and conservation measures, with implications for water sustainability. Historically, supply management has been the dominant water resources management paradigm, predicated on a growth mindset where increasing water demand can and should be met with new water supplies, accessed via additional or expanded infrastructure, e.g., dams, water intakes, pipes (Winpenny 2005).

Implementing water demand management measures is most often less expensive than infrastructure-related solutions, and have fewer negative environmental effects (Wutich et al. 2014). Demand management, also understood as a policy framework, started emerging in the 1980s as a new paradigm (Bithas 2008). It was characterized by water efficiency measures, offering to decouple – or at least loosen – economic growth from ever increasing water demand (Gleick 2000). In practice, water efficiency measures, have generally been implemented as complementary to supply management solutions and/or temporary (Xiao, Fang, and Hipel 2018). Water efficiency measures rely mostly on technological fixes, and also on economic (e.g., water pricing) and education and information measures (Alias, Boyle, and Hassim 2017). However, technological fixes often trigger the Jevon's paradox, or rebound effect, where the use of water-efficient fixtures results in increased water use, making technological fixes insufficient to ensure water use reduction (Alcott 2005, Gifford 2011, Batchelor et al. 2014). Ultimately, demand management's priority is to meet (increasing) water demand, and sustainability is not part of its mandate (Wolfe and Brooks 2017). Thus, water efficiency's capacity to reduce water use in a way that can improve the resilience of water systems against current, large-scale threats to water quality and quantity, is limited (Rockström, Falkenmark, Folke, et al. 2014).

Water conservation measures are characteristic of the "soft-path" water management approach. This approach fundamentally questions why any particular water demand exists and how it is fulfilled, thus potentially favouring reuse alternatives (Brooks, Brandes, and Gurman 2009, Wolfe and Brooks 2017). This soft path approach is focused on changing practices as the primary, although not exclusive, means to reduce water use (Brooks, Brandes, and Gurman 2009). Water efficiency can be considered a starting point and complementary to water conservation in efforts to reduce water use (Brooks, Brandes, and Gurman 2009, Gilbride and Maas 2012).

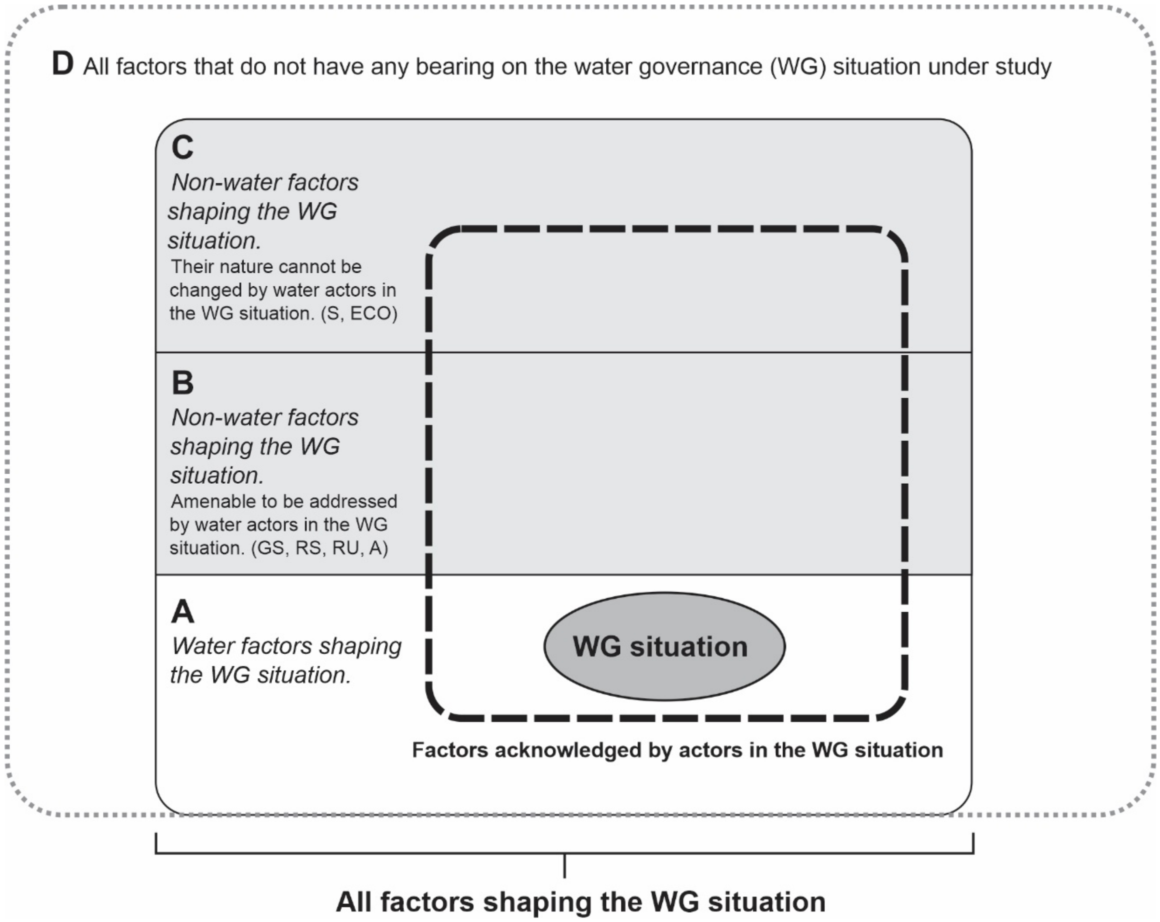
Emphasis on implementation of water efficiency measures, over water conservation measures, as a way to achieve water sustainability, reflects the green economy's alignment with weak sustainability tenets. The current emphasis globally on the green economy pathway to sustainability, led by multi-lateral organisations such as the UN for instance, is a factor shaping local water use policies and practices of public and private organizations towards water efficiency, over water conservation type of approaches. In that sense, water conservation and efficiency policies provide appropriate case studies to explore the role of external factors for water policy objectives, and water sustainability.

1.4 Diagnostic framework for understanding the role of non-water factors in water governance

Non-water factors influence water governance processes and outcomes even if water actors in the water governance situation do not address them, or even acknowledge them. When the impacts of non-water factors over water governance are negative (e.g., they pose barriers to solving water problems), it is imperative to address and engage them to try to change their negative impacts. I suggest that rethinking our conceptualization of water governance situations to better acknowledge the importance of these factors can enable new ways for approaching and solving water problems in an interconnected world. This reconceptualization is crucial for devising a way to account for the role of non-water factors in water governance.

This section presents a diagnostic framework (represented in Figure 1) to assess the boundaries of water governance situations, thus meeting Objective 1 of this research. The framework brings together concepts identified in the literature review (Section 1.3) relevant to understanding in detail the nature and position of non-water factors in respect to specific water governance situations, and the extent to which they can be leveraged for solving water problems based on the ability of water actors to address and influence such factors. Specifically, these concepts emerged from the literature survey of ways in which the water governance literature has grappled with water's complex interconnections with other sectors (Section 1.3.1), and the review of institutional analysis frameworks for diagnosing environmental governance problems (Section 1.3.2). The concepts of problemshed and polycentric governance provide the foundation for developing the idea of water governance consisting of an internal and external dimension, as suggested by Rogers and Hall (2003). The institutional analysis frameworks and other concepts detailed in this section are the building blocks that guided this framework's design and architecture. This section explains how the building blocks complement each other to construct a diagnostic framework that captures the role of non-water factors in water governance situations. Figure 1 is described in more detail at the end of this section.

Figure 1: Diagnostic framework for assessing non-water factors in water governance situations



The main notions characterizing the conceptual framework are actors' ability to influence (i.e., control deriving from a mandate vs. ability to influence without being in charge); the distinction between water governance and water governance situations; and water and non-water factors. I identified these notions as important for this research, based mainly on the contributions of five theoretical building blocks: Rogers and Hall's (2003) water governance definition; UNWWAP's (2009) "water box" conceptual framework; De Loë and Patterson's (2017a, b) exploration of external factors to water governance; the Combined IAD-SES Framework (CIS) (McCord et al. 2017, Cole, Epstein, and McGinnis 2019) from the Bloomington School of Institutional Analysis; and the Millennium Ecosystem Assessment (2005) definition of factors that can effect change (drivers). De Loë and Patterson's specific attention to external factors in water governance, and their call for the need to rethink water governance arrangements beyond water-centric approaches, provide the basis for further exploration of external factors carried out in this work. The rest of the building blocks emerged from the literature review as the most useful to conceptualize and flesh out the role of non-water factors in water governance situations.

Table 2 maps each building block's contribution to a different area of the framework. As shown in the table, while all blocks imply an internal/external divide, each block uses different criteria for drawing boundaries in relation to different issues (e.g., water governance, water management, action situation boundaries, system boundaries), resulting in various understandings of what is "external" (and different levels of "external"). However, there was an underlying thread across the concepts: *the actors' ability to influence*. I distinguish two kinds of actors' ability to influence: (a) control and responsibility over a factor, deriving from a mandate (e.g., the water sector is the domain of water actors); and (b) having the ability or potential to influence a factor, even if the actor is not responsible for that factor (e.g., water actors engaging with urban development officials). This insight about actors' ability to influence has important implications for choosing the terms that flesh out the idea of "external factors to water governance". The following sub-section introduces the notions underpinning the framework's terms.

Table 2: Contribution of building blocks to the diagnostic framework diagram

Building blocks	**Diagnostic framework diagram areas**		
	A	**B**	**C**
Rogers and Hall's (2003) internal governance of water	✓		
Rogers and Hall's (2003) external governance of water		✓	✓
De Loë and Patterson's (2017a) internal factors to a water governance action situation	✓		
De Loë and Patterson's (2017a) external factors to a water governance action situation		✓	✓
UNWWAP's (2009) water box	✓		
UNWWAP's (2009) outside the water box: broad socio-economic objectives		✓	
UNWWAP's (2009) outside the water box: broad drivers of change			✓
Combined IAD-SES Framework's (CIS) action situation (or a network of) (McCord et al. 2017, Cole, Epstein, and McGinnis 2019)	✓		
CIS' contextual factors endogenous to a system: governance systems (GS), actors (A), resource systems (RS), resource units (RU) (McCord et al. 2017, Cole, Epstein, and McGinnis 2019)		✓	
CIS' exogenous shocks to a system: social, economic and political systems (S), related ecosystems (ECO) (McCord et al. 2017, Cole, Epstein, and McGinnis 2019)			✓
Millennium Ecosystem Assessment's (2005) factors amenable to decision-makers influence/change	✓	✓	
Millennium Ecosystem Assessment's (2005) factors that decision-makers cannot influence or change			✓

1.4.1 Water governance vs. water governance situation

The cornerstone definition of water governance in this study is Rogers and Hall's (2003). As a whole, water governance is "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society" (Rogers and Hall 2003, 16). These systems can be found across two dimensions:

- the *internal governance of water*, "concerned with the functions, balances and structures internal to the water sector" (Rogers and Hall 2003, 17); and
- the *external governance of water*, which includes influences from various other policy areas, such as politics, trade among others, that can contribute to, or complicate, water governance. For instance, a well defined property rights system can contribute to water governance, while political instability can complicate it.

Additionally, water governance also "includes the ability to design public policies and institutional frameworks […] [and] water policy and the process for its formulation must have as its *goal* the sustainable development of water resources" (Rogers and Hall 2003, 16) (emphasis added). It follows from Rogers and Hall's (2003) definition that factors in the external governance of water do play a role in influencing water decision and policy-making, and understanding them is relevant to achieving water sustainability. Recognizing an "external governance of water" dimension, and accepting that the objective of water policy processes should be water sustainability (Rogers and Hall 2003), are two insights crucial for answering my research question.

A water governance specific instance can be represented in institutional analysis terms as an action situation or a network of action situations. An "action situation", in short, is a space where actors interact transforming inputs into outcomes (Ostrom 2005). A "network of adjacent action situations" representation fleshes out the governance processes under study into governance tasks (e.g., financing, monitoring) or into the action situations that originate the rules defining every component of the focal action situation (McGinnis 2011b). de Loë and Patterson (2017a) center their water governance analysis within the boundaries of an action situation, then trace external factors in adjacent action situations. Thus, their identification of external factors requires understanding internal factors first. The CIS (McCord et al. 2017, Cole, Epstein, and McGinnis 2019) has at its core a focal network of action situations, which is shaped by contextual factors and exogenous shocks. In the CIS, explaining changes in contextual factors can be the primary interest, and specific action situations at the source can then be traced back.

In this research, I depart from both approaches and use the generic term "*water governance situation*" to reflect a specific instance where water decision-makers interact to produce an outcome (e.g., formulate public policies, design institutional frameworks), where the situation can represent either an action situation (with its components and rules) or a network of these because my attention is not in the internal composition of the situation as such. However, I take from the CIS the distinction between contextual factors and exogenous shocks, where the former can be influenced by interactions in the network while the latter cannot (sub-section 1.4.3 details this further). The CIS picks up this distinction from the Social-Ecological Systems Framework (SESF) (Ostrom and Cox 2010), which differentiates four sub-systems (governance systems, resource systems, resource units, and actors) from two sources of exogenous drivers (social, economic and political systems; and related ecosystems). As a result, my research characterizes external factors in terms of systems and exogenous drivers, because that distinction can flesh out in more detail what lies outside a water governance situation: the “external governance of water” dimension, characterized by non-water factors.

1.4.2 Actors’ control deriving from a mandate: differentiating water from non-water factors

Rogers and Hall’s (2003) distinction of the internal from the external governance of water rests on the idea of the “water sector”, which is the mandate area of water actors, or their domain. UNWWAP (2009) calls this domain the “water box”, which is under direct (although not full) control of water actors. Both cases recognize that what goes on within the water sector, or “box”, cannot be solely explained, managed, or governed by water factors alone, because there is a whole suite of external “non-water” influences at play. Reflecting this perspective, de Loë and Patterson (2017a, 2017b) also use the water sector as a criterion to distinguish what is internal or external to a water governance action situation, and they tend to identify the water sector with hydrological boundaries. However, the “water sector” criterion does not seem to play a definitive role: ultimately, they suggest boundaries of the action situation can be modified to address external factors.

For all of these authors, the core divide relies on belonging to the water sector/box (or not). The “water sector” plays an important role in building this diagnostic framework because, in the case of actors, it implies having a mandate, and thus control and responsibility (to various degrees), over a water issue. Here, I understand the water sector in a broad sense to encompass any water issue, including water services, for which service areas tend to be as relevant as (or more than) hydrological boundaries.

Based on this insight, I propose categorizing factors in two groups:

- *Water factors*: Factors (including actors) whose primary purpose (or mandate, in the case of actors) revolves around water resources and/or services, and whose related institutions enable associated actors to make water decisions and policies. These are located in A in Figure 1. Examples of water actors at various scales are UN-Water, a country’s minister of water resources, a non-governmental organization such as Water Aid, water utility officials, among others.
- *Non-water factors*: Factors (including actors) whose primary purpose (or mandate, in the case of actors) does not revolve around water, but which nevertheless can influence water governance processes and outcomes. Factors “outside the water box”, broader socio-economic objectives (e.g., economic development, health) and broader drivers of change (e.g., climate change, population growth) (UNWWAP 2009) fall in this category. These are located in B and C in Figure 1. These factors are the focus of this study.

The emphasis on “primary” purpose or mandate in differentiating water from non-water actors, recognizes that, in practice, actors (individuals, organizations) can simultaneously pursue multiple objectives. This is the case particularly with decision makers in governments at various levels, e.g., a municipality pursues simultaneously many objectives for its community. Which mandate takes priority for an actor will vary according to each situation under analysis.

1.4.3 Actors' ability to influence

The Combined IAD-SES Framework (McCord et al. 2017, Cole, Epstein, and McGinnis 2019), also known as CIS, conceives situations in a system as subject to influences of two types of factors:

- *endogenous contextual factors*: set the stage and shape the interactions within the network of action situations at the core of a system. These contextual factors (governance systems, resource systems, resource units, actors) can be re-shaped by actors and interactions in the focal network of action situations (i.e., they can be endogenously determined), opening opportunities or posing challenges to the actors (e.g., a group in the network can lobby actors outside the network to change legislation that would favor their position in the network).
- *exogenous shocks or influences*: include wider climate patterns, demographic trends and technology trends, among others. Actors in the focal network of action situations do not have the ability to change them. The SES Framework's variables S (social-economic-political systems) and ECO (related ecological systems) (Ostrom and Cox 2010) portray these factors.

Similarly, the Millennium Ecosystem Assessment (2005, 29) also uses the actors' ability to influence to classify factors into endogenous or exogenous: "any factor that changes an aspect of an ecosystem" (as the focus of the study is ecosystems) is endogenous if decision-makers can influence them, or exogenous if they are out of the decision-makers' control. The endogenous/exogenous classification depends on the scale where decision-makers are located, which in this case depends on the specific water governance situation (e.g., water use reduction policy in Ontario).

De Loë and Patterson (2017a) recognize that what actors "have the power to do" will ultimately determine which opportunities they can tap into that arise from mutual benefit scenarios between internal and external factors to a water governance situation. UNWWAP (2009) goes into more detail and distinguishes factors "outside the water box" into broad drivers of change, which are out of the control of water actors (e.g., climate change, population growth), and socio-economic objectives, where water actors can certainly approach actors whose mandates respond to other socio-economic policy areas (which the UNWWAP (2009) encourages them to do), in order to attempt to change their impacts over water.

The insight here is that actors' ability and potential to influence factors is a relevant criterion to classify factors. In this research, which aims to help identify opportunities for improving water governance responses to water problems, classifying factors in terms of the ability of water actors to influence them is relevant to distinguish which non-water factors can actually be addressed and harnessed by water actors.

1.4.4 Summary of implications of the diagnostic framework

The categorization of factors in this framework into water and non-water as described above is important because while non-water factors are external to the water sector, they can be part of water governance, i.e., in the external governance of water dimension. De Loë and Patterson (2017a) see external factors in adjacent action situations, and suggest modifying the water governance action situation boundaries to address them and finding opportunities from mutual benefit scenarios. Instead, in the diagnostic framework developed here, a water governance situation cannot (or does not need to) internalize external factors because (a) these are captured by the external governance of water dimension (Rogers and Hall 2003), where they are further classified into exogenous shocks or belonging to other systems; and (b) external factors have been defined as non-water, and the situation as under the mandate of water actors, i.e., the water governance situation only reflects Rogers and Hall's (2003) internal governance of water dimension. The diagnostic framework here suggests addressing external factors as an avenue for solving water problems, where potential co-benefits and win-win situations of solving water problems can be used as a starting point for engagement and further negotiation. The frameworks by de Loë and Patterson (2017b) and UNWWAP (2009) also point in this direction. Thus, the non-water criterion focuses the attention on a group of factors that can open new avenues for solving water problems, by water people reaching out and addressing non-water actors, institutions and drivers impact over water.

However, not all non-water factors are amenable to be addressed by water actors. It is important to identify which ones are amenable, in order to pinpoint the non-water factors that actually represent feasible opportunities for water actors to address and harness to solve water problems. UNWWAP's (2009) broad drivers of change are not under the control of (or cannot be curbed by) water actors in a specific water governance situation, while these actors have the potential to address factors in other socio-economic policy areas.

1.4.5 Diagnostic framework description

The framework developed here thus embodies both a broader conceptualization of water governance, which accounts for its external dimension; and a diagnostic tool to map non-water factors in water governance situations in practice, along the lines of the institutional analysis tools used here. As a diagnostic tool inspired in the institutional analysis frameworks mentioned earlier, this diagnostic framework can be used to analyse situations at various scales, e.g., municipal, provincial, national.

The argument here is that non-water factors can be part of water governance, specifically, of what Rogers and Hall (2003) call "the external governance of water" dimension of water governance. Non-water factors in this dimension influence the water actors' decisions, the scope and impact of their actions and institutions by shaping the context in which they take place, even if the actors are not aware of, and/or not address non-water factors impacts over them and thus over the water governance situation. Thus, in order to understand the role of non-water factors in water governance situations, it is necessary first to identify the non-water factors influencing the situation, which ones are already being addressed and mobilized by the water actors, and which ones represent opportunities for harnessing in the future. In other words, the objective of this framework is to flesh out the external governance of water to further understand how water actors can use factors in it to their advantage. The framework developed here based on the insights in earlier sub-sections helps doing this.

At the basis is Rogers and Hall's (2003) "external governance of water" idea, which is the realm containing all the non-water factors (spaces B and C in Figure 1) influencing the water governance situation (circle), whether the actors in the situation acknowledge such impacts or not. One type of non-water factors (C), by their nature (such as population growth or wider technological developments), are beyond the control of the water actors in a specific governance situation, i.e., water actors in the situation cannot change their nature by themselves. However, the other type of non-water factors (B) can potentially be influenced by water actors in the situation (e.g., factors in other socio-economic policy areas that depend on or impact water to an extent). Therefore, B contains non-water factors that both shape the water governance situation and can be influenced by its actors, to various extents. In that sense, B represents opportunity (or challenges) containing non-water actors, drivers and institutions (e.g., partnerships, nexus initiatives) that can be harnessed by water actors to garner support for contributing to solve water problems.

In respect to the actors in the water governance situation, they acknowledge the effects of a collection of factors (dotted line box in Figure 1), and act accordingly. These actors' mandates remain within (A) by definition, but can nevertheless leverage non-water factors to address the water problem at hand. The specific list of non-water factors at play will vary according to the specific water governance situation, and also through time. Under this framework, influencing non-water factors does not imply that these factors become endogenous to the water governance situation per se, because of the definition of water governance used in this study. Non-water factors make up the external governance of the water situation, inspired by Rogers and Hall's (2003) "external governance of water" idea, and water actors will only be able to influence a sub-set of them.

Methodologically, applying this diagnostic framework to an empirical water governance case sheds light over the dotted line box in Figure 1, i.e., factors whose impact over the water governance situation actors acknowledge. The implication of this diagnostic framework is that water actors can increase the number of new potential opportunities for contributing to solve water problems by recognizing the role of non-water factors (i.e., expanding the scope of the dotted line box in Figure 1). Water actors can recognize the role of non-water factors by bringing participants in the water governance situation together to discuss the type of factors at play in water governance processes and outcomes, in order to collaboratively reveal the role of non-water factors, if any. Once non-water factors influence has been acknowledged (and its nature assessed in terms of opportunity or challenge posed to a water governance situation), water actors can bring together participants to work out how to address such impact, and reach out to actors responsible for such non-water factors, figure out co-benefits, and work out win-win solutions.

1.5 Methods

This research adopts a critical realist ontology, which acknowledges that there is a reality, a social world that is a context to human activity (where such context is a result of slow, long-term processes), but that humans cannot directly access (Fox 2008). Beliefs and perspectives, articulated in language, mediate such access. Compatible with a critical realist ontology is a constructivist epistemology. Constructivism implies that "meaning is in humans' construction of reality" (Moon and Blackman 2014, 1175). A constructivist account "has a strong deductive element" and deduces empirical implications from correspondence with a guiding theory or model (Blatter 2008, 70). In this sense, the theory or frameworks are devices that help grasping reality in a certain way, enabling comparisons between patterns in the framework and observations, i.e., "pattern matching" (Yin 2013). A qualitative approach to research is consistent with a critical realist ontology and constructivist epistemology, allowing for in-depth inquiry (Creswell 2003). Reflecting this overarching perspective, this study is characterized mainly by (i) using a qualitative case study research design as a strategy of inquiry (Creswell 2003); (ii) devising, iteratively with data collection, a diagnostic framework for conceptualizing non-water factors in water governance situations, to guide analysis across all chapters; (iii) using semi-structured interviews to enable the emergence of new themes (Creswell 2007); (iv) including a variety of perspectives from multiple sources related to the cases to ensure triangulation (Maxwell 1992). In this sense, the water sector and water governance situations are constructed. Seeing these constructions through the lens of the diagnostic framework allows qualifying certain elements as part of what is defined as the "external governance of water" dimension, and their role in water governance situations. In turn, understanding non-water factors in that way can enable changes in the practice of water governance, with potential implications for water sustainability.

1.5.1 Case study design

A case study research design was deemed appropriate for this research because it is suitable to address "how" or "why" research questions (Yin 2013); it enables an in-depth understanding of one or more particular instances of a phenomenon (Mabry 2008); and it facilitates an exploratory approach into new areas (Hartley 2004). Three water policy objectives, in the empirical context of the Canadian province of Ontario, provide the cases: reduction of industrial, commercial, and institutional water demand from the municipal supply (municipal policy); water conservation and efficiency (provincial policy); and the financial sustainability of municipal water systems across the province (provincial level). These are theoretically "crucial cases", selected to enable theoretical, or analytical, generalization guided by the research purpose, objectives and conceptual framework (Yin 2013). Specifically, "most likely" cases (Blatter 2008) were selected strategically according to the research needs (Verschuren and Doorewaard 2010): water conservation and efficiency related policy objectives are relevant given the current understanding of water sustainability in the context of wider sustainable development and the green economy mandates (literature review section); and the financial sustainability of water systems was deemed appropriate in the context of analysing links with sustainable finance.

This thesis uses public policy case studies, based on the perspective that policy-making and governance are closely intertwined: a governance system determines who is involved and what issues are prioritized across the policy-making process; while the resulting policies add to the institutional body structuring a governance system (see Sections 1.3.1 and 1.3.2). Policy processes and governance are closely intertwined in the IAD, and related frameworks (Weible and Sabatier 2017). Studying a policy case using IAD-derived frameworks can provide insights about governance, particularly in terms of the actors, drivers and institutions influencing the policy process, and the type of resulting institutions. This study follows on the steps of others that have used public policy cases to study external factors to water governance (e.g., Breen, Loring, and Baulch 2018, de Voogt and Patterson 2019, Egan and de Loë 2020).

In Chapters Two and Three, the focus is on a single case: a water conservation and efficiency policy objective at the municipal, and provincial level, respectively. The same analysis approach was applied in both chapters: to look into the water governance situation to trace non-water factors relevant to each situation, guided by the diagnostic framework. Two cases were selected purposively to meet the research objective of Chapter Four of shedding light into the links between a specific non-water sector and a water governance situation. In the case of sustainable finance, two aspects were identified to be relevant in relation to the environment (i.e., capital flows and risk management). Thus, two cases that were suitable to explore links with both aspects were selected: the financial sustainability of municipal water systems; and the reduction of industrial, commercial, and institutional water demand from the municipal supply, respectively. Table 3 summarizes the cases by chapter, and the rationale for their use in each chapter. The overall goal of selecting the cases on this fashion was to enable replicability, which takes place when two or more cases reflect the logic of the model used to guide the study (Yin 2009). In turn, insights derived in this way allow for analytical generalization (Yin 2009), or theoretical generalization, "characterized by drawing interpretive inferences from a variety of observable objects to meaningful abstract concepts" (Blatter 2008, 69). Non-water factors found to shape these cases are specific to these cases and are not necessarily the same ones that could be found in relation to other water governance situations, i.e., non-water factors found are not generalizable to other water governance situations. Rather, analytical generalization is expected to be achieved regarding the conceptual framework's categories (and new ones added through this study), as a valid way of systematically accounting for non-water factors and characterizing their role for achieving water policy objectives in a variety of water governance situations.

All three cases are in the empirical context of the Canadian province of Ontario. As such, they share the same geographical, social, and political context, which facilitates comparisons across chapters, and analytical generalization. The empirical context section provides a brief description of the three cases, which are further described in the respective chapters.

Table 3: Case studies by chapter

<table>
<tr><th>Cases and rationale for selection for each chapter</th><th>Chapter Two</th><th>Chapter Three</th><th>Chapter Four</th></tr>
<tr><td>Reduction of industrial, commercial, and institutional water demand from the municipal supply (municipal policy)</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>Water use reduction via water conservation and efficiency (provincial policy)</td><td></td><td>✓</td><td></td></tr>
<tr><td>Financial sustainability of municipal water systems (provincial policy applicable to municipalities)</td><td></td><td></td><td>✓</td></tr>
<tr><td rowspan="2">Rationale for selecting these cases for each chapter</td><td colspan="2">Shed light on a range of non-water factors at play in a water governance situation, and potential implications for water sustainability</td><td>Explore links between a water situation and a specific non-water sector (informed by the nature of that sector)</td></tr>
<tr><td colspan="2">Account for non-water factors acknowledged by water actors in their interactions within the water governance situation</td><td>Attempt to also capture non-water factors that, while not accounted for by water actors in the water governance situation, might still (potentially) link to the situation</td></tr>
</table>

1.5.2 Data collection

This section summarizes the data collection methods, which are explained in more detail in Chapters Two, Three, and Four. Two main, complementary qualitative data collection methods were used: document review and interviewing. These methods were supplemented with personal observations recorded throughout the data collection process and summary notes from attendance to relevant events. In total, 210 documents of all types were collected between April 2018 and February 2020. Some of these documents were used in more than one chapter (*table 4* summarizes the number and type of interviews, and the documents are listed in *Appendix A*). The data collection process started with preliminary research to identify the core institutions defining each of the water governance situations under study, followed by targeted document collection and interviews that took place iteratively. Data collection and construction of the diagnostic framework took place iteratively. Collection of qualitative data was concurrent (i.e., took place simultaneously) and were taken from various sources to represent different relevant perspectives (multilevel, functionally, private vs. public sector, etc.) to contribute to triangulation (Johnson 2014, Heath 2015, Zeegers and Barron 2015). Data collection took place until it reached the point of saturation, i.e., until no new data appeared, and data collection efforts showed diminishing returns (Saumure and Given 2008). Being a qualitative study, purposive sampling was used (Morgan 2008a). In choosing specific data sources, I drew a nonprobability sample (Morgan 2008a), because the total population cannot be fully determined. Snowball sampling is a technique for drawing nonprobability samples, which “uses an initial set of data sources as the basis for locating additional data sources” (Morgan 2008a, 800). In summary, I used purposive and snowball sampling to locate all data sources in this study. The approach to data collection was to capture a snapshot of the current general state of the water governance situations, as represented by the core institutions and actors defining the water policy objectives (their making and implementation) pursued in those governance situations, rather than carrying out an exhaustive survey of the situations. The logic for this approach is that the non-water factors identified this way are the ones that so far have shaped the situations the most, even if they are not the only non-water factors at play.

Through document review, 134 documents were identified for analysis. The types of documents reflecting water governance situations included legal documents (e.g., acts, regulations); agreements (e.g. the Great Lakes St. Lawrence River Basin Sustainable Water Resources Agreement); programs, strategies and plans (e.g., municipal water conservation and efficiency strategies); reports and public statements (e.g., by civil society initiatives shaping the water governance situation), and websites of relevant actors and initiatives. Documents were produced by a range of public (at the municipal and provincial level), private and civil society organizations, depending on the actors more active in each water governance situation. Publicly available documents were identified through internet searches, references in other documents and by interviewees. The document review provided context for the data gathered through interviews and events attended.

To obtain a more nuanced understanding, and gather a sense of the future evolution of the policy-making and implementation considerations around policy objectives pursued in water governance situations, it was necessary to go beyond publicly available documents. With this purpose, interviews with thirty-one key informants directly involved in the situations, either currently or in the past, took place. Potential key informants were identified through the document review, snowball sampling (recommended by other interviewees or by potential interviewees that ended up not participating for various reasons), and recommendations from faculty in my thesis committee with expertise in the topics being studied. The set of potential key informants were senior officials in their respective organizations: directors, managers in municipal and provincial governments and agencies, non-profits (representing civil society, and multi-stakeholder interest groups), and the private sector (including consultancies, industry representatives, and the investor community). Interviews were semi-structured to guide the conversation towards the research objectives, while also providing flexibility to allow new themes to emerge, to minimize conceptual framework bias (Mason 2004, Bloor and Wood 2006). Interviews lasted for an average of thirty minutes each. I conducted the interviews over the phone, recorded them digitally when allowed by interviewees (and took more detailed notes when recording was not allowed), and transcribed them manually. The interview guide (*Appendix B*) consisted of core concerns regarding drivers and objectives of the policies and of the actors and networks shaping them. The guide was refined iteratively as more insights were gained during the data collection process. Specific questions were tailored to each interviewee's experience, background and type of organization they were involved with. To ensure anonymity, evidence from interviews was reported under an identifying number (e.g., Interviewee X). Only two interviewees were identified with their job titles, as per their request. Numbers were assigned to the full set of participants, so each participant has a unique identifier across the chapters. This interview data collection procedure was approved by a University of Waterloo Office of Research Ethics Committee (ethics clearance ORE #22931), in accordance with the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. The following table provides an overview of the 31 interviewees.

Table 4: Interviews by background and chapter

Interviewee background	**Total interviews***	**Chapter 2**	**Chapter 3**	**Chapter 4**
Municipal governments and agencies	9	9	-	7
Provincial government and agencies	5	3	5	4
Non-profits (civil society, networks)	6	2	4	4
Private sector (consultants, industry, associations, investor community)	11	3	4	7
Total*	**31**	**17**	**13**	**22**

* Note: The number of interviews by chapter does not equal the total number of interviews because many key informants were able to comment on the topics covered in more than one chapter.

Finally, data collected through document review and interviews were supplemented with personal observations recorded throughout the data collection process, as well as summary notes taken during attendance to relevant events. Personal observations added nuance to findings obtained through the two main data collection methods. I attended events in the context of Chapter Two and Four (further details in these chapters). Attendance to events facilitated arranging some interviews, as well as provide further context.

1.5.3 Data analysis

All data was organized, coded and analysed using QSR NVivo 10 software. Content analysis, as a qualitative analysis method, enables to systematically examine data to identify manifest and latent meanings (Saldaña 2011, Schreier 2012). Content analysis was used, and it largely followed a deductive approach (Hsieh and Shannon 2005), guided by the conceptual framework categories, which in turn were informed by the literature review. An inductive coding strategy complemented the mainly deductive approach to allow for new concepts and themes to emerge from the data (Saldaña 2013). The structure of coding trees used in Chapters Two and Three mirrored the diagnostic framework categories, and codes were added in the tree to capture emergent themes. In Chapter Four, an additional coding tree was devised for the first round of coding to capture categories relevant to sustainable finance. Each chapter provides further details about the specific analysis processes.

Across the chapters, the evidence provided to support findings consisted primarily of quotations from documents and interviews that illustrated a common point found in the data under a specific analysis category (Sandelowski 1994). Quotations from interviews were reported in a way that would ensure the preservation of anonymity. Triangulation of data sources, collection and analysis was used to confirm the validity of the non-water factors found, and to determine conceptual saturation of non-water factors found in the data (Charmaz 2006, Yin 2009). In the case of this study, triangulation helped reach saturation and validity by ensuring that perspectives from different sources were taken into account in the analysis (e.g., interviewees from, and documents produced by, organizations at different levels and with different functions participating in a water governance situation).

1.6 Empirical context

The Canadian province of Ontario provides the empirical context that grounds the exploration of three water governance situations. In particular, water conservation and efficiency policies in Ontario, at the municipal and provincial level, make up this empirical setting, which is reviewed in this section together with a brief outline of the water governance situations (developed in more detail in Chapters Two, Three, and Four).

Ontario is the largest province in Canada, with 38% of the country’s population (Statistics Canada 2016). The city of Toronto, located in the shores of Lake Ontario in the Great Lakes Basin, is Ontario’s capital, and is Canada’s largest city, with a population of approximately three million (City of Toronto 2018). Toronto is also Canada’s largest financial centre, the second largest in North America after New York (TFI 2018). The population of the province is concentrated in Southwestern Ontario, with 81% of the province’s inhabitants (Office of Economic Policy 2019). The Greater Toronto Area accounts for 48% of Ontario’s population, and groups five municipalities, three of which are covered in this study (Peel, York, Toronto) (Office of Economic Policy 2019). The Great Lakes Basin is crucial for the water supply of Ontario: over 98% of the province’s inhabitants live in the Great Lakes and St.Lawrence River Basin, and over 80% obtain their drinking water from the lakes (Government of Ontario 2019).

The Great Lakes count for 20% of fresh surface water in the world (Government of Ontario 2019). The perception of Canadians that they have access to plentiful water resources is at the base of the “myth of water abundance” in Canada. This is a myth because the country actually has access to 6% of the world’s renewable water supply, most of its population live far from the larger water sources, and climate change and population growth are increasing pressures over water sources (de Loë and Kreutzwiser 2007, Benidickson 2017). There is a history of water conservation and efficiency initiatives in Canada, in the context of efforts to dispel this myth, and a wider global water demand management debate that started in the northern hemisphere in the 1980's (Wynn 2010). Canadian provincial and municipal governments, and civil society organizations across the country, thus showed interest on demand management. The provincial government, through the Canadian Council of Ministers of the Environment's Water Conservation and Economics Task Group, prepared and/or commissioned a series of studies until the late 2000's to inform the national debate about water conservation and efficiency. Civil society organizations based in Ontario were part of national networks, mainly made up of similar organizations and academics (e.g., the POLIS Project at the University of Victoria, EcoJustice, Canadian Environmental Law Association CELA, Forum for Leadership on Water FLOW), advocating and developing knowledge about the benefits of water conservation and efficiency in the country. The Ontario provincial government started promoting water conservation and efficiency in the late 1980's (Kreutzwiser and Feagan 1989), but the interest weaned a decade later (de Loë and Kreutzwiser 2005). Then, the interest on water quantity returned after 2000, when an E.Coli outbreak in the community of Walkerton resulted in seven deaths and an ill community (de Loë et al. 2001). Recently, public awareness over water quantity in Ontario has grown. This new interest is partly because of national and international media attention to the ongoing, and very public, controversy over Nestlé's groundwater extraction for bottling water (McClearn 2015, Freeman 2016, Balpataky 2018). This prompted a review of the provincial water quantity management policy "to ensure the fair sharing, conservation and sustainable use of the surface and ground waters" until 2021 to understand if it is "adequate to manage existing or anticipated regional water scarcity due to climate change and population growth" (Fedchun and Brodie-Brown 2017, 7).

In this context, one of the three water governance case studies under analysis here revolves around Ontario's water use reduction policy objective. The cornerstone institutions making up this policy framework are the Water Opportunities and Water Conservation, and the Ontario Water Conservation and Efficiency Program. The latter organizes the overarching institutional framework governing efforts contributing to, and benefitting from, water use reduction in the province. Such institutional framework consists of 56 institutions (legislations, strategies, programs), both water, such as the Water Resources Act, and non-water focused, such as the Building Code. The Program results from Ontario's commitment under the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement to develop and implement water conservation and efficiency in the province (MOE 2012b).

This context is only part of the background for the case study regarding the reduction of industrial, commercial, and institutional (ICI) water demand from the municipal supply. The five Ontario municipalities that pursue this objective (City of Toronto, City of Guelph, Peel Region, York Region, Waterloo Region) also do so responding to their own drivers. Guelph and Waterloo are groundwater-reliant municipalities (100% and 75% of water supply, respectively), unlike the other three municipalities, which rely on Lake Ontario's water. In Canada, provinces are responsible for water resources management, and municipalities for water and wastewater services. Thus, the water users affected directly by provincial water management policies and regulations are those taking directly from surface or ground waters, i.e., industries and municipalities. Provinces shape most of relevant water regulations, while municipalities tend to focus on implementation (CMW Consortium 2014). Achieving efficiencies is one of the main three priorities across the Canadian municipal water sector, the other two are the financial sustainability of water systems, and making water systems resilient (CMW Consortium 2014, CWN 2020b). The third case study is the financial sustainability of water systems, selected for its relevance to the Canadian municipal water sector and its alignment with the "capital flows" aspect of sustainable finance, the specific non-water sector under study in Chapter Four. The financial sustainability of water systems policy objective is defined by the Ontario's Safe Drinking Water Act, 2002, the Financial Plans regulation 453/07 and its guidelines. The act requires licensing of drinking water systems, and to address financial issues of municipal water systems, following the Walkerton Inquiry Report recommendations; however, these issues continue largely unaddressed (OSWCA 2018).

Water governance case studies at the municipal level in Ontario are relevant empirical settings for this study of non-water factors in water governance: Canadian municipalities, and their water utilities, are aware of the interactions between water and broader social, economic and environmental objectives, as well as of the co-benefits that can be achieved across municipal objectives (e.g., between water and reduction of greenhouse gas emissions) (CWN 2020b). The following map shows Ontario's position in the Great Lakes Basin, and the location of the five municipalities part of the reduction of ICI water demand case.

Figure 2: Municipalities in Ontario with water use reduction programs for industrial users

1.7 Rationale for the complementarity of chapters, and organization of thesis

The core of the dissertation is three interrelated manuscripts (Chapters Two, Three, and Four) designed to be publishable as stand-alone articles in academic journals. These are bookended by introductory and concluding chapters. Chapter One provides the overarching rationale, purpose and background that nests the empirical work carried out in each of the three chapters. Chapter Five brings together the findings and contributions of each of the previous three chapters, and reflects on them to meet the purpose and objectives of the overarching research project. Each of the three core chapters is grounded in the same empirical setting, the Canadian province of Ontario. The individual chapters were conceived to address the overarching research question presented in Section 1.1, but via different, complementary approaches.

- Chapters Two and Three use an "inside-out" approach, represented in Objective 2 (Table 1). Under this approach, the analysis starts from the water governance situations, and expands to explore the range of non-water factors acknowledged by water actors in them. While Chapters Two and Three share this approach, their focus is on different scales (municipal and provincial, respectively), to reflect from different perspectives on the boundaries and scales to organize water governance arrangements. The intention was to understand whether the insights arising from the application of the diagnostic framework at different scales would vary in terms of the typology of non-water factors in the external governance of water. These chapters are also written for different scholarly audiences: Chapter Two for scholars specifically familiar with the Bloomington School of institutional analysis frameworks, and Chapter Three for researchers in the broader community of people engaged with water governance in the Great Lakes basin.
- Chapter Four uses an "outside-in" approach, which narrows down the question by focusing on one non-water sector as a potential source of factors driving water governance situations. This is reflected in Objective 3 of this thesis (Table 1). In that sense, Chapter Four examines data portraying a relevant non-water sector, sustainable finance in this case, to identify whether any sustainable finance factors are part of the external dimension of water governance.

Combining these different approaches in one project allows for the generation of insights at different scales, and from different perspectives (i.e., inside-out vs. outside-in). The combination of approaches thus helps enable replicability of the framework's logic, and thus analytical generalization of the categories of the diagnostic framework, including the underpinning conceptualization of the external governance of water, as explained in Section 1.5.1. Analytical generalization would thus assert the relevance and usefulness of the diagnostic framework and the underpinning conceptualization of the external governance of water. Each of these chapters also address two of the three overall research objectives, as shown in Table 1. In terms of data collection and analysis, the diagnostic framework devised to address Objective 1, and presented in Section 1.4, guides work in the three core chapters. Chapter Four supplements this framework with another one that characterizes the specific non-water sector under study (i.e., sustainable finance).

Chapter Two, which examines non-water factors at the municipal level, was prepared for submission to the *International Journal of the Commons*. This journal is appropriate because the analysis in Chapter Two gives prominence to the institutional analysis frameworks that are central to commons scholarship, and thus speaks to a scholarly audience working in this space. Chapter Three investigates non-water factors at the provincial level, with reference to the broader setting of the Great Lakes. This manuscript was prepared for submission to the *Journal of Great Lakes Research*. Chapter Four explores the (potential) links between the sustainable finance field and water policies affecting municipal water systems. This manuscript is intended for submission to the *Water Alternatives* journal, because of its focus on policy issues and processes, particularly water governance across levels, from the local to the global, and attention to economic processes. The three manuscripts will be submitted to the respective journals following thesis submission.

Chapter 2

The role of non-water factors in governing industrial water use reduction in municipalities

2.1 Introduction

The issue of the scale at which water governance should be organized to best address water problems is one of the main ongoing debates in the literature (Woodhouse and Muller 2017). Water governance arrangements are commonly organized around boundaries corresponding to hydrological features such as the watershed or basin despite the causes of water problems spanning levels and jurisdictions across these boundaries (Molle 2006, de Loë and Patterson 2017b). How we frame and bound water governance situations determines what issues are prioritized, how they are addressed, the actors involved in decision-making, and the form of the resulting governance arrangements (Blomquist and Schlager 2005, Dennis and Brondizio 2020). It is thus necessary to rethink how we frame and bound water governance responses to increasingly complex water problems (Blomquist, Calbick, and Dinar 2005, Huitema and Meijerink 2014).

Global megatrends such as climate change, population growth patterns, and economic trends, along with drivers, actors and institutions centered in diverse policy realms such as energy, food, and trade, amongst others, are driving water use, management and governance processes and outcomes at many scales (Rogers and Hall 2003, UN World Water Assessment Programme 2012, Gupta and Pahl-Wostl 2013, de Loë and Patterson 2017a, Biswas, Tortajada, and Rohner 2018). Conversely, water is also a crucial element in achieving objectives in these sectors, and it underpins sustainable development goals (UN-Water 2016). Despite the many interconnections between water governance and external factors, water actors tend to tackle water problems with tools from within the “water box” (UNWWAP 2009). This water-centric perspective is, in part, limiting progress on SDG6 (UN-Water 2018b, 2020). Engaging with actors, drivers and institutions in non-water sectors may afford opportunities to achieve water policy objectives, such as water efficiency (Gober 2013, Cosgrove and Loucks 2015). How to bound water governance responses or solutions that can better account for the role of external factors, in order to improve the effectiveness of these responses, is not yet well understood (de Loë and Patterson 2017b).

Diagnostic approaches are increasingly being used to assess the boundaries of water governance situations (e.g., Garrick et al. 2013, Hinkel et al. 2015). Diagnostic approaches aim to improve the efficacy of solutions to environmental problems, compared to “panaceas” (e.g., prescription of public or private ownership of resources), by enabling deep understanding of the local context for developing tailored solutions (Ostrom and Cox 2010). Scholars in the Bloomington School of Institutional Analysis have produced and applied a variety of diagnostic frameworks, notably the Institutional Analysis and Development Framework (IAD) (Ostrom 2011), and the Social-Ecological Systems Framework (SESF) (Ostrom 2007), to analyse environmental governance situations. The IAD and the SESF are intended as maps to diagnose specific policy problems and potential solutions, i.e., they enable a diagnostic approach to policy analysis (Ostrom and Cox 2010, Heikkila and Andersson 2018). These frameworks include variables to account for external drivers. However, not enough attention has been paid to these external factors, despite their being crucial to understand systems' functioning (McGinnis 2019). Furthermore, McGinnis (2019) recognizes that it is necessary to systematically reflect on the boundaries of environmental governance systems and situations to improve the rigour of institutional analysis. Zooming in and out of the situation to identify external factors relevant to a specific situation is an appropriate procedure in this regard, as suggested and operationalized by de Loë and Patterson (2017a), and as argued by McGinnis (2019).

In this study, we explore how we can account for relevant external factors driving specific water governance situations. We do this by developing and applying a diagnostic framework based on institutional analysis principles. Our approach builds on de Loë and Patterson (2017a) diagnostic approach, and the Combined IAD and SES Framework (CIS) (McCord et al. 2017, Cole, Epstein, and McGinnis 2019). Our framework focuses on further characterizing the types of external factors according to the extent they can be influenced and leveraged by water actors in the water governance situation in their pursuing of specific water objectives (e.g., solving a water problem, achieving a water policy objective). We argue that the role, and potential, of external factors in driving water governance situations, can be better understood when we formally recognize an external dimension to specific water governance situations.

The empirical context for the research is the case of the governance of industrial water use reduction (WUR), focusing on municipalities' industrial WUR policy making and implementation. Municipal programs for industry are a useful empirical setting for exploring the role of external factors because municipalities and industries are subject to multiple societal demands and can thus connect water to various wider dynamics. Also, water conservation and efficiency (WCE) measures have been identified as crucial for sustainable water governance (Wiek and Larson 2012), and are increasingly a main feature of urban water management in the 21st century (Cosgrove and Loucks 2015). Furthermore, water conservation governance can be affected by "structural factors", such as urban density, socio-demographic changes, and transformation of cities from manufacturing to service centres (Sauri 2013).

Public policy cases have previously been used to study external factors to water governance (e.g., Breen, Loring, and Baulch 2018, de Voogt and Patterson 2019, Egan and de Loë 2020). Policies are a key instrument used by governments to steer collective action towards sustainability (Kooiman 2003, Meadowcroft 2007, Lange et al. 2013). Policy processes and governance are closely intertwined in the IAD , and related frameworks (Weible and Sabatier 2017). In that setting, governance is understood as the "process by which the repertoire of rules, norms, and strategies that guide behavior within a given realm of policy interactions are formed, applied, interpreted, and reformed" via collective decisions made by state and non-state actors (McGinnis 2011a, 171). The application of IAD and SES frameworks to empirical cases is intended to identify opportunities for policy intervention to change outcomes in the situation under analysis (McGinnis 2019). Thus, studying a policy case using IAD-derived frameworks can provide insights about governance, particularly in terms of the actors, drivers and institutions influencing the policy process, and the type of resulting institutions.

Section 2 of this chapter develops the diagnostic framework, presents the empirical context in which the study was conducted, and the data collection and analysis methods employed. Section 3 applies the diagnostic framework to organize the analysis of municipal programs aimed at reducing industrial water use in Ontario, and presents the types of external, non-water, factors at play. Section 4 discusses the findings and opportunities opened by non-water factors for municipalities to meet their water policy objective. This section also summarizes the main conclusions.

2.2 Methods

2.2.1 Conceptual framework

The main notions underpinning the diagnostic framework are (i) the distinction of water vs. non-water factors; and (ii) the actors' ability to influence. These key ideas result in understanding external factors as "non-water factors", and classifying them in two types (B and C) according to the ability of water actors to influence them. These ideas are developed below.

The actors' ability to influence is distinguished in two types: responsibility over a factor deriving from a mandate (e.g., the water sector is the domain of water actors) vs. the ability to influence regardless of any express mandate to do so (e.g., water actors engaging with urban development officials), including unintended consequences. These notions are based on the contributions of four main building blocks: De Loë and Patterson's (2017a, b) call for rethinking water governance by systematically exploring the role of external factors, which motivated our study; Rogers and Hall's (2003) recognition of the "external governance of water" dimension; UNWWAP's (2009) "water box" conceptual framework; and the Combined IAD-SES Framework (CIS) (McCord et al. 2017, Cole, Epstein, and McGinnis 2019).

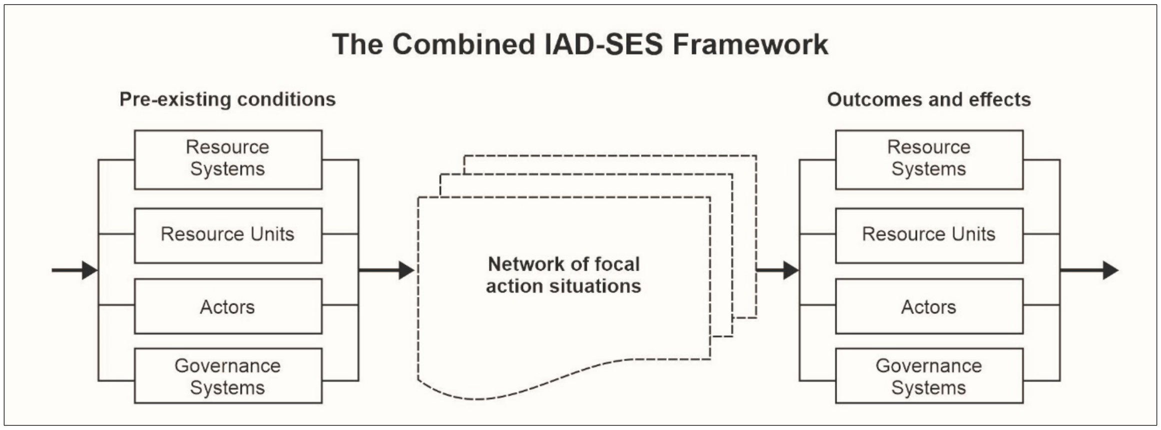
Water governance is "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society" (Rogers and Hall 2003, 16). These systems can be found across the internal and external governance of water dimensions. The internal is "concerned with the functions, balances and structures internal to the water sector" (Rogers and Hall 2003, 17), and the external includes influences from civil society and other areas of government, such as politics, and trade, that shape water governance. Both Rogers and Hall's (2003) and UNWWAP's (2009) concepts rest on the "water sector" to draw the internal/external boundary, where being inside the water sector implies having a primary mandate (involving control and responsibility) over water matters. The UNWWAP (2009) classifies external factors into broad drivers of change, such as climate change and population growth; and socio-economic objectives, such as economic development. Even though their primary purpose or function does not revolve around water, non-water factors are important to water governance because they can influence water governance processes and outcomes.

Drawing on the concept of "action situations", central to scholarship in the social-ecological systems literature (Ostrom 2005), we use the term "*water governance situation*" to reflect a specific instance where water decision-makers interact to produce an outcome (e.g., design institutional frameworks, achieve a water policy outcome). These water governance situations can represent both individual action situations, and, following CIS scholars (McCord et al. 2017, Cole, Epstein, and McGinnis 2019), networks of action situations. Furthermore, we take from the

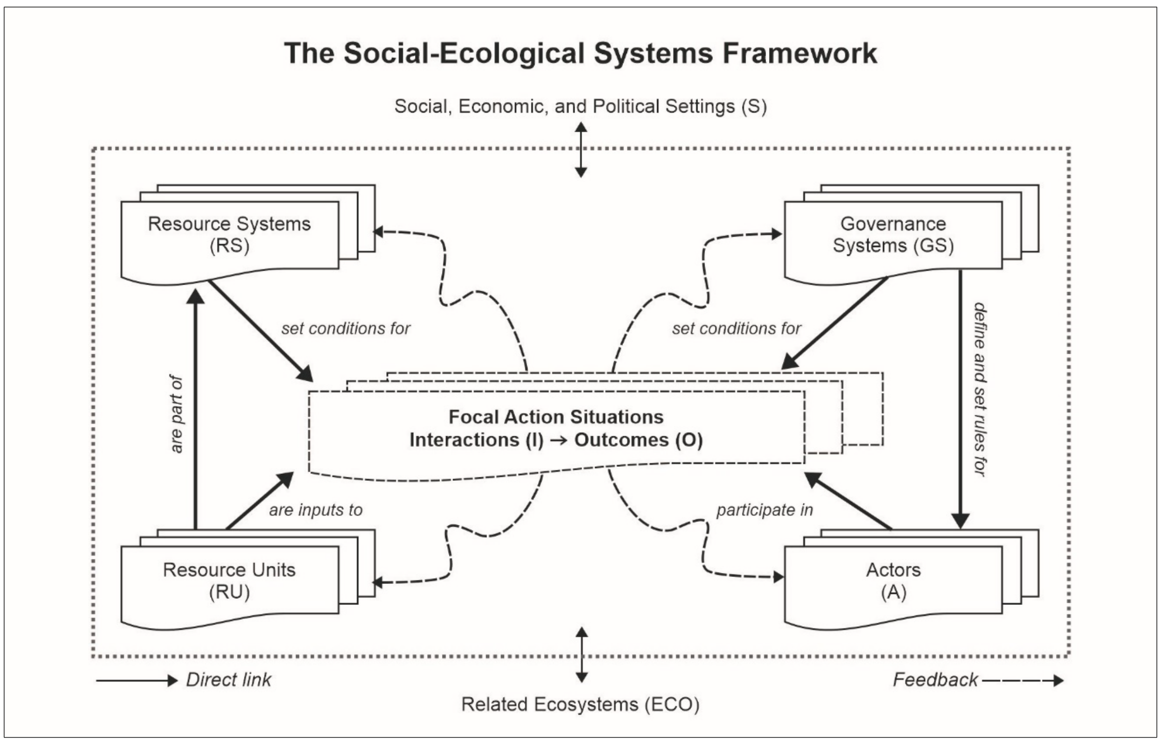
CIS the distinction between contextual factors and exogenous shocks, where the former can be influenced by interactions in the network while the latter cannot. The CIS configuration is well-suited to assessing the dimensions of water governance as portrayed by Rogers and Hall (2003): the contextual variables, and exogenous shocks, shaping the focal network can reflect the external governance of water. The CIS' contextual variables are represented by the SES framework's (Ostrom and Cox 2010) four sub-systems (governance systems "GS", actors "A", resource systems "RS", and resource units "RU") (Figure 3). The CIS also considers that exogenous shocks, or new developments, can affect contextual conditions and interactions in the network. Exogenous shocks are developed in more detail in the SES framework: related ecosystems "ECO", and social, economic, and political settings "S" group factors such as climate patterns (ECO1), demographic trends (S2), and technology (S7) (McGinnis and Ostrom 2014). Thus, the CIS contextual variables (GS, RS, RU, A) and the SES framework exogenous variables (S and ECO) are useful to flesh out Rogers and Hall's (2003) external governance of water.

Using the CIS for exploring external factors to water governance follows previous studies in the social-ecological systems literature that have paid attention to the role of "external factors". For instance, Perez et al. (2011) used Anderies, Janssen, and Ostrom (2004)'s institutional analysis framework to identify that "external driving forces" related to globalization and population growth, affect actors, resources and infrastructure in a groundwater governance SES, making it more vulnerable. Using the SES framework, Torres Guevara, Schlüter, and Lopez (2016) found that external social, economic and political factors to the SES explained the lack of self-organization by actors within an SES, and Delgado-Serrano and Ramos (2015) highlighted the importance of S and ECO in explaining dynamics in an SES. Nonetheless, with McGinnis (2019), we argue that insufficient attention has been paid to these external factors, which need to be addressed more systematically.

Figure 3: The Combined IAD-SES Framework and the Social-Ecological Systems Framework configurations



Reproduced from Daniel H. Cole, Graham Epstein, Michael D. McGinnis, *Combining the IAD and SES frameworks*, 2019, in *International Journal of the Commons*, vol.13, p.11, Creative Commons Attribution 3.0 License (https://creativecommons.org/licenses/by/3.0/)



Reproduced from Michael D. McGinnis, Elinor Ostrom, *Social-ecological system framework: initial changes and continuing challenges*, in *Ecology and Society*, vol. 19, Copyright McGinnis and Ostrom, published under a Creative Commons Attribution-NonCommercial 4.0 International License (https://creativecommons.org/licenses/by-nc/4.0/)

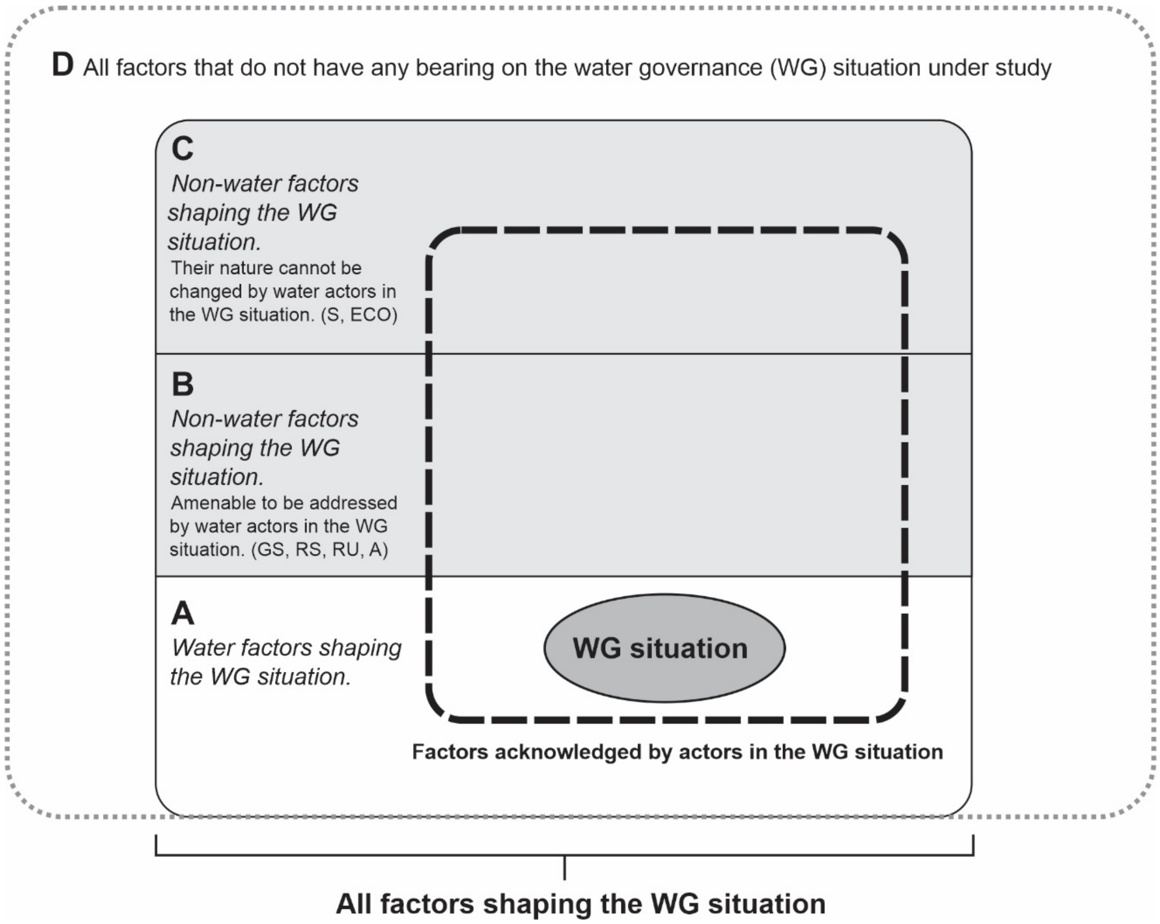
While our study is motivated by de Loë and Patterson (2017a, 2017b), our diagnostic framework departs from the diagnostic tool proposed by them because our focus is identifying types of non-water factors that can be influenced and leveraged by water actors to achieve water policy objectives. In that respect, the water governance situation cannot (or does not need to) internalize external factors because (i) these are non-water factors by definition, and (ii) they are captured by the external governance of water dimension, where they are further classified into exogenous shocks or belonging to other systems.

In summary, our framework (Figure 4) brings attention to non-water factors that influence a water governance situation in zones labelled "B" and "C", which make up the "external governance of water" of a particular water governance situation. Grounded on (i) the CIS distinction of exogenous shocks (to which actors in the focal network of action situations can only adapt to) from contextual variables (which actors in the network can affect); and on (ii) our distinction of water from non-water actors based on their ability to influence; we define B and C as follows:

- B are non-water factors amenable to be addressed or engaged by water actors in a specific water governance situation, such as broader socio-economic objectives (e.g., economic development), to achieve desired outcomes. Type B factors can be characterized in terms of GS, RS, RU, and A variables.
- C are non-water factors that water actors can respond and adapt to, but whose nature cannot be changed by water actors in a specific water governance situation, i.e., that are beyond those water actors' control. Examples include broader drivers of change (e.g., climate change). Factors in the zone labelled "C" can be characterized in terms of S and ECO variables.

Actors in a water governance situation only recognize the effects of a sub-set of non-water factors (signaled by the dotted line box). Actors in all types of water governance situations can mostly only respond and adapt to Type C factors. Water actors can engage Type B non-water factors to achieve desired outcomes. The remaining Type B factors are latent opportunities for water actors to leverage. Applying this diagnostic framework to a specific water governance situation can help locating the particular non-water factors at play for that situation.

Figure 4: Diagnostic framework for understanding the role of non-water factors in water governance situations



2.2.2 Empirical context

Five municipalities in Ontario provide the empirical setting to examine the role of non-water factors in municipal WUR policies for industrial users. Ontario is the largest province in Canada, with 38% of the country's population (Statistics Canada 2016). Ontario's population is expected to grow 38% in the 2018-2046 period from 14 to almost 20 million (Office of Economic Policy 2019). As is the case in other provinces, municipalities in Ontario are responsible for water supply services. Five municipalities in southern Ontario (City of Toronto, City of Guelph, Peel Region, York Region, Waterloo Region) run programs specifically targeted to industrial, commercial and institutional (ICI) water users; these programs encourage these sectors to be water efficient and/or conserve water. These municipalities contain some of the most populated and economically active urban areas in the country (Statistics Canada 2017). In terms of water sources, Guelph and Waterloo are groundwater-reliant municipalities (100% and 75% of water supply, respectively), while the other three municipalities rely on water from Lake Ontario, one of the Great Lakes.

Table 5 shows the case of York Region's ICI sector water demand. As a sector, ICI users account for a fifth of total water demand, three times less than the residential demand. However, the importance of tackling the ICI sector lies in how large a single industrial water user's absolute water consumption is compared to a single household's use. That is why municipalities focus on the largest ICI users, i.e., the low hanging fruit, for their WUR programs (City of Guelph 2016, York Region 2018). Thus, targeting large ICI water users is an appealing way for municipalities to reduce overall water demand.

Table 5: York Region's water demand by sector (million litres per day – MLD)

	2015		2017	
Sector	**MLD**	**%**	**MLD**	**%**
Residential	195	59%	199	65%
Industrial, Commercial and Institutional (ICI)	66	20%	70.3	23%
Other	26.5	8%	0.6	0%
Non-revenue water	42.7	13%	37.7	12%
Total Demand	**330.2**	**100%**	**307.6**	**100%**

Source: York Region (2016, 2018)

The five municipalities' ICI WUR programs are directed to all ICI sectors, and do not have specific policy objectives for each of the subsectors (e.g., industrial vs. institutional). Thus, we will refer to these as the combined "ICI programs". The municipalities' ICI programs fall under three categories (PPG 2019). In category (i) in Table 6, municipalities provide a free assessment of ICIs water use, and municipalities define the scope of this program. In category (ii), ICI water users contract a consultant to carry out an assessment of their water use, and the municipality shares the costs. In (i) and (ii) the municipality provides various forms of incentives for ICI water users to implement the assessment recommendations. Toronto is the only municipality with a category (iii) program. Category (iii) is actually an economic development program where a discounted water rate is granted to industries that implement a water conservation plan, among other criteria. Toronto also stands out for being the only municipality that already met its water efficiency plan targets (City of Toronto 2011).

Table 6: Categories of municipal ICI water conservation and/or efficiency programs

Category	**Guelph**	**Waterloo**	**Peel**	**York**	**Toronto**
(i) Free water audit & incentive			✓	✓	✓
(ii) Cost-share water conservation & incentive	✓	✓			
(iii) Reduced industrial water rate (IWR)					✓

Source: PPG (2019)

The five municipalities interact with a suite of actors in the following main issue networks: the Ontario-only networks Municipal Water Efficiency Eco-Cluster (Eco-cluster) and the Water Efficiency Committee of the Ontario Water Works Association (OWWA-WEC); national Canadian Water and Wastewater Association (CWWA) Water Efficiency Committee; and the Alliance for Water Efficiency (A4WE), a North American initiative. The Eco-cluster concentrates on ICI water efficiency programs; the other three also cover residential measures. The OWWA-WEC, the Eco-Cluster and the CWWA committee involve active sharing of expertise among members; the A4WE functions as a platform for dissemination of research and best practices. The participating actors in both Ontario-only networks include officials of other municipalities (some interested in industrial water efficiency), provincial-level agencies, conservation authorities, engineering consultants, and NGOs. The OWWA-WEC and the A4WE are long-term initiatives, functioning for over 10 years. The Eco-cluster was funded by a grant from the Ontario's Independent Electricity System Operator (IESO), and was convened from February 2017 to December 2018 by the Toronto and Region Conservation Authority (TRCA), through Partners in Project Green (PPG). PPG is a public-private partnership launched in 2008 by the TRCA and the Greater Toronto Airports Authority to create the Pearson eco-business zone (TRCA 2008, PPG 2019).

In summary, the empirical units of analysis are the five municipal policy objectives to reduce WUR for industrial users. Data documenting what the current policies consist of portray the considerations taken into account when formulating and implementing such policies. As such, the policies, and the data documenting them, capture the outcomes of the processes involved in governing industrial WUR at the municipal level, i.e., they reflect the municipal water governance situations. In that sense, the core "water actors" in this study are the municipal officials responsible for achieving the ICI WUR objective in their jurisdictions. Other water actors are the networks mentioned in the preceding paragraph, most importantly the OWWA-WEC, its membership being overwhelmingly municipal officials responsible for WUR.

2.2.3 Data collection

Two main, complementary qualitative data collection methods were used in this study: document review (including strategies, plans, websites), and semi-structured key informant interviews. These were supplemented with summary notes from attendance to presentations, and personal observations deriving from all the preceding data and collection process. Data collection stopped when saturation was reached (Saumure and Given 2008). In total, 74 documents, including interviews, were collected between April 2018 and July 2019. Data sources have various origins (geographically, functionally, multi-level) to support triangulation.

The research asks to what extent and how non-water factors shape the governance of water. In an exploratory study like this, acknowledgement of non-water factors in the policy-making and implementation of the water policy objective at hand (ICI WUR) was taken as evidence of them playing a role or influencing decision making (the nature and extent of which was later qualified by the diagnostic framework-guided analysis). Thus, the approach to data collection was to start with current documents that defined the policy objective, that is, that captured the motives, purpose and objectives in its making (e.g., water conservation and/or efficiency strategies and/or master plans) and implementation (e.g., ICI program websites, marketing material). The majority of documents were authored by the municipalities. Other documents about ICI water efficiency and municipalities in Ontario were authored by other active members of the networks referred to earlier.

To obtain a more nuanced understanding of the policy-making and implementation considerations (particularly around the role of non-water factors, and industrial water users), it was necessary to go beyond publicly available documents. Seventeen interviewees participated in this study, who shared their perspectives around ICI and/or industrial water conservation and/or efficiency in Southern Ontario. Seven interviewees also provided insights to Chapter Three about non-water factors in WUR policies at the provincial level. Two main criteria served to identify interviewees for this chapter: managers of municipal ICI programs in Ontario; and other senior active non-municipal members of the Ontario-only networks mentioned earlier with experience and/or interest in industrial efficiency. To provide additional context, four interviewees, of the total of 17, were identified at conferences, selected from people who were knowledgeable about the broader state of industrial water stewardship in Ontario, Canada and North America. The interviews were semi-structured to guide the conversation but also to give the respondents the freedom to highlight other relevant information and minimize conceptual framework bias (Bloor and Wood 2006). Interviews took place over the phone, were digitally recorded when consented by interviewees, and transcripts were made manually by the main author. Interviews lasted for an average of thirty minutes each. Interviewees were assigned numbers to preserve anonymity. One interviewee wished to be referred to by his job title, which is indicated where applicable.

Data collected through document review and interviews were supplemented with summary notes taken by the first author when attending several presentations at the Ontario Water Works Association Water Efficiency Workshop (September 2018). Personal observations were recorded throughout the data collection process, particularly after interviews and presentations.

2.2.4 Data analysis

The data were analyzed through content analysis using QSR NVivo 10 software, which supported compilation and coding. Content analysis largely followed a directed, deductive approach (Hsieh and Shannon 2005), with the diagnostic framework providing the analysis categories. Analysis took place in three rounds, under the logic that non-water factors—and how they link to ICI programs—first need to be identified (first round of coding). Then they need to be assigned an institutional diagnosis variable (second round of coding). The third round of analysis consisted on synthesizing the implications of the non-water factors for achieving the water policy objective under analysis.

In the first round of coding, passages from all documents (including interviews and personal observations) were coded under third- or second-tier nodes of the diagnostic framework coding tree. This coding tree consisted of two parent (first-tier) nodes concerning non-water factors: (B) amenable to be addressed by water actors, and (C) beyond water actors' control. The child (second-tier) nodes "socio-economic objectives" and "drivers of change" are under (B) and (C), respectively. Grandchildren (third-tier) nodes included, as starting points, the most cited factors in the literature ("climate change" under drivers of change, and "economic development" under socio-economic objectives), and further third-tier nodes were added as they appeared in the data. To inductively capture other non-water factor types emerging from the data, second-tier nodes "other factors amenable to be addressed by water actors" and "other factors beyond water actors' control", were added under (B) and (C), respectively. Once all documents were coded, a table was created for each parent node, synthesizing all the non-water factors identified and how they link to ICI programs, according to the data.

The coding process consisted of a deductive approach followed by an inductive approach. Under the deductive approach, a passage was coded directly at the third-tier node level if they were related to socio-economic objectives or drivers of change. For instance, municipal water efficiency and/or conservation plans explain the drivers that led to the development of that plan. Most of them have passages arguing that WUR is necessary to adapt to changes posed by climate change and population growth, which challenges the municipalities' ability to provide water services. These passages would be coded under the "drivers of change" child node, according to the UNWWAP (2009) definition of drivers of change. This type of passages would be also coded under institutional variables ECO1 (climate patterns) and S2 (demographic trends), during the second round of coding. If the passage pertained to another type of non-water factor, then it was provisionally placed in one of the child nodes "other factors amenable to be addressed by water actors" or "other factors beyond water actors' control", following the endogenous vs. exogenous logic borrowed from the CIS framework, and the SES framework definition of ECO and S variables, as explained in Section 2.2.1. Once all documents were coded, the passages in these "other" nodes were grouped with other similar passages to form new categories. This is how factors such as "data analytics development" and "organizational objectives" factors emerged from the data (see Section 2.3). In summary, the UNWWAP (2009) concepts of "socio-economic objectives" and "drivers of change", the CIS endogenous vs. exogenous logic, and the SES framework definition of exogenous variables, together provided the parameters to code passages at the children and grandchildren nodes. Because our focus is in non-water factors as defined in our framework, "water factors", i.e., Type A factors, were not coded as part of this research.

The second round of coding then assigned the variables for institutional diagnosis to the non-water factors in the tables (exogenous variables S and ECO, and contextual conditions GS, A, RS, RU). Tables 7 and 8 summarize the results from both rounds. The final (third) round of analysis consisted of revisiting the links (identified in the first round) between non-water factors and ICI programs, with the purpose of identifying their implications for achieving the water policy objective of reducing industrial water demand (e.g., pursuit of this objective, how to achieve it) – see Table 9.

2.3 Results

This section identifies the non-water factors driving, to different extents, the industrial water use reduction policies across the five municipalities, according to the diagnostic framework's categories: non-water factors amenable to be addressed by water actors (Type B), and beyond water actors' control (Type C). Factors that would be categorized as "Type A" in the framework, i.e., water factors (whose primary purpose or mandate revolve around water resources and/or services), were identified and discussed in the empirical context section. These included the municipal water officers responsible to implement the municipal water efficiency programs, for instance. As noted above, Type A factors were not formally coded because the focus is on Type B and C factors.

2.3.1 Non-water factors beyond the control of water actors in a water governance situation (Type C factors)

The evidence pointed to two main Type C factors bearing on municipal ICI programs in Ontario: climate change and population growth. Technological advancement and commercialization, data analytics development, and political leadership change, are the other three Type C factors identified. Table 7 shows how each factor links to ICI programs, according to the data, and the associated institutional analysis variable.

Table 7: Non-water factors in Ontario municipalities' industrial water use reduction policies: factors beyond the control of water actors in a water governance situation

Type C factors	Link to ICI programs	Institutional variables assigned
Climate change	Adaptation to this factor drives the need for program	ECO1 Climate patterns
Population growth	Factor drives the need for programs to meet growth needs	S2 Demographic trends
Technological advancement and commercialization	Factor shapes program's planning and implementation features (including reviews)	S7 Technology
Data analytics development	Factor facilitates information for decision-making around programs	S7 Technology
Political leadership change (municipal, provincial, federal)	Factor shapes programs planning and implementation	S3 Political stability

These five factors are all "drivers of change", according to the UNWWAP (2009) definition used in our framework in Figure 4. All of these can be captured by the existing exogenous variables ECO (related ecosystems) and S (social, economic, and political settings). Each factor is explained below as portrayed in the data.

Climate change was associated with increased weather variability and unpredictability, which impact water and wastewater services, as well as water demand. On the supply side, the evidence indicated that irregular precipitation patterns complicate supply projections, making planning more difficult. City of Guelph (2016, 1) illustrates how WUR can help them deal with climate unpredictability: "less pumping also means less dependence on regular rainfall events to recharge the aquifer, a factor that is becoming less predictable as our climate changes". On the demand side, the evidence indicated that more variable temperatures provoke swings in water consumption. The Toronto Water (2019, 34) operating budget of 2019 illustrates that "in 2016 and 2017, water consumption levels have been impacted by extreme swings in precipitation": in 2016 water consumption spiked due to unexpectedly dry and warm summer, while in 2017 consumption dropped significantly because of a cooler, wet spring and summer. The need to adapt to and mitigate the effects of climate change tends to cut across various municipalities' work areas (not just water), but WCE efforts (including ICI programs) run by the water departments contribute to this wider municipal goal. Interviewees 3 and 4, municipal officials, suggested that the water department's programs also had to contribute to adapting to and mitigating the effects of climate change because that was part of the mandate across the municipal government.

Population growth in southern Ontario comes with increasing urbanization, and economic and employment growth. Confirming the importance of the relationship between population growth and WCE manifested by municipal officials in three of the five municipalities, the PPG (2019, 4) stated that "[a]s communities in Ontario grow in population, there is an associated increase in water consumption and wastewater generation […] Realizing the high costs associated with increasing water supply to serve its growing population, some larger municipalities have found more cost effective and environmentally sustainable is to incentivize people to conserve water. The conserved water then provides the extra capacity to provide to its population". York Region (2018, 11) exemplifies how water conservation is already contributing to meet this objective: their "commitment to innovation and being a leader through water conservation strategies has resulted in overall water demand remaining constant despite population increases. Water demand gradually declined between 2012 and 2017 despite increases in York Region's population, proving that water conservation works".

Technological advancement and commercialization refers particularly to improvements in resource efficient technologies, and their increasing affordability and availability. Reflecting the argument made in documents from three out of five municipalities, Peel Region (2012, 23) acknowledges that "as new and emerging technologies come available in the marketplace, Peel will consider the feasibility of introducing select viable technologies as pilot programs and where applicable work in partnership with interested municipalities in Ontario and North America". This factor thus shapes the features (e.g., incentives, reach) of ICI programs, and prompts their reviews to minimize or eliminate municipal incentives for adoption of water efficient technologies when the market itself is facilitating adoption (e.g. development of air-cooled, rather than water-cooled options), among others.

Data analytics development refers to improved availability of water (and energy) data related to water systems and water use, and their analysis to inform decision-making by water managers in municipalities and ICI sectors. This factor was less relevant than others, according to the evidence. For instance, an official in a municipality considering implementing an ICI program shared that the municipality is giving industrial customers access to water data, so "we are not outright saying you need to conserve water, but we are also helping them be able to see their water use down to like the hour, in that way they […] have a better idea of where the water is going, they can track it all, and we can speak to them later on" (Interviewee 2). For instance, York's big data initiative involves improving water consumption data tracking to better target programs for high water users and also to better understand greenhouse gas savings from water use reductions (York Region 2018). The relevance of this factor is expected to increase because the availability and quality of data has improved in the last decade, allowing municipalities to harness new information.

Finally, the data revealed that the political stance of the authorities in office determines the continuation and future availability of funding for the implementation of ICI programs. Interviewee 10 explains, “some [grants and incentive program] have changed, because of the provincial government change over, but some of them are still widely available from the federal side”. Supporting this claim, some ICI programs have been funded by the Federation of Canadian Municipalities (FCM) Green Municipal Fund (federal funds). The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) funded some businesses in the food and beverage industry, including Molson Coors, Campbell’s (Provision Coalition 2017), and the Ontario Ministry of Economic Development, Job Creation and Trade funded small scale wineries and breweries working on water stewardship (also funded by the federal Agriculture and Agri-Food Canada) (Bloom 2018), to improve water efficiency in their operations. Uncertainty about funding increases around election times (municipal and provincial elections took place, and upcoming federal elections were a hot topic during the data collection period), which puts on hold decision-making about the ICI programs. During the research, it became apparent that some municipalities were on stand-by regarding provincial funds because there was elections’ results uncertainty with the new provincial government.

2.3.2 Non-water factors amenable to be addressed by water actors in a water governance situation (Type B factors)

Type B factors in relation to our water governance situation include two kinds of objectives: “socio-economic objectives” (Figure 4) and organizational objectives. The “organizational objectives” category emerged from the data, and refers to objectives that municipalities and businesses pursue as organizations and that show to be important criteria in implementing WCE measures (details below). The three most frequently accounted for objectives in the data (marked with an * in Table 8) are municipalities’ cost-efficiency and effectiveness mandate, economic development, and greenhouse gas emission reduction targets. All these municipal objectives are driven, to different extents, by provincial mandates. Table 8 shows factors under each type of objective, how they link to ICI programs, and the institutional variables that best reflect them.

Table 8: Non-water factors in Ontario municipalities' industrial water use reduction policies: factors amenable to be addressed by water actors

Factors	Type B factors	Link to ICI programs	Institutional variables assigned (associated actors and institutions) (McGinnis and Ostrom 2014)
Socio-economic objectives	Economic development*	• Program contributes to achieving factor. • Factor shapes program features	GS: Economic development governance system • GS6: Municipal official master plans (setting of municipal objectives and priorities)
	Planned and sustainable growth	• Program contributes to achieving factor (municipalities comply with the growth plans and legislation) • Factor drives the need for IWCE to meet growth needs	GS: Planned and sustainable growth governance system • GS6: (i) Ontario's Places to Grow Act ; (ii) Municipal official plans • GS5: (i) Growth Plan for the Greater Golden Horseshoe; (ii) Municipal growth strategies • GS1: (i) Municipalities; (ii) Province
	Infrastructure development	• Program contributes to meeting factor • Factor shapes and facilitates IWCE planning and implementation	GS: Infrastructure development governance system • GS6: Ontario's Building Code Act • GS5: (i) Ontario's Building Code; (ii) Municipal development charges • GS1: (i) Municipalities; (ii) Province
	Greenhouse gas emissions reduction*	• Program contributes to achieving factor • Factor justifies need for program • Factor can draw industrial interest towards program (increase business buy-in with integration of water and energy conservation)	GS: GHG reduction governance system • GS6: Municipal official plans • GS5: Municipal initiatives • GS2: (i) TRCA-PPG; (ii) ECO • GS1: (i) Municipalities; (ii) Province (IESO); (iii) Province
Organizational objectives	Municipalities' cost-efficiency and effectiveness mandate*	• Factor drives need for program • Program contributes to meeting factor	GS: Municipal governance system • GS5: Cost-efficiency and effectiveness mandate • GS1: Municipalities
	Businesses rationale (cost minimization and ROI maximization)	• Factor shapes features of program • Program meeting this factor depends on the individual businesses calculations.	GS: Corporate governance system (internal governance of a business) • GS5: Cost minimization and ROI maximization • GS2: Businesses

Notes: GS= Governance system; GS1= Government organizations; GS2= Nongovernment organizations; GS5= Operational rules; GS6= Collective rules. (*) most frequently acknowledged factors.

All of these objectives are pursued within their own governance systems (GS), which make up the context surrounding the water governance situation. The types of second-tier variables that mostly appeared in the data pertained to the type of organizations (governmental or not), and the type of rules (collective, operational) at play. Each factor is explained below, illustrated with examples extracted from the data.

Economic development is a municipal priority, usually set in overarching municipal plans. Interviewee 2 argues that municipalities aim to be economically competitive mainly in two respects: in comparison to other municipalities, to attract businesses to come and remain in their regions; and within their region, by providing a competitive business environment for their businesses to flourish, in order to support regional employment and the tax base. Interviewees from across the five municipalities confirmed the importance of the large water users for the economic development of their municipalities. The pre-eminence of economic development for a municipality shapes the form these programs take (e.g., rebates, discounted water rates, partnerships with retailers and contractors servicing industrial water users), and their target geographic areas. In that sense, water tools, such as ICI programs, are also used to meet non-water objectives. For example, the PPG (2019, 7) states that the Toronto's Industrial Water Rate program is an "economic development initiative to retain industrial facilities". According to the (City of Toronto n.d.), the rationale to offering a discounted rate to manufacturers that have a water conservation plan is both "to help support economic growth and encourage water conservation".

The planned and sustainable growth objective drives the need for WCE. For instance, City of Guelph (2016, 1) states that "in 2004, [Guelph] commenced a Water Supply Master Plan which looked to ensure water supply was available for future growth as identified in the Province of Ontario's Places to Grow legislation […] Upon completion and endorsement by City Council in 2007, the final Water Supply Master Plan identified enhanced WCE as the top priority in reclaiming finite water supply capacity", which guided the City's Water Conservation Program. Likewise, Interviewee 1 acknowledged that the ICI program "is one program of many that [our municipality] offers in order to meet our growth targets for the Places to Grow Act in Ontario […] so thus we have programs like this and many others to help reclaim that capacity in order to sustain growth, it is important". Planned and sustainable growth is expressed in all the municipalities' growth plans in response to both the Ontario's Places to Grow Act and the resulting Growth Plan for the Greater Golden Horseshoe (GGH Growth Plan). The Act states that it supports "a culture of conservation" (Government of Ontario 2005, 1). The GGH Growth Plan (MMAH 2019, 50) details that municipalities should prioritize optimization and improved efficiency within water and wastewater systems (municipal and private), through developing and implementing "official plan policies and other strategies in support of […] water conservation [objectives], including through […] water demand management for the efficient use of water; and water recycling".

The infrastructure development objective is expressed by the Ontario's Building Code (act and regulation). The code's section 7.6.4 requires water efficient fixtures in all buildings, including industrial. Municipalities recognize that the code's requirements have changed the local market and thus influenced the way ICI WUR is implemented: York Region (2016, 2) highlights that "the marketplace has adopted the latest provincial Building Code by moving toward water efficient fixtures and appliances. This shift in the marketplace meant that Regional rebates could be phased-out with little impact on water conservation".

Greenhouse gas (GHG) emissions reductions is a municipal and provincial objective, reflected in programs such as Guelph's Community Energy Initiative (City of Guelph 2016), and Ontario's 2018 Environmental Plan. According to the Environmental Commissioner of Ontario, at least 32% of Ontario's municipalities' GHG emissions come from water and wastewater systems (Saxe 2018). Municipalities recognize GHG reduction as a co-benefit of ICI programs, and some even have it as an explicit objective: for instance, Waterloo estimated that "the sum of the annual [water] savings [from supply, wastewater and heating] over the [2015-2025] period equates to 7,700 tonnes of CO2e, […] is a significant contribution for the Region towards reaching its 2019 emissions targets" (Region of Waterloo 2014, 24). Municipalities are also aware that GHG reduction, and associated energy cost-savings, garner more attention from businesses than just water conservation: the PPG (2019, 14) illustrates these interconnections by recommending municipalities to update their ICI programs by including "greenhouse gas savings associated with identified water savings opportunities to reinforce the additional environmental benefits of water conservation (some programs include this already)", and others are already considering it. According to Interviewee 5, the water efficiency officer at Waterloo region, and Interviewee 10, municipalities are already looking into how to integrate GHG and WCE requirements in ICI programs.

Municipalities aim to be fiscally responsible across their operations without creating a burden to taxpayers, and thus have a cost-efficiency and effectiveness mandate (Interviewees 3, 5). The Peel Region (2012, 23) captures it clearly: "since demand-side (water efficiency) measures are flexible and typically much less expensive to implement than infrastructure expansion on a litres per day basis, it is fiscally responsible of Peel to meet as much of its increasing water demands as possible through the implementation of water efficiency programs". After all, according to the PPG (2019), municipalities' main rationale for offering ICI programs is to reduce their own capital expenses over the long term by delaying, downsizing or eliminating investments in water and wastewater infrastructure. Interviewee 8, a municipal official, argued that water conservation is one of the strategies municipalities have to defer many water capital projects, an insight shared by most interviewees. Cost-effectiveness also applies to operational expenses, as illustrated by Region of Waterloo (2014, 1): "[b]enefits associated with […]water savings include: low program costs compared to the cost of new supply side measures; reduced operating costs associated with less energy and chemical use and other variable cost savings". Energy is the largest operational expenditure: Saxe (2018) highlights that meeting lower water demands saves municipalities energy and chemical costs for water treatment and distribution, where energy accounts for the largest cost to municipal water utilities, in a context where water and wastewater provision is the largest energy use (38% of total energy use) in municipalities in Ontario.

Finally, businesses pursue cost minimization and return on investment (ROI) maximization. According to municipal officials from all five municipalities, the main selling point of ICI programs is the cost-saving opportunities they offer to businesses, although they are also aware that increasingly businesses have sustainability mandates. To illustrate, the PPG (2019) reports that the direct and indirect benefits to participants across all the ICI programs under study are reduction of capital expenses and utility costs, improving bottom line, increasing operational efficiency, as well as improving sustainability performance and achieve corporate social responsibility (CSR) targets. Because water costs are inexpensive relative to other costs, municipalities also advertise associated savings: operational expenses savings include reduced electricity and natural gas bills, as well as potential reductions of sewer surcharge and stormwater bills; and capital expenses savings, which arise from higher and faster returns on capital investments (e.g., equipment or infrastructure upgrades) thanks to rebates. However, because the price of water is low, "it's really these programs reaching out to people and convincing them to participate, it's not necessarily industries reaching out and saying we want to save water" (Interviewee 9). Additionally, the interviewee indicated this is why some programs are considering tying together "energy and water conservation […] it's economies of scale, but also energy might be higher on [the businesses'] radar than water" (Interviewee 9).

In summary, municipalities take into account non-water factors in policy and decision-making around WUR. This is well captured by two quotes. According to the City of Guelph (2016, iv),

> water efficiency is a core community and regulatory objective which transitions across City operations, future planning activities and provincial regulations […] [M]any key City planning documents and legislation related to water conservation […] reflect changing demographics and regulatory environment. While each document reflects its respective core business function, many also influence water use efficiency and resource protection.

Also, the Ontario's Ministry of Environment acknowledges that York Region's Long-Term Water Conservation Strategy 2018 report "does an excellent job describing the factors affecting water demand: water conditions, population growth, water rates, and changes to Ontario's Building Code" (York Region 2018, 5).

2.4 Discussion and conclusion

2.4.1 Discussion

This section starts by summarizing the main findings of this study. The following are the main points of discussion: water actors are aware of cross-sector interactions and harness them to achieve a water objective; actors can simultaneously pursue multiple objectives, thus their primary mandate in relation to the governance situation under study is crucial for the type of analysis proposed here; understanding of the results in terms of institutional variables; and, existing and potential multi-level interactions present opportunities for pursuing water objectives.

The results indicate that non-water factors are important in driving the processes and outcomes of these specific municipal policy-making and implementation situations regarding industrial WUR in two respects: by driving municipalities to set the water policy objective of reducing ICI users' water use, and by shaping how that objective is met through different types of ICI programs (policy implementation). The non-water factors identified in this study played a role in policy formulation, decision-making, and implementation, three of the commonly-identified phases of the public policy making process (Howlett and Cashore 2014). It is worth remarking that the non-water factors found at play in these specific cases are ultimately instances of the categories (i.e., socio-economic objectives, organizational objectives) which were found consistently across the cases. Table 9 summarizes the factors at play in each of these respects.

Table 9: Non-water factors driving municipal decision- and policy-making regarding ICI programs

Factors		**Driving water policy formulation and decision-making** (need for conception/continuation of ICI programs)	**Driving water policy implementation** **(**decisions about ICI programs' features and planning)
Beyond water actors' control (Type C)		• Climate change (ECO1) • Population growth (S2)	• Technological advancement and commercialization (S7) • Data analytics development (S7) • Political leadership change (S3)
Amenable to be addressed by water actors (Type B)	*Socio-economic objectives*	• GHG reduction (GS) • Planned and sustainable growth (GS)	• GHG reduction (GS) • Economic development (GS) • Infrastructure development (GS)
	Organizational objectives	• Municipalities' cost-efficiency and effectiveness mandate (GS)	• Businesses rationale (cost minimization and ROI maximization) (GS)

The literature tends to assume that water decision-makers commonly remain within the water box and need to be encouraged to reach out to other areas (Gupta et al. 2013). In contrast, the results from this study show that municipal water decision-makers acknowledge various wider dynamics, from the local to the global, and actively try to address and harness them in their decision-making to meet their water policy objective. For instance,

- GHG reduction is the most important non-water opportunity found in the evidence, in that municipal water actors are already exploring this option to further their water policy objective. GHG reduction drives the need for reducing ICI's water demand in order to reduce municipalities' overall energy usage to treat and pump water. GHG reduction shapes ICI programs by presenting an opportunity to make them more attractive to ICI users, through linking them to energy savings and thus appealing to the "businesses rationale" factor.
- To increase the businesses uptake of ICI programs, water actors are engaging with other departments within the municipality (e.g., economic development) to understand in more depth the particular situation of local businesses, and to adapt ICI programming accordingly. Economic development factors were the most influential ones across the five municipalities, and are expected to be influential in water decision-making across governments at multiple levels in developed and developing countries.

- Water actors understand that ICI programs can work as a cross-sectoral solution, as non-water factors and policy- and decision-making around ICI WUR mutually affect each other. The three most frequently accounted for Type B factors (Table 8) are also explicit objectives of some ICI programs, and the other Type B factors are seen as “co-benefits”. Furthermore, ICI programs contribute to achieving all identified socio-economic and organizational objectives to different extents (meeting the “businesses rationale” depends on the individual participating business).

Municipalities are well aware of the complex cross-sector and multi-level interlinkages, as evidenced for instance by the literature on cities taking the lead on climate change adaptation and mitigation (Rosenzweig et al. 2010, Pablo-Romero, Sánchez-Braza, and González-Limón 2015) . The difference between what the water governance literature assumes and the results from this study may be a result of the literature tending to focus on water managers (e.g., UNWWAP 2009), or other practitioners focused on water resources per se, rather than water services. Targeting water decision-makers on the municipal water services side can shed more light on the role of non-water factors in water governance because municipalities have to meet a variety of socio-economic objectives for their communities, as well as their own objectives, in order to function as an organization.

Municipalities, as well as other public or private organizations, pursue multiple objectives. Ultimately, municipalities are key organizations in local governance systems, and have to juggle many mandates; thus, municipalities are a space of negotiation where many governmental policy-makers, who interact in issue networks with other government and non-governmental actors at multiple scales, negotiate multiple socio-economic and organizational objectives. Specific actors within these organizations can answer to multiple objectives too. Whether a specific actor is water or non-water depends on its primary mandate (Sections 2.2.1 and 2.3) in relation to the specific water governance situation under study.

In institutional analysis terms, this instance of water governance situations at the municipal level can be characterized as a polycentric governance system (McGinnis and Ostrom 2011, Aligica and Tarko 2012), where decisions made in non-water hubs affect water decision and policy-making. The non-water factors shaping this instance of water governance are well captured by the exogenous variables ECO (related ecosystems) and S (social, economic, and political settings) (Table 7), and by the contextual variable GS (governance systems) (Table 8) and some of their respective second-tier variables. The five Type C factors play an important role in influencing the formulation of these type of programs and their implementation: the programs are adaptation responses to them. Our diagnostic framework, which relied on the external governance of water dimension being partly defined in terms of socio-economic objectives, led to the characterization of all Type B factors at play as governance systems of their own. Indeed, within each of these non-water governance systems, decisions and policies are made on how to meet specific socio-economic and organizational objectives. To illustrate, the GHG reduction governance system is a complex system where actors including municipalities and provincial agencies lead the drafting of plans and initiatives to meet the GHG reduction public policy objective. These actors are a subset of the larger group that is involved in GHG reduction in Canada. The main factors associated to the governance system found in this study were actors and institutions, specifically, government organizations (GS1), operational rules (GS5), and collective rules (GS6).

The multiple governance systems at play in these cases involve actors and institutions at municipal and provincial levels. These governance systems interact among them and with water governance, which opens the possibility of crafting win-win situations for actors and objectives in water governance and other governance systems. Within the governance systems there are a variety of actors and institutions from the municipal and provincial scales, public and private (Table 8), showing cross-level interactions within each governance systems. The main non-water institutions identified across these governance systems are overarching municipal master plans and provincial acts and plans. Some of these institutions, for instance, the Building Code and the Green Energy Act, formed in non-water collective-choice arenas; nevertheless they include WCE clauses product of interactions of water and non-water actors at other scales beyond our water governance situation. As a result, the Building Code, part of the "infrastructure development" factor, has made more water efficient fixtures available, facilitating ICI programs implementation. At the municipal level, water actors trying to further engage with non-water ones to leverage them to achieve their water policy objective, such as GHG emissions reductions, are spotted at the operational level.

Level-shifting from operational (where decisions are implemented) to collective-choice (where decisions are made) can also present opportunities for furthering water policy objectives. Level-shifting is a problem-solving strategy to "change patterns of undesirable interactions and outcomes at operational or collective-choice levels" (Ostrom 2005, 63). In our case, level-shifting could be employed to further harness the "businesses rationale" factor, for instance. ICI programs have mostly engaged with plant level managers, which in Ontario (where most manufacturing plants belong to small-and-medium enterprises) are in many cases the businesses owners. However, there are various national and multinational companies with operations in the region. For instance, the food and beverage industry faces water risks of different types and their corporate water management is an important component of their corporate social responsibility activities (Weber and Hogberg-Saunders 2018). Tying businesses' cost minimization rationale more closely to corporate social responsibility benefits to engage with businesses decision-makers could open new doors for uptake. In fact, Ontario municipalities are increasingly using private environmental management system standards, such as ISO 14001, as a tool bridging water government and corporate regulations (Tovilla and Webb 2017).

In summary, the implications of non-water factors for water governance arrangements pursuing the ICI WUR public policy objective are important. They support the existence of these objectives, and the way in which they are being implemented. They also present the potential for closer collaborations and partnerships with non-water actors (government on non-governmental) where the realization of co-benefits could further shape the implementation tools and the objectives themselves, e.g., closer interaction with businesses could turn into an increased use of market mechanisms.

2.4.2 Conclusions

We explored how we can account for relevant non-water factors driving specific water governance situations to identify types of non-water factors that represent points of intervention to achieve water objectives. We argue that a diagnostic framework built around the concept of an external dimension of a water governance situation is a useful way to account for the role of non-water factors and their potential in addressing problems targeted by specific water governance situations. We used the case of the governance of industrial water use reduction (WUR), specifically on the case of municipalities' industrial WUR policy making and implementation.

Findings from this work confirm that non-water factors do drive the governance of water by influencing the context in which water policy-making takes place, the need to set an institutional framework around a specific issue, and the potential for collaboration with non-water actors. Importantly, non-water factors (and their associated actors and institutions at various institutional and geographical levels) drive the decision to set a certain water policy objective (e.g., WUR), and the content of water institutions crafted or modified to meet that objective (e.g., municipal water master plans, WCE strategies, ICI programs). Furthermore, non-water factors also constrain or facilitate the implementation of such policies by shaping the context in which they are deployed (e.g., businesses rationale, availability and affordability of technologies in the market), which in turn inform the type of instruments to be used (e.g., rebates). In that sense, non-water factors can open opportunities to achieve water policy objectives. For instance, the integration of water and energy conservation programs at the municipal level can increase the uptake of ICI programs by businesses, because it leverages the businesses rationale (e.g., energy cost savings), and the GHG emissions reductions objective.

This work contributes to the water governance literature in four ways. First, it proposes a diagnostic approach based on institutional analysis frameworks, that maps the Rogers and Hall (2003) water governance definition in terms of the CIS framework for institutional analysis (McCord et al. 2017, Cole, Epstein, and McGinnis 2019). In particular, we mapped the external governance dimension of a water governance situation in terms of the CIS' contextual variable governance systems (GS) and exogenous shocks variables related ecosystems (ECO) and social, economic, and political settings (S), which are also sub-systems in the SES framework (McGinnis and Ostrom 2014). This mapping helped to identify the importance of water actors' ability to influence, and thus to break down the factors in the external governance dimension of a water governance situation into Type B and C factors. Second, our diagnostic approach operationalises and asserts the academic usefulness of the UNWWAP's (2009) "water box" framework classification of external factors into drivers of change and socio-economic objectives. Our study suggests considering an additional class: "organizational objectives". This class is important because it reinforces that decision-makers are subject to pressures originating within the organizations they are part of, which can also shape how they make decisions and implement policy (e.g., municipalities' cost-efficiency and cost-effectiveness mandate). In this way, this chapter responds to two needs in the water governance literature: the need for further understanding external factors in water governance (e.g., Ingram 2008, Wiek and Larson 2012, Gober 2013, de Loë and Patterson 2017b, Tortajada and Biswas 2018, Biswas 2019); and the need to improve the ability to draw boundaries for more effective water governance solutions (e.g., Breen, Loring, and Baulch 2018, de Voogt and Patterson 2019, Egan and de Loë 2020). It is worth remarking that the findings of this study are consistent with concepts in other fields, such as policy spillovers in policy studies, which theorize about the interactions between different policy areas (e.g., Kingdon 2003, Ackrill and Kay 2011). The water governance literature is a sub-set of a broader body of scholarship studying governance regarding water issues. Further research exploring concepts such as policy spillovers in the context of the water governance literature could yield further insights on the role of non-water factors.

Third, the finding that water policy-makers already consider non-water factors in their activities, and some engage with them, to various extents, challenges an assumption in the literature that water actors often have a narrow water-centric perspective. This assumption might be more a reflection of the level at which researchers have tended to focus. Water decision-makers at the municipal level ultimately contribute to municipal objectives, not just water ones. Thus, this study contributes another perspective to the literature arguing that water practitioners and scholars frequently use a water-centric perspectives in organizing and analyzing water governance responses to water problems (e.g., UNWWAP 2009, Gupta et al. 2013, de Loë and Patterson 2017b). Fourth, this study adds to the broader literature about the governance of water use reduction in urban municipalities (e.g., de Loë et al. 2001, Wolfe 2008, Furlong and Bakker 2011, Sauri 2013).

Finally, this chapter also contributes to the institutional analysis literature in the ways highlighted by McGinnis (2019) by addressing the need to pay attention to external drivers, represented by the exogenous variables S and ECO in the SESF, and the contextual variables in the CIS. This contribution in turn adds to systematically reflecting on the boundaries of environmental governance systems and situations to improve the rigour of institutional analysis. In the context of understanding the role of non-water factors in water governance situations, this study suggests paying attention to objectives (particularly socio-economic and organizational) as a way to clearly identify and define the governance systems (GS) at play, and their associated actors (GS1, GS2) and institutions (GS5, GS6).

It is promising that water decision-makers have started acknowledging and engaging with non-water factors. However, there is still much to be done in terms of re-framing their messaging and highlighting water's contributions to other sectors, in order to put water higher up the political agenda (Biswas 2019). Further research is required in this respect. Also, while the methodology used in this chapter allowed identifying non-water factors that are already being considered by water actors (to varying extents), further research is needed to find non-water factors that are not being formally acknowledged by water actors, but are nevertheless influencing water governance.

Chapter 3

Non-water factors in water governance and their implications for water sustainability: the case of Ontario's water use reduction policy

3.1 Introduction

The Province of Ontario, Canada's largest province and one of the eight jurisdictions within the Great Lakes Basin, has historically been concerned for water use reduction. Ontario's provincial government began promoting water conservation and efficiency in the late 1980's (Kreutzwiser and Feagan 1989). However, interest waned only a decade later (de Loë and Kreutzwiser 2005). Concern for water quality and quantity resumed after 2000, when an E.Coli outbreak in the community of Walkerton resulted in seven deaths and thousands of serious cases of illness in the community (de Loë et al. 2001). Particularly since 2015, public awareness and concern relating to water quantity in Ontario have grown in response to local, national and international media attention around extraction of groundwater for commercial water bottling (McClearn 2015, Freeman 2016, Balpataky 2018). Controversy relating to Nestle's operations in southern Ontario prompted a review of the provincial water quantity management policy in 2017 "to ensure the fair sharing, conservation and sustainable use of the surface and ground waters" until 2021 to understand if it is "adequate to manage existing or anticipated regional water scarcity due to climate change and population growth" (Fedchun and Brodie-Brown 2017, 7).

This review continued past the change of provincial government administration in June, 2018, and is ongoing. The scope of the review includes revisions to the Ontario Water Resources Act, which governs water allocation and use in the province, and the water use reduction policy developed in response to Ontario's Great Lakes commitments under the previous government (MOE 2020). The regulatory amendments suggested up until the public consultation that took place in mid 2020 included a number of measures within the water sector's traditional remit, e.g., improving public access to water taking data, and enabling municipalities to provide input into water bottling decisions. However, it is not clear that these type of measures will be enough to address the public's concerns over water quantity. This is particularly important as there are other concerns linked to cases such as the Nestle water taking that are not exclusively tied to water. Examples include the presence of large multinationals in small communities, and the creation of jobs by them (Jaffee and Case 2018), promoting a green economy (MOE 2012a), accommodating population growth (ECO 2011), among others. This context raises the possibility of water reduction policies serving other objectives besides reducing water use, which would imply a strong influence of external factors on water governance in this case.

Multiple scales, actors, and drivers are at play in this space. Some relate directly to water governance, while others, such as economic development objectives, can be viewed as peripheral, or outside of a tight framing of the boundaries of water governance. Nonetheless, these external factors, which we refer to as "non-water factors", could be relevant to the creation and implementation of water use reduction policy. Instances of non-water factors are demographic drivers and energy policies. Better understanding the role of non-water factors in water governance can equip water practitioners to more effectively engage and collaborate with actors from outside the water domain, in order to generate additional opportunities to solve water problems, or to achieve water objectives at the core of water governance situations. From this perspective, the purpose of this chapter is to explore the range of non-water factors that influenced the development and implementation of water use reduction measures in Ontario between 2009 and 2018, and to identify opportunities for harnessing these factors to advance water use reduction objectives. Explicit consideration of non-water factors, we argue, is a valuable addition for water governance practitioners' toolkit in the path towards water sustainability. This chapter is part of a larger project exploring non-water factors and water governance at various scales. Thus, attention to the provincial level in this chapter complements a focus on the municipal level (Chapter Two), and on one specific sector with emerging significance for water governance (sustainable finance in Chapter Four) as a potential source of non-water factors.

3.2 Water use reduction measures, and a framework to diagnose non-water factors in water governance

This section is divided into three parts. The first section provides additional context around water use reduction policy in Ontario and the related governance system. The second part sets out our perspective on water sustainability, and the link to conservation and efficiency measures. The third part grounds the main elements leading to the conceptual framework used to identify the role of non-water factors in water governance and their potential to be harnessed to advance water sustainability.

3.2.1 Ontario's policy framework for water use reduction

The cornerstone institutions that originally established Ontario's water use reduction policy framework are the *Water Opportunities and Water Conservation Act* (WOWCA), passed in 2010, and the Ontario Water Conservation and Efficiency (WCE) Program, launched in 2012 and revised annually. Most of the debate shaping the formulation of this policy framework took place between 2009 and 2012. Various actors across the provincial government, non-governmental organizations, and private companies participated in the development of the WOWCA and the WCE Program.

The WCE Program (MOE 2012a) organizes the overarching institutional framework governing efforts contributing to, and benefitting from, WUR in the province. It was established by a Liberal government, which was replaced in June, 2018, by a Conservative government that had campaigned on opposition to many of the Liberal government's environmental and economic initiatives. Nonetheless, the overarching objectives of the WCE Program remain the same even after the June, 2018 election and change of government, and the province continues to report on implementation progress annually. There are five objectives in the WCE program: (1) contribute to long-term sustainable water management that takes into account ecosystem water needs; (2) implement supply and demand management to promote efficient use and conservation of water; (3) improve monitoring and standardize reporting; (4) develop science, technology and research; (5) develop education and information sharing programs for water users. The WCE Program's 2018 update, after the new provincial government took office, contains 56 institutions (legislations, strategies, programs). These institutions relate to water, e.g., the *Ontario Water Resources Act*, and to non-water sectors, e.g., the Building Code. None of the 56 institutions that were updated are dedicated primarily to WUR, but they all either include elements that support WCE measures, or highlight the importance of WCE to achieve their objectives.

The motivation to organize an overarching water use reduction policy in Ontario partly reflects earlier developments in the Great Lakes region, and partly addresses developments across Canada. The WCE Program results from Ontario's commitment under the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (the Agreement) to develop and implement WCE goals, objectives and programs, mandatory or voluntary, for which formal collaboration with local actors started in 2009 (MOE 2012b). Signed in 2005 by all the Great Lakes-St. Lawrence jurisdictions (two Canadian provinces and eight states in the United States), the Agreement addresses the concerns of provinces and states relating to water quantity in the basin, specifically large water withdrawals and diversions, and the impacts of growing population and economy, and climate change on water demand and supply (MOE and MNR 2009). According to the provincial government, Ontario's WCE commitments under the Great Lakes Agreement "are the impetus for moving forward now and developing a [WCE] Strategy for the entire province [which] will build on Ontario's existing legislation, regulations and programs for water management" (MOE and MNR 2009, 13).

The *Water Opportunities and Water Conservation Act* is the second cornerstone institution that originally set up the direction of Ontario's water use reduction policy. The changes introduced by the WOWCA were implemented in the years after its launch. Thus, the WOWCA plays an important role in setting the direction of the Ontario WUR policy. The debates that would later lead up to the Ontario WCE Program informed the WOWCA. The WOWCA was inspired by the Liberal government's *Green Energy Act*, 2009, the primary objective of which was expanding the clean energy industry, as a way to grow a green economy in the province. The WOWCA essentially replicates in the water sector the *Green Energy Act*'s approach, as part of the wider 2010's 5-year Open Ontario Plan to reactivate the economy after the 2008 global recession (Government of Ontario 2010). Noteworthy is that the water users affected directly by provincial water management policies and regulations are those large users taking directly from surface or ground waters, i.e., industries and municipalities. In Canada the provinces are responsible for water resources management, and the municipalities for providing water and wastewater services. Thus, municipalities have their own water conservation and efficiency policies applicable to residents and businesses using their municipal water services, and their policies respond to drivers facing each particular municipality. Likewise, some industries also implement WCE in their facilities responding to various drivers, including demonstrating corporate social responsibility (Council of Great Lakes Industries 2015).

3.2.2 Water sustainability and water conservation and efficiency measures

Increasing water demand and associated wastewater discharges, together with climate change effects on the hydrological cycle, are negatively affecting water quality and quantity, threatening future water availability for humans and ecosystems, and thus global sustainability (Mekonnen and Hoekstra 2011, Rockström, Falkenmark, Allan, et al. 2014). In the context of sustainable development, water efficiency is a central concern. Water use efficiency has gained traction in global water policy and within the global sustainable development agenda; it is a specific target of the Sustainable Development Goal on water (SDG6) (UN-Water 2018a). However, water sustainability entails more than efficient water use. Here we understand water sustainability as "the ability to use water in sufficient quantities and quality from the local to the global scale to meet the needs of humans and ecosystems" (Juwana, Muttil, and Perera 2012, 359), where sustainable water use is "the use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the ecological systems that depend on it" (Gleick 2000, 131).

The literature presents multiple water management and governance approaches with different implications for water sustainability. Historically, supply management has been the dominant water resources management paradigm, predicated on a growth mindset where growing water demand can and should be met with new water supplies, generally via additional or expanded infrastructure, e.g., dams, water intakes, pipes (Winpenny 2005). A new paradigm, demand management, started emerging in the 1980s. Implementing water demand management measures in water supply systems that serve urban populations typically is less expensive than supply management solutions, and has fewer negative environmental effects (Wutich et al. 2014). Water demand management, characterized by water efficiency measures, emerged as a response to increasing pressures of climate change, population growth, and others, over water resources (Gleick 2000, Alias, Boyle, and Hassim 2017). In particular, water efficiency offered to decouple – or at least loosen – economic growth from ever increasing water demand (Gleick 2000).

Water efficiency involves minimizing the amount of water used for a task (Vickers 2001), and relies on technological, economic (e.g., water pricing), and education and information measures to accomplish this goal (Alias, Boyle, and Hassim 2017). Water efficiency's capacity to reduce water use in a way that can improve the resilience of water systems against current, large-scale threats to water quality and quantity, is limited (Rockström, Falkenmark, Folke, et al. 2014). For instance, the use of water-efficient fixtures tends to result in increased water use – a phenomenon known as Jevon's paradox, or the rebound effect – making technological fixes insufficient to maximize water efficiency (Gifford 2011, Batchelor et al. 2014). In practice, water efficiency measures, a trademark of demand management approaches, have generally been implemented as temporary measures and/or complementary to supply management solutions (Xiao, Fang, and Hipel 2018). However, in a context of increasing water scarcity, climate and demographic pressures, "supply management, even when modified by demand management will often not produce sustainable water outcomes" (Wolfe and Brooks 2017, 9).

Alternatively, water efficiency can also be considered a starting point and complementary to water conservation in efforts to reduce water use (Brooks, Brandes, and Gurman 2009, Gilbride and Maas 2012). Especially in the context of water supply for urban populations, water conservation measures are part of the "soft path" water management approach. Water conservation is the beneficial reduction in water use, waste or loss that usually requires changes in tasks to reduce water use (Baumann, Boland, and Sims 1984, Vickers 2001). Along these lines, the "soft path" approach fundamentally questions why any particular water demand exists and how it is fulfilled, thus potentially favouring reuse alternatives (Brooks, Brandes, and Gurman 2009, Wolfe and Brooks 2017). Thus, the soft-path focuses on changing practices as the primary, although not exclusive, means to reduce water use (Brooks, Brandes, and Gurman 2009).

The decision to pursue water supply management, or water conservation and efficiency, policies is influenced by a wide range of factors, including drivers such as population growth, climate change, and broader institutional and political contexts, amongst others (Hornberger, Hess, and Gilligan 2015, Brown and Hess 2017). To illustrate, emphasis on implementation of water efficiency measures, over water conservation measures, as a way to achieve water sustainability, reflects the growing importance of the "green economy" pathway to sustainability (e.g., UNEP 2011, UNEP IRP 2012, 2016), led by multi-lateral organisations such as the UN. This study focuses on non-water factors' influence on the water conservation and efficiency approach taken by Ontario, specifically.

3.2.3 Non-water factors in water governance: a conceptual framework

Water governance is "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society" (Rogers and Hall 2003, 16). This is a widely used definition in water governance studies (Özerol et al. 2018). However, Rogers and Hall (2003) go further and state that these systems are found across two dimensions: the internal and external governance of water, which often go unnoticed in the literature. The internal dimension is "concerned with the functions, balances and structures internal to the water sector" (Rogers and Hall 2003, 17). The external dimension includes influences from various other policy areas, such as politics, and trade among others, that can contribute to, or complicate, the governance of water. From this perspective, water governance also "includes the ability to design public policies and institutional frameworks [which] must have as its goal the sustainable development of water resources" (Rogers and Hall 2003, 16). Thus, Rogers and Hall (2003) highlight the importance of understanding how water decision- and policy-making are shaped by factors in the external dimension of water governance, to contribute to water sustainability.

Concern for appropriately bounding governance systems is long-standing in water governance scholarship. For example, Blomquist and Schlager (2005, 105) argue that "boundaries that define the reach of management activities determine who and what matters. Inside the boundaries, individuals and groups may participate in decision making and have their interests, values, and concerns addressed. Those who fall outside the boundaries have fewer and indirect ways of participating." This perspective is reflected in the work of scholars who seek to better account for how actors, drivers and institutions influence changes in water governance, often with the goal of improving the effectiveness of specific water governance arrangements towards sustainability (Ingram 2008, Wiek and Larson 2012, Gober 2013, de Loë and Patterson 2017b, Tortajada and Biswas 2018, Biswas 2019). Better understanding the role of external factors in water governance can equip water practitioners to more effectively engage and collaborate with actors from outside the water domain (Gober 2013, Cosgrove and Loucks 2015). For instance, the concept of "problemshed" is useful as it allows seeing water problems, and the governance arrangements created to address them, in their wider socio-political context. The problemshed is a socially constructed scale that aims to internalize externalities, where the reach of a problem defines the space(s) and the network of actors involved across sectors and scales (Allan 2005, Mollinga, Meinzen-Dick, and Merrey 2007). To illustrate, the concept of virtual water trade understands the global trade system as a problemshed (Allan 2005). Whilst the problemshed concept has gathered attention by scholars, in practice it is challenging to build institutions around problemsheds, and efforts to operationalize the concept are ongoing (e.g., Daniell and Barreteau 2014, Mollinga 2020). This study presents a framework built around a similar rationale to the problemshed, but following an alternative diagnostic approach. A diagnostic framework enables context-specific enquiry into a problem and its causes, to facilitate tailored solutions and thus improve their efficacy (Ostrom and Cox 2010).

Concern for external factors to water governance is not limited to water scholarship. The UNWWAP's (2009, i) "water box" concept is designed to reveal how the "water sector" is shaped by both internal and external drivers. Two types of forces outside the water box shape what goes on inside: broad drivers of change (e.g., climate change, population growth, technology trends), and socio-economic objectives (e.g., economic development). Thus, if the objective is water sustainability, people in the water sector should recognize that they alone cannot manage or govern water resources, and thus need to work with people from other sectors to better address their impacts over water (UNWWAP 2009).

Rogers and Hall (2003) and UNWWAP (2009) both rely on the idea of the "water sector". Those who belong to the water sector have a mandate, and thus a degree of control and responsibility, over a water issue. Water actors are not in charge of other policy areas, but they have the ability to influence them, to various extents. The Millennium Ecosystem Assessment (2005) classifies factors that drive changes in an ecosystem depending on if decision-makers can influence them or are out of their control. Likewise, the Combined IAD-SES Framework, CIS (McCord et al. 2017, Cole, Epstein, and McGinnis 2019) for institutional analysis, differentiates influences coming from two types of factors: contextual factors, which set the stage for actors' interactions and can be changed by their outcomes; and exogenous shocks, which include wider climate patterns, demographic and technology trends, amongst others, that are out of the control of actors interacting in a specific situation. Contextual factors include categories such as governance systems (which include state and non-state organizations, as well as institutions at various levels), actors, resource systems and resource users. Exogenous shocks include other social, economic, and political settings (including broader demographic, political stability, economic trends), and related ecosystems (including climate and pollution patterns). Thus, the Millennium Ecosystem Assessment (2005) and the CIS distinction of drivers in terms of the actors' ability and potential to influence them is relevant to understand which external factors shaping water governance can actually be addressed by water actors or not.

Building on these perspectives, the main insight that underpins our conceptual framework is the *actors' ability to influence*. The actors' ability to influence is distinguished in two types: control and responsibility over a factor deriving from a mandate vs. the ability to influence without being in charge. Factors refer to actors, drivers, and/or institutions. In that sense, water and non-water factors are defined here as follows:

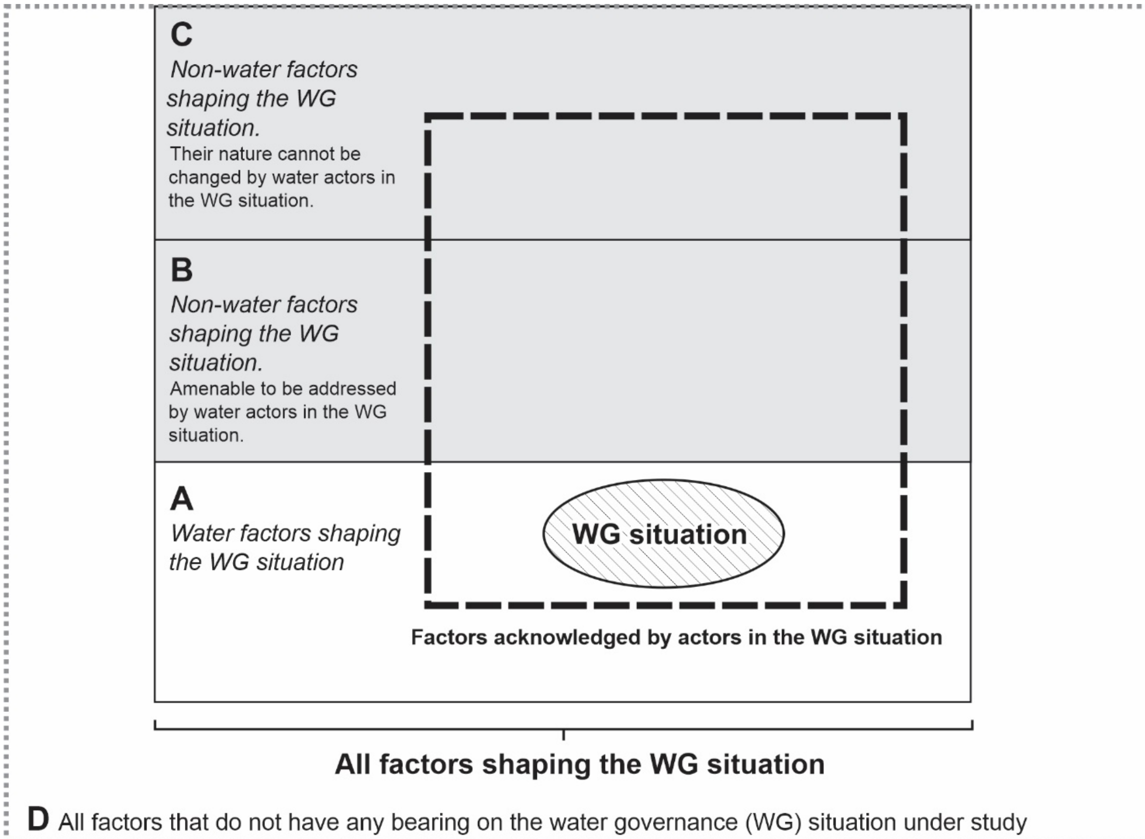
- water factors are factors whose primary purpose (or mandate, in the case of actors) revolves around water resources and/or services. In this context, institutions are the "rules of the game" (North 1990), and include enforceable rules (e.g., regulations, policies) and strategies (e.g., guidelines, plans) (Ostrom 2005).
- "non-water" factors are those whose primary purpose (or mandate, in the case of actors) does not revolve around water, but that nevertheless can influence water governance processes and outcomes. These include broader socio-economic objectives (e.g., economic development) and broader drivers of change (e.g., climate change) (UNWWAP 2009).

This study focuses on non-water factors as a way to understand external factors to water governance. The framework used here (Figure 5) was originally inspired by de Loë and Patterson's (2017a, b) call for the need to rethink water governance by exploring the role of external factors. Our focus is fleshing out what Rogers and Hall (2003) call the "external governance of water dimension", and identifying types of non-water factors that can be influenced by water actors to achieve water policy objectives. In that respect, our framework departs from de Loë and Patterson's (2017a) diagnostic approach in that (i) our framework does not require an in-depth investigation into the internal nature of the water governance situation to identify external factors; and (ii) the water governance situation cannot (or does not need to) internalize external factors because these are captured in the external governance of water dimension. Both (i) and (ii) are possible because of the distinction between water and non-water factors.

Bringing all these elements together, Figure 5 illustrates our overarching conceptual framework. The framework distinguishes between factors that shape a water governance situation (found in areas labelled "A", "B", and "C") from those that do not (found in the area labelled "D"). The factors that do shape the situation belong to the water sector (A), or not (B and C). Thus, B and C make up the "external governance of water" of a specific water governance situation. Non-water factors can be broken down into two types: those that are amenable to be addressed or engaged by water actors in a water governance situation (B), e.g., broader socio-economic objectives; and those whose nature cannot be changed by water actors, i.e. that are beyond water actors' control (C), such as climate change, population growth, technology trends. In the institutional analysis context, Type B factors can be mapped against the contextual factors, e.g., other governance systems, and actors, of the CIS; while Type C factors can be mapped against the exogenous factors in the SES framework Water actors in a water governance situation acknowledge only of the influence of a sub-set of non-water factors (within the dotted line box). The rest of non-water factors in B represent potential opportunities for water actors to tap into.

This study's focus is to understand which non-water factors are shaping the empirical water governance situation under study by interrogating water actors and institutions within that particular situation (i.e., Type B and Type C factors within the dotted line box). As a diagnostic tool, this framework can be applied to analysing situations at various scales, e.g., municipal, provincial, national. This flexibility results because the situation at the core is defined in terms of interactions of interest to the researcher, which can take place at any scale. This diagnostic framework is applicable to a variety of water governance situations, including public policy cases. Public policies are a key instrument used by governments in efforts to steer collective action towards sustainability (Kooiman 2003, Meadowcroft 2007). Thus, policy-making and governance are closely intertwined: a governance system determines who is involved and what issues are prioritized across the policy-making process; while the resulting policies add to the institutional body structuring a governance system (Howlett 2009, Craft and Howlett 2012).

Figure 5: Framework for diagnosing non-water factors in water governance



3.3 Methods

3.3.1 Data collection

Two main, complementary qualitative data collection methods were used: document review, including policies, reports, websites, public letters; and semi-structured key informant interviews. These were supplemented with personal observations by the first author made during the data collection process. Fifty-six documents, including interviews, were collected between April 2018 and July 2019; collection finished when data saturation was reached (Saumure and Given 2008). Most documents were collected in 2018, when the extent of the changes made by the new provincial government administration that took office in June 29th, 2018, to environment-related policies was becoming clearer. In that sense, the Ontario's WUR policy under study is that which was in place until the end of 2018, and does not consider changes made by the new government that took office on June 2018, most importantly, the repeal of the *Green Energy Act* and elimination of WaterTAP, the water technologies promotion agency.

Data collection and the construction of the diagnostic framework took place iteratively, i.e., the focus on non-water factors and the internal/external dimensions of water governance was set before data collection started. The exact differentiation between drivers of change and socio-economic objectives was in place before data analysis started. The approach to data collection consisted of two techniques. First, preliminary research to identify the main institutions defining

Ontario's WUR policy, which are the WCE Program and WOWCA. Second, document collection and interviews took place iteratively. Documents included the WCE Program and WOWCA as such, and background documents that fed into the making of both; these included documents produced and/or commissioned by provincial ministries to inform public discussion about the Program and WOWCA, documents produced by civil society, decisions on those discussion posted in the Environmental Bill of Rights Registry, government speeches, and documents related to the Great Lakes Agreement and WCE goals and objectives, that provide to the rationale behind the Ontario WCE Program. Therefore, most documents, 80%, are dated between 2009 and 2012.

Thirteen interviewees participated in this study. Seven interviewees also provided insights to Chapter Two. The interviewees were identified through the snowball sampling technique (Morgan 2008b) with the initial set of interviewees found through the document review. All of the interviewees were senior officials within their organizations (e.g., managers, directors) working in different aspects related to water conservation and efficiency, to various extents. Of the 13 interviewees in this study, nine were active members of Ontario government agencies, civil society and private sector directly involved or knowledgeable about the development of the WCE Program and WOWCA, who provided more depth to the data that was publicly available. Four of the interviewees were knowledgeable about broader water quantity debates in Ontario and in the Great Lakes region, which provided context. Semi-structured interviews were useful to guide the conversation while allowing flexibility for new angles to emerge and minimize conceptual framework bias (Mason 2004). Finally, personal observations were recorded about the rest of data and the data collection process itself.

3.3.2 Data analysis

The conceptual framework categories served as a guide in a largely deductive approach to content analysis (Hsieh and Shannon 2005). QSR NVivo 10 software supported content analysis with data organization and coding. The analysis procedure consisted of two rounds: non-water factors were first classified according to the framework's categories, and then their links and implications for water policy-making were analyzed.

In the first round of analysis, passages from all types of documents (including interviews and observations) containing non-water factors were identified and coded under third- or second-tier nodes of the coding tree, which reflected the conceptual framework. The coding tree comprised two first-tier nodes: (B) non-water factors amenable to be addressed by water actors in a water governance situation, and (C) non-water factors beyond water actors' control. The second-tier nodes included the UNWWAP (2009) categories "socio-economic objectives" and "drivers of change" under (B) and (C), respectively. The second-tier also incorporated "other addressable factors" under (B), as well as "other factors beyond water actors' control" under (C), to account for other type of non-water factors unforeseen in the literature. Finally, third-tier nodes included, as starting points, the most cited factors in the literature ("climate change" under drivers of change, and "economic development" under socio-economic objectives), and further third-tier nodes were added as they appeared in the data. The framework thus, allows for new types of factors emerging from the data to be accounted for across all tiers of the coding tree.

In terms of how the coding-tree was used in the coding process, first, a deductive approach took place, followed by an inductive approach. A passage was coded directly at the third-tier node level if they were related to socio-economic objectives or drivers of change (i.e., deductive approach). For instance, the WOWCA and supporting documents argue in several passages that pursuing water conservation and efficiency through promoting clean technologies locally can also contribute to creating local jobs. This type of passages reflected an economic development driver, and were coded under the "economic development" third-tier node, which belongs within the "socio-economic objectives" second-tier node. If the passage pertained to another type of non-water factor, then it was provisionally placed in one of the second-tier nodes "other addressable factors" or "other factors beyond the control of water actors", following the endogenous vs. exogenous logic borrowed from the CIS framework and the Millennium Ecosystem Assessment definition of drivers, as explained in Section 3.2.2. Once all documents were coded, the passages in these "other" nodes were grouped with other similar passages to form new categories (i.e., inductive approach). This is how the "water users' cost-saving rationale" factor emerged from the data (see Section 3.4.2). In summary, the UNWWAP (2009) concepts of "socio-economic objectives" and "drivers of change", the CIS endogenous vs. exogenous logic, and the Millennium Ecosystem Assessment definition of drivers, together provided the parameters to code passages at the third and second-tier nodes. It is important to restate that because our focus is in non-water factors as defined in our conceptual framework, "water factors", i.e., Type A factors, were not coded as part of this research.

The second round of analysis involved creating two tables, one for each first-tier node, which listed the non-water factors found and synthesizing their links and implications for Ontario's WUR policy, according to the data. Tables 10 and 11 summarize the results. It is worth noting that this data collection and analysis method tracks the acknowledged non-water factors (the dotted line box, rather than the whole of B and C in Fig.1). Acknowledgement of non-water factors was taken as evidence of their shaping Ontario's WUR policy-making, to various extents. Then, conceptual framework-led analysis qualified the nature of the influence of such factors.

The empirical units of analysis are the two cornerstone institutions defining the provincial WUR public policy: the WOWCA and WCE program. In this sense, the provincial WUR policy can be understood as a network of two situations where water and non-water actors and institutions, government and non-governmental actors located across different scales (e.g., the Great Lakes Agreement, the Green Energy Act), interact across the external and internal dimensions of each situation. Data documenting the policies capture the issues taken into account in the policies formulation and implementation, and the outcomes of such processes, as instances of water governance arrangements. In that sense, the core "water actors" in the overarching WUR situation are the provincial officials in the water resources departments. WUR as a public policy, is an objective spearheaded by water provincial officials, with the support of provincial officials in other areas, civil society organizations and actors in the cleantech space, particularly water technology companies. However, these actors, while supporting the overarching water use reduction objective, had different ideas about how to achieve such objective. Section 3.4 discusses this in more detail.

3.4 Results

The focus in this section is on non-water factors relevant to the development and implementation of Ontario's provincial-level water use reduction policies and programs. These are presented here according to the conceptual framework's B and C categories: amenable to be addressed by water actors (Type B), and beyond water actors' control (Type C). Water factors, i.e., factors whose primary purpose (or mandate) revolve around water resources and/or services, that shaped the water governance situation– which would be categorized as "Type A" in the framework – were identified and discussed previously. These included the two main institutions that define Ontario's WUR policy: the WCE Program and WOWCA, as well as the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement, for instance.

3.4.1 Type C Factors: Non-water factors beyond the control of water actors in a water governance situation

The most mentioned Type C factors bearing on the WUR policy framework across sources are two drivers of change climate change and population growth, as defined by UNWWAP (2009). Both factors drive the need for water use reduction, and thus to establish a policy that promotes it as a way to deal with their implications. Table 10 lists the factors and their link to Ontario's WUR policy. Other factors mentioned were broad urbanization and employment trends, but they were mentioned only once each.

Table 10: Main non-water factors in Ontario's water use reduction policy: factors beyond the control of water actors in a water governance situation

Type C factors	Link to Ontario's WUR policy
Climate change	Adaptation to this factor drives the need for WUR policy. WUR policy updates have to adapt to these factors evolving impacts over water quantity and quality.
Population growth	Factor drives the need for the policy, as a way to secure enough water supply to accommodate growth.

Climate change is widely acknowledged in documents from across all types of actors (government, civil society organizations, etc.) across documents and interviews, as part of the rationale for needing WCE. Across the documents, there was an understanding that climate change can impact water availability in Southern Ontario via increasing evaporation and weather variability. Thus, WCE policies are seen as part of adaptation and mitigation responses. This is illustrated by Maas (2009b, 20): "implementing water efficiency measures now can help make ecosystems and communities more resilient to long-term risks and reduce the vulnerability of all sectors to the impacts of a changing climate". Likewise, Jones and Henderson (2010, 12) express that climate change can "have a dramatic impact on the water supplies that are "mission critical" to sustaining regional economies and social prosperity", making climate change one of the drivers for jurisdictions to develop policies promoting water efficiency and clean water technologies. In the MOE (2012a) climate change as a driver mostly appears in programs related to promoting a green economy, part of a broader economic development objective.

All types of actors in the evidence, across documents and interviews, expected population to grow in Ontario, in the Great Lakes basin and surrounding areas, and they expected that this will put pressure on provincial and regional water supplies. For instance, Interviewee 13 notes that, regarding water quantity, "there are some parts of the province where there's not as much water as the demand, or at least in the future with population and employment growth". In the MOE (2012a) specifically, population growth as a driver mostly appears in programs related to land use and urban growth planning. Whenever population growth was acknowledged as a driver across our data, water use reduction appeared as a response. This is clearly illustrated by the ECO (2011, 88): "many communities in Ontario are currently experiencing pressure to accommodate expanding populations […] Water conservation measures can reduce the demands on both the local drinking water treatment plants and the sewage treatment plants, helping to extend the life of existing infrastructure and deferring, or even avoiding, the need for costly expansions and upgrades". Population growth driving the need for the WUR policy as a way to secure water supply to accommodate growth reflects a demand management approach to water use reduction.

In summary, according to MOE and MNR (2009, 6), "developing a [WCE] strategy" in Ontario is a way of dealing with pressures created by "population growth, increasing water consumption and the impact of climate change [which] are all creating challenges and stresses on the quality and quantity of the province's water". WCE is posed as the most cost-efficient way of ensuring water supplies for a growing population, and even more so in a climate change context, according to the majority of the interviewees.

3.4.2 Type B Factors: Non-water factors amenable to be addressed by water actors in a water governance situation

Five Type B factors were acknowledged in the data to affect Ontario's WUR policy (Table 11). Four of them are better described as sustainable development objectives, instead of the original conceptual framework's category name "socio-economic objectives", although the underlying definition is the same. Economic development is by far the most important Type B factor: it was the only factor explicitly portrayed as crucial in the evidence (details after table 11), and it appeared the most across interviews and all types of documents. The fifth Type B factor, "cost-saving rationale" expected from public or private water users, emerged from the data, originally coded under the "other addressable factors" second-tier node in the coding tree. The cost-saving rationale follows economic development in importance in terms of appearance across different types of documents. Table 11 shows the five Type B factors and how they link to Ontario's WUR policy, according to the data.

Table 11: Non-water factors in Ontario's water use reduction policy: factors amenable to be addressed by water actors in a water governance situation

Category of factor	Type B factors	Link to Ontario's WUR policy
Sustainable development objectives	Economic development	• Policy contributes to factor (aims to create demand for water technologies, which in turn create green jobs) • Factor drives policy to adopt a water demand management approach (emphasis on technological fixes)
	Greenhouse gas emissions reduction	• Policy contributes to factor (by reducing water's energy usage) • Factor shapes policy (e.g., requiring joint water and GHG emissions reporting) to contribute to policy
	Sustainable urban growth and infrastructure development	• Policy contributes to factor (by protecting water bodies supporting future urban growth and their green areas) • Factor contributes to policy (by requiring water efficiency measures in their sector)
	Biodiversity and ecosystems protection	• Policy contributes to factor (by contributing to habitat protection) • Factor contributes to policy (by requiring WUR measures in their sector)
Other	Water users' cost-saving rationales	• Policy contributes to factor (by facilitating savings) • Factor contributes to policy (by making WCE appealing to all users) • Factor drives the need for WCE (particularly for the province and municipalities, as a way on saving on water management costs)

The most influential non-water factor in framing Ontario's WUR policy is "economic development". This common perspective is well captured by Interviewees 13 and 20, two senior provincial officials, who called this the "ultimate driver". At the Great Lakes level, the Agreement related documents recognize that "efficient use and conservation of our water resources can […] enhance economic viability and competitiveness of the region" (GLSL Regional Body 2007, 1), and that "[f]ailure to manage Basin waters responsibly would put future economic growth at risk" (CGLG 2006, 3). In Ontario, the economic development objective is so crucial for the WUR policy that this policy can even be considered an economic development one. This is illustrated by the ECO (2011, 88), "the primary motivation for introducing the WOWCA was economic and job growth, a secondary, but important objective of the Act is to promote water conservation". Interviewee 22 agrees, "the object of the [WOA, part of the WOWCA] is about the future and sustainability of water in the province, but […] the way it's manifested is in water technologies that achieve that goal […], in a very specialized economic development group". Likewise, Interviewee 20 summarizes the intent of the WOA: it was to set the frame to "how we drive this economic opportunity and sustainable water management opportunity at the same time". Many changes introduced by the WOWCA (e.g., changes to the Building Code include requirements for water efficient fixtures in all buildings) were to foster demand for technologies, where the intent was to create policies that would encourage a context for water technology companies to flourish. In this sense, WCE measures can promote WUR and economic development: according to the MOE and MNR (2009, 14) "tools that not only reduce water use but also improve Ontario's economic competitiveness" are important because "sustainable water supplies are also fundamental in placing Ontario among the world's leading places to do business".

The analysis revealed the growing global demand for water technologies and services as an opportunity for local economic development. Documents and interviews across different types of actors suggested supporting innovation and local water technology companies can create green jobs. This perspective was mainly espoused by the government and private sector actors: after the 2008 recession, and the Green Energy Act intent to create jobs in the clean energy industry, the Ontario government declared that "the next frontier in the green economy is water. More specifically [sic], water technologies and services to help people around the world conserve their clean water and clean up their polluted water" (Government of Ontario 2010). Interviewee 23 stated that civil society also appealed to the green economy because it offered "opportunities and ideas for getting our government to take [WCE] more seriously". According to the government, the global water technology market represented "a tremendous Ontario opportunity" because of its size ($400 billion doubling every 5 or 6 years), and Ontario's growing clean water industry, the largest sub-sector of the province's environmental industry (Government of Ontario 2010).

In summary, the data portrays the WUR policy's intentions (i) to increase the local demand for water technologies and services, by "recognizing […] that market opportunities depended on putting some of the right drivers in place in a policy, legislative context" (Interviewee 20), i.e., by raising the policy and regulatory requirements for WCE by water users; and (ii) to encourage technological solutions that could help solve local water problems, including contributing to WCE. However, these did not fully materialize. According to the ECO (2017) and Sandhu (2018), while the WOWCA bestowed the provincial government with powers to further regulate water users' WCE, many regulations did not materialize leaving the WUR policy aspirational in nature and unambitious in practice, without much power to change water users' practices and thus spur demand for WCE technologies. According to Interviewee 11, "the biggest opportunity exists on the book right now: the wastewater discharge regulations, but they don't enforce them", or change them from concentration to contaminants mass, to facilitate WCE practices. Because technology adoption is a challenge in Ontario, companies develop their technologies targeting demand abroad and local water resources do not necessarily benefit. Supporters of the technology approach recommend "Ontario […] must align and integrate existing and future water policies and programs with its economic development priorities [to] protect Ontario's water resources and support economic development of Ontario's water industry" (Jones and Henderson 2010, 29).

The second main non-water factor is the "cost-saving rationale" of water users, including the province and municipalities (e.g., savings for taxpayers, efficiency in public budgets) and businesses (e.g., savings in costs associated to water use, including energy costs). The GLSL Regional Body (2007) and the MOE and MNR (2009) present WCE practices as a strategy to reduce long-term water and wastewater infrastructure costs by deferring upgrades. Jones and Henderson (2010, 12) state that there is "the need for increased efficiency and the implementation of innovative and sustainable water technologies and solutions" as operating costs (water, energy, and other inputs) rise. Maas (2009a, 1) captures it well: WCE "is the most economical source of new water". The OWC Alliance (2010, 1) agrees: "it is far cheaper to fix inefficiencies than to build new infrastructure”. Civil society also mobilized this factor to advocate for economic instruments to promote WCE: for instance Maas (2009c, 31) suggested to “make [WCE] a condition for provincial and federal support” for water infrastructure, and Maas (2009d, 1) favoured “encouraging volume based pricing”. Interviewees 14 and 22 also expressed another aspect of the cost-saving rationale: the expectation that the new provincial administration would cut funding to the water innovation area as part of a province-wide red tape cutting program.

Three additional factors were identified through the document analysis, but did not arise as drivers during the interviews. The first is the “greenhouse gas emissions reduction” objective. Its relationship to WUR policy is well illustrated by GLSL Regional Body (2007, 1): “efficient use and conservation of our water resources can […] support reductions in energy use and greenhouse gas emissions”. For instance, the ECO (2011, 92) highlights that the WOWCA amended the Green Energy Act “to require the provincial government to consider [WCE] (in addition to [existing] energy efficiency and greenhouse gas emissions) when constructing, acquiring, operating and managing government facilities”. Thus, the government leverages the water-energy nexus to raise awareness of the importance of WCE for GHG emissions reductions, thus contributing to both.

The “sustainable urban growth and infrastructure development” factor appeared predominantly in the WCE Program. According to the program (MOE 2012a), WUR contributes to achieve this objective in two respects: by protecting the hydrological features of protected areas surrounded by urban growth areas, e.g., the Greenbelt, the Niagara Escarpment, and the Oak Ridges Moraine; and by protecting water bodies supporting the future growth of designated urban areas, e.g., the Greater Golden Horseshoe Growth Plan. Likewise, elements related to this factor contribute to WCE: Maas (2009c, 9) says the Building Code requires “water efficient plumbing fixtures in buildings constructed after January 1st, 1996”, and the ECO (2011) states that the WOWCA amended the Building Code to also require that WCE standards are reviewed and updated periodically. McClenaghan (2010) reports that civil society hoped for green infrastructure to be explicitly included in the WUR policy, but this did not happen.

Finally, the “biodiversity and ecosystems protection” factor was portrayed in the data to have a bidirectional relationship with Ontario’s WUR policy. This perspective is summarized by the GLSL Regional Body (2007, 1): “efficient use and conservation of our water resources can […] minimize impacts of water use to support healthy aquatic ecosystems of the Great Lakes […] Basin” that can benefit flora, fauna, and communities. Maas (2009c, 8) echoes this: “keeping sufficient water in watersheds, wetlands, and aquifers is critical to ensuring ecosystem function and health. Functioning watersheds provide valuable ecosystem services such as purification, flood protection, and habitat. Every litre of water saved represents additional water available to maintain these critical ecosystems and the services they provide”. The WCE Program includes the Ontario’s Biodiversity Strategy, the Crown Forest Sustainability Act, and the Species at Risk Stewardship Program. Other Program components, such as Ontario Parks Water Conservation Initiatives, consist of low-flow fixtures and leakage minimization, contributing to water use reduction.

3.5 Discussion and conclusions

This section starts by summarizing the main non-water factors found at play in the case of this specific water governance situation, and how they influence the situation. It then discusses how a water policy can be used instrumentally to meet other non-water objectives, and examines multi-level interactions with other governance systems. The section concludes by highlighting the contributions of this work to the water governance literature.

The overarching finding of this work is that non-water factors influenced the governance of water use reduction in Ontario, through their impact on Ontario's WUR policy, to the extent that this policy cannot be fully understood without understanding the main non-water factors at play. The non-water factors identified in this study played a role in policy formulation, decision-making, and implementation, three of the commonly-identified phases of the public policy making process (Howlett and Cashore 2014). The data presented three types of relationships between non-water factors and the WUR policy (Table 12):

- factors drive policy formulation and decision-making, i.e., the need for the policy (the case of both Type C factors, and the cost-saving rationale), or influence the policy implementation approach (e.g., economic development shapes the policy to adopt a water demand management approach);
- factors contribute to achieve the policy by promoting WCE in their respective sectors;
- WUR policy contributes to achieve non-water focused objectives.

Table 12: Non-water factors driving Ontario's water use reduction policy and policy-making

<table>
<tr><th colspan="2">Non-water factors</th><th>Driving policy formulation and decision-making (*) or policy implementation (**)</th><th>Contributing to WUR policy</th><th>WUR policy contributes to factor</th></tr>
<tr><td colspan="2">Beyond water actors' control (Type C)</td><td>• Climate change *
• Population growth *</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="2">Amenable to be addressed by water actors
(Type B)</td><td>Sustainable development objectives</td><td>• Economic Development (green economy)**
• GHG emissions reduction**</td><td>• Sustainable growth
• Biodiversity</td><td>• Economic development (green economy)
• Sustainable growth
• Biodiversity
• GHG emissions reduction</td></tr>
<tr><td>Other</td><td>• Cost-saving rationale*</td><td>• Cost-saving rationale</td><td>• Cost-saving rationale</td></tr>
</table>

Non-water factors, specifically Type B (Tables 11 and 12), show a bi-directional relationship (Table 12) with the WUR policy (i.e., contribute to, and are supported by, WUR policy). This confirms that B, in the framework in Figure 5, is the space of opportunity where water actors can engage with non-water ones to search for win-win situations. Our analysis revealed the following relationship patterns in the case of this specific governance situation:

- When WCE serves other objectives, it works as a tool or solution to address challenges in, for instance, biodiversity (where WCE contributes to maintaining the habitat for species to thrive).
- When the non-water factors contribute to WCE, they do so by requiring (or advising) specific sectors to manage their water impacts. Such is the case of the Crown Forest Sustainability Act, which requires forest operations to manage their water impacts.
- Non-water factors shape WCE policy in the cases of economic development (it drives policy to adopt a water demand management, rather than a conservation, approach), and GHG emissions reduction (by requiring joint reporting of GHG emissions and water use reductions).
- The water users' cost-saving rationale is the only factor that can drive the need for WCE policies, but is strong enough to do so in the case of government agencies or municipalities (particularly in the latter, which are responsible for providing water services to the population). This rationale does not necessarily drive the need for WCE measures for individual businesses, unless their water-associated costs are large.

A key implication of our findings is that a water policy can be used to achieve other non-water objectives. A non-water factor can be so determinant over water policy that the water policy can end up primarily serving a non-water objective, raising the question of what we consider a water policy in the first place. This helps explain why some water policies end up falling short of meeting their proposed water objectives. That is the case of the role of the economic development factor in Ontario's WUR policy. The WUR policy's main purpose in practice is to contribute to economic development. This is reflected in the policy's emphasis on fostering local water technology companies, which, besides creating jobs, was expected in turn to favour an improved and more efficient water management locally. However, supporting the water technologies development was not accompanied by regulations or measures to directly incentivize reduction of water use. Therefore, local users did not create the local demand required to adopt the new technologies in the first place.

The influence of the economic development factor is clear in Ontario's WUR policy in that it has adopted a demand management approach centering on water efficiency, specifically on water efficient technologies and fixtures. While both WOWCA and the WCE Program talk of water conservation and efficiency, a closer look indeed reveals that their emphasis in practice is on water efficiency only, i.e., the policies do not question behaviours, water uses or allocations. For instance, four WCE Program's objectives explicitly reflect a demand management approach: complement supply management, clean technologies development, access to information and water use data, education for water users. Only one of its objectives seems to reflect a water conservation approach, by referring to sustainable water use and management and considering the ecosystem's water needs, but the detail still reflects an emphasis on water efficiency.

In relation to WUR itself, the policy is weak in that the powers the policy grants the provincial government to promote water users' WCE have not materialized. While the province acknowledges water as an important resource, practical measures to protect water are lacking (Sandhu et al. 2019). This has implications for water sustainability. If the primary purpose of the WCE policy is economic development, then this can partly explain why the WCE policy is weak in contributing to water sustainability: even further regulations and measures directly promoting water efficiency practices (instead of an indirect approach to promote them) are not in place, and ultimately its water efficiency approach overshadows water conservation. In both cases, the sway of this non-water factor over Ontario's WUR policy can hinder its contribution to water sustainability, as espoused by water conservation and a soft-path paradigm.

Changing policies towards a water conservation approach requires changing the mindset of water policy-makers and managers to see different ways of using water, and discern the socio-economic and political institutions that hinder the conception and implementation of water conservation policies (Brooks et al. 2015). Understanding the role of non-water factors can enhance the process of policy change to one more conducive to water sustainability in the long term, by helping water policy- and decision-makers see water differently: it brings to the fore the inherent interactions of water with other sectors, instead of seeing water as an isolated sector or resource to be controlled.

This analysis of non-water factors highlights that there is a need in Ontario for institutional change, specifically, to reframe the current WUR policy to be more responsive to water problems and to address water use reduction more directly. Type B non-water factors already at play can also be leveraged in this effort. For instance, policy-makers changing the WUR's policy emphasis towards water conservation could resort to institutions and actors related to non-water factors that benefit from water conservation, such as the biodiversity and GHG emissions reductions objectives. Highlighting and enabling co-benefits of water conservation for several sectors could strengthen the support for water conservation policies across government and water users.

In terms of the Ontario WUR policy as a water governance situation, the evidence showed that the WOWCA modified institutions in other sectors to include WCE measures that would advance the WUR policy, in the case of the Building Code; and that would be of mutual benefit, in the case of the Green Energy Act. In that sense, the evidence suggests that the GHG emissions reductions and the sustainable urban growth and infrastructure development objectives are being proactively engaged and mobilized by water actors in the water governance situation to advance their policy objective. Further research that looks inside the water governance situation is needed to understand in more detail the dynamics between non-water factors being actively mobilized and the water governance situation. While WUR and economic development policies in Ontario are very closely related, it is ultimately economic development actors the ones engaging water institutions as tools to advance their economic development objective, rather than the other way around. Thus, more can be done to harness the co-benefits between WUR and all the Type B factors.

As seen in this study, the influence of a non-water factor can be as high as to make a water policy serve primarily a non-water objective. This insight raises the question about what we understand as "water policies", and their nature. Based in the non-water factors found, and their relationship to the WUR policy, a water policy could be a policy that governs a water resources or services objective, and/or a non-water objective using a water tool. But does using a water tool make a policy a water one? According to our definition of water factors, no, but the use of a water tool (e.g., reducing water use to reduce GHG emissions) would still impact water management, and thus water. Hence, it is relevant to question the nature of seemingly water institutions in further detail.

Regarding multi-level interactions, sustainable development objectives at play are pursued at the same level of the water policy objective (in this case, the provincial level), but the governance systems in which the objectives are pursued span multiple levels, connecting local water situations with international dynamics. All Type B factors identified here as sustainable development objectives are other public policy objectives pursued at the provincial level. As mentioned in Section 3.2.2, Type B factors can also be understood in terms of the “contextual factors” in the CIS framework of institutional analysis. This perspective helps us see that our focal water governance situation is influenced by several governance systems. Each sustainable development objective is pursued in its own governance system. While these other public policy objectives are pursued at the provincial level, as is the objective at the core of our focal water governance situation, elements within those governance systems operate at different levels, i.e., their activities are not necessarily constrained at the provincial level. For instance, actors promoting the water technology ecosystem in Ontario, e.g., water technology investors, water technology developers, involved primarily in the governance system around the economic development objective, were Ontario- based but active in international markets (e.g., Jones and Henderson 2010). The implication of this for the water governance situation under study is that, while the sustainable development objectives per se are pursued at the provincial level, the governance systems in which they are pursued span levels, thus connecting the local situation to influences playing out at other levels, including the international. This observation serves to clarify that Type B factors, amenable to be engaged by water actors, refer in this case to the sustainable development objectives per se, i.e., the institutions directly defining them and the main actors responsible to steer them. Type B factors in this case do not refer to the overarching governance systems within which the objectives are pursued. In that sense, the form in which water conservation and efficiency plays out locally, not only reflects provincial dynamics, but also dynamics at the international water technology markets, for instance.

In conclusion, our aim was to identify which types of non-water factors can be harnessed by water actors to contribute to achieving water objectives, particularly water sustainability, through exploring the range of non-water factors that influence the governance of WUR in Ontario,. In the case of Ontario’s water use reduction policy, non-water factors such as climate change and population growth drive the policy formulation and decision-making, and influence its implementation approach towards a water efficiency focus (economic development). Non-water factors can also contribute to achievement of water use reduction goals by promoting water use reduction in their respective sectors (e.g., sustainable growth and infrastructure development factor). Likewise, the WUR policy can also contribute to achieve non-water objectives (e.g. biodiversity and greenhouse gas emissions reductions). In that sense, non-water factors can open opportunities for water policy-makers to strengthen the water conservation component of water use reduction policies and contributing to water sustainability, by building cross-sectoral support for water conservation based on the benefits that water conservation brings to other sectors (e.g., biodiversity protection, greenhouse gas emissions reductions). Non-water factors amenable to be addressed by water actors (Type B factors) can pose opportunities for finding win-win situations.

The insights from the Ontario case contribute to the literature calling for the need to further understand the role of external factors in water governance (e.g., Ingram 2008, Wiek and Larson 2012, Gober 2013, de Loë and Patterson 2017b, Tortajada and Biswas 2018, Biswas 2019). This study fleshes out Rogers and Hall's (2003) "external governance of water" dimension into non-water factors amenable to be addressed by water actors (Type B factors), or beyond the control of water actors (Type C factors). In this sense, this study argues that non-water factors are part of the "external governance of water" dimension of a governance situation, and that this dimension is important in shaping the formulation and implementation approach that water policies take to reach their objectives (e.g., water use reduction policies adopting water efficiency rather than a water conservation approach). Non-water factors can thus influence our path to water sustainability (or away from it), in this case represented by the water conservation approach, by defining an enabling (or hindering), institutional framework. Insights from this analysis also add to the literature about the governance of water quantity in Ontario (e.g., Kreutzwiser et al. 2004, Mitchell et al. 2014, Sandhu et al. 2019).

An important implication of our study is that non-water factors can have such a high level of influence over a water policy that the water policy can end up primarily serving that non-water focused objective, i.e, water policies can be used instrumentally. In the Ontario WUR policy case, this insight helps explain why the policy is considered to fall short on its water efficiency, and particularly water conservation, claims, thus constraining this policy's contribution to water sustainability. In that sense, this insight raises the question about what we understand as "water policies". Based in our findings, a water policy could be a policy that governs a water resources or services objective, and/or a non-water objective using a water tool. It is important to further develop the concept of "water factors" to add more nuance to our understanding of what "water policies" entails, to more clearly differentiate when a policy's objective is targeted to solve a water problem, compared to a policy using a water tool to solve other problems. This differentiation is relevant to better account for interactions of water with a variety of non-water factors (e.g., broader societal goals), and thus better direct policies, and related water governance arrangements towards water sustainability. The water factors definition posed in this chapter is a starting point that requires further exploration.

Chapter 4

Accounting for sustainable finance in water governance situations in the context of the transition to a low-carbon economy

4.1 Introduction

Some of the main current debates in the water governance literature include the issue of scale, i.e., the scale at which water problems can best be addressed and water governance should be organized, and the growing importance of markets in water governance arrangements (Woodhouse and Muller 2017). Traditionally, governance of water problems has been approached and framed from a water-centric perspective. Hydrological features, such as the watershed, have been a common boundary for organizing water governance arrangements in jurisdictions around the world (de Loë and Patterson 2017b).

The usefulness of traditional water-centric framings of water governance has been questioned in the context of growing complexity of water problems (Moss and Newig 2010, Huitema and Meijerink 2014). Drivers at various scales, including global megatrends such as climate change, population growth patterns, and economic trends (e.g., economic growth, transnational trade, the increasing impact of environmental risks on financial performance of companies and investors) are driving water use, and shaping the ability of people in the water sector to achieve desired water-related outcomes (Rogers and Hall 2003, UN World Water Assessment Programme 2012, Gupta and Pahl-Wostl 2013, de Loë and Patterson 2017a, Biswas, Tortajada, and Rohner 2018).

Despite the many interconnections, water actors have tended to tackle water problems with tools and approaches located within the "water box" (UNWWAP 2009). This approach has limitations, as evidenced by slow progress on Sustainable Development Goal (SDG) 6 (UN-Water 2018b). Engaging with actors, institutions and drivers outside the water sector may afford opportunities to achieve water policy objectives, for example, by harnessing the value that water has for actors in other sectors to achieve their own objectives (Gober 2013, Cosgrove and Loucks 2015, de Loë and Patterson 2017b). To illustrate, water underpins most sustainable development goals, including clean industrialization (SDG9) and sustainable economic growth (SDG8) (UN-Water 2016, 2018a). Reflecting growing awareness of these relationships, water governance scholars have identified the need to account for how non-water actors, institutions, and other forces drive changes in water governance (Ingram 2008, Wiek and Larson 2012, Gober 2013, de Loë and Patterson 2017b, Tortajada and Biswas 2018, Biswas 2019). Crucial in this effort is improving our ability to make boundary judgments that allow those engaged in water governance to appropriately consider significant external factors (Blomquist and Schlager 2005, de Loë and Patterson 2017b, Dennis and Brondizio 2020).

The financial sector is a source of "external" drivers that have long been of interest to people involved in water governance. For instance, many recent institutional reforms in the water sector focus on market mechanisms that facilitate the entrance of powerful actors via privatization or similar arrangements (Cesano and Gustafsson 2000, Castro 2007, Ruiters and Matji 2015, Furlong 2019). Water crises and other environmental risks have risen to the top 10 global risks in terms of likelihood and impact in the last few years (World Economic Forum 2016, 2017, 2019), and thus have captured institutional investors and corporations' attention. These actors' increasing engagement with environmental issues pose new challenges to the sustainability of water and its governance (Hepworth 2012, Larson et al. 2012, Daniel and Sojamo 2012, Conca 2015). Besides risk management, water and the environment are increasingly seen as opportunities for financial returns. To illustrate, the financialisation of water is an emerging practice, part of a broader financialisation of the environment trend, which consists of the financial sector investing in environment related activities and financial instruments such as exchange traded funds and conservation finance to generate returns (Bayliss 2013, Sullivan 2013, Weber and Feltmate 2016a, Clapp and Stephens 2019).

Sustainable finance, a sub-sector of the finance community, has received less attention in the water governance literature. It is important to pay attention to this growing sector, in the context of the great need of funding, beyond public finance, to achieve SDG6 globally (Hutton and Varughese 2016). The sustainable finance field comprises financial services aligned with the SDGs and the Paris Agreement (UNEP Inquiry 2017). Public investment may not be enough to achieve the SDGs, and many actors, including environmental NGOs, encourage private investment into projects aimed, for instance, to improve water supplies and ecosystems, by promoting bankable projects that attract private investors (e.g.,WWF, BCG, and ING 2018, WWF 2018). Policies and institutions that enable both accessing private finance and enhancing the capacity of the water sector to absorb private finance are important for improving the sustainability of the water sector (Alaerts 2019). While there has been attention to the relationship between finance and water, there is a need to account in particular for how institutional investors contribute to sustainable water use, because they are an important actor not considered in current water management discourse (Hogeboom, Kamphuis, and Hoekstra 2018). This is important given that the "longer-term interests of the water and financial sectors will converge" in the context of climate change adaptation and climate-related risks management (Alaerts 2019, 1). Sustainable finance, a fast growing segment of the financial markets (UNEP Inquiry 2017), would provide a focused examination of the relationship between finance and water.

In this study, we explore how we can account for relevant sustainable finance (SF) factors in specific governance solutions to water problems. To do this, we developed a two-staged diagnostic approach to identify which SF factors currently or potentially link to water governance situations, with the purpose of identifying potential opportunities to contribute to achieving water objectives, such as water policy objectives, or solving water problems. Diagnostic approaches allow for context-specific enquiry, and are increasingly being used to assess water governance boundaries (e.g., Garrick et al. 2013, Hinkel et al. 2015). In this study, we argue that sustainable finance has great potential to significantly drive future decision-making around municipal water supply in the context of the water sector's chronic underfunding, and the global efforts to transition to low-carbon economies. Thus, SF is an area that water governance scholars and practitioners need to take into account when creating governance arrangements to address water problems. Examples of possible connections include activities such as financing water infrastructure and corporate water risk management that can drive (directly or indirectly) water governance processes and outcomes, such as water policies. We explore this question in the case of two water policy objectives in Ontario, each broadly reflecting opportunity and risk management, two important considerations in the SF domain. The policy objectives are the financial sustainability of water systems, and industrial water use reduction, which aim to contribute to water sustainability.

We use public policy cases along the lines of others who have also used them to study external factors to water governance (e.g., Breen, Loring, and Baulch 2018, de Voogt and Patterson 2019). Public policies are a key instrument used by governments in efforts to steer collective action towards sustainability (Meadowcroft 2007, Kooiman 2003). However, with the growing participation of non-state actors in policy-making processes, policy outcomes can be better understood as the "result of governing processes that are no longer fully controlled by the government, but subject to negotiations between a wide range of public, semi-public and private actors" (Sørensen and Torfing 2007, 3). Thus, studying a policy case provides insights about governance, particularly in terms of the actors, drivers and institutions influencing policy-making, from agenda setting to implementation, and the type of resulting institutions.

Water policies in Ontario provide a relevant context. Canadian municipalities and their water utilities are aware of the interactions among water and broader social, economic and environmental objectives, as well as of the co-benefits that can be achieved across municipal objectives (e.g., between water and reduction of greenhouse gas emissions) (CWN 2020b). In the last few years, professional and academic events for and by the local water sector are incorporating sessions dedicated to exploring sustainable finance instruments, including green bonds. This signals an emerging interest in the field. Examples include sessions in the Great Lakes Forum 2018, various editions of the Canadian Water Summit, Canadian Water Network's Blue Cities 2019 and Financing Water Systems webinar 2020. The financial sustainability of water systems and resource efficiency in municipal operations are priorities in the Canadian municipal water sector, and necessary to achieve resiliency of water systems (CMW Consortium 2014, CWN 2020b).

Given the global scope of the SF field, we focus on SF in Canada, with an emphasis on institutional investors based in Toronto, Ontario's provincial capital and Canada's financial centre. Canada's SF market is relatively small but is growing rapidly (one of the three fastest growing SF markets in the world), supported by a consensus among the investment community and the national and sub-national governments (EPSF 2018b, GSIA 2019). The Canadian federal government is interested in expanding SF to contribute to green growth and a transition to a low-carbon economy (Environment and Climate Change Canada 2016, 2019). In support of this goal, the federal government established a high-level public-private Expert Panel on Sustainable Finance in 2018 (EPSF), following the lead of a similar European Commission initiative, and in line with the 2015 Paris Agreement, and the UN Sustainable Development Goals (SDGs).

Toronto, the second largest financial centre in North America after New York, aims to position itself as a global SF hub (TFI 2018). Reflecting its importance, financial institutions, academia and municipal, provincial and federal-level government agencies interested in the global competitiveness of the Toronto financial sector formed Toronto Finance International (TFI). TFI represents the city in the Financial Centres for Sustainability (FC4S), an initiative launched in 2017 by the UNEP Inquiry into the Design of a Sustainable Financial System (UNEP Inquiry). The Toronto Stock Exchange (TSX) joined the UN's Sustainable Stock Exchanges initiative in 2019 (SSE 2019). Some of the largest institutional investors in the world (particularly pension funds, such as the Canada Pension Plan Investment Board, CPPIB, and the Ontario Teachers Pension Plan, OTPP), and 50% of the twelve largest infrastructure investors globally are Canadian. Most are based in Toronto (TFI 2018), and many are founding members and active in SF international networks and initiatives (e.g., G20's Task Force on Climate related Financial Disclosures, TCFD; UN Principles for Responsible Investment, PRI; CDP).

4.2 Analytical framework

In this section, we outline the analytical framework used to explore the how we can account for relevant sustainable finance actors, institutions, and drivers in water governance problem-solving. For brevity, we use the term "non-water factors" to capture the diverse range of external actors, institutions and drivers that exist.

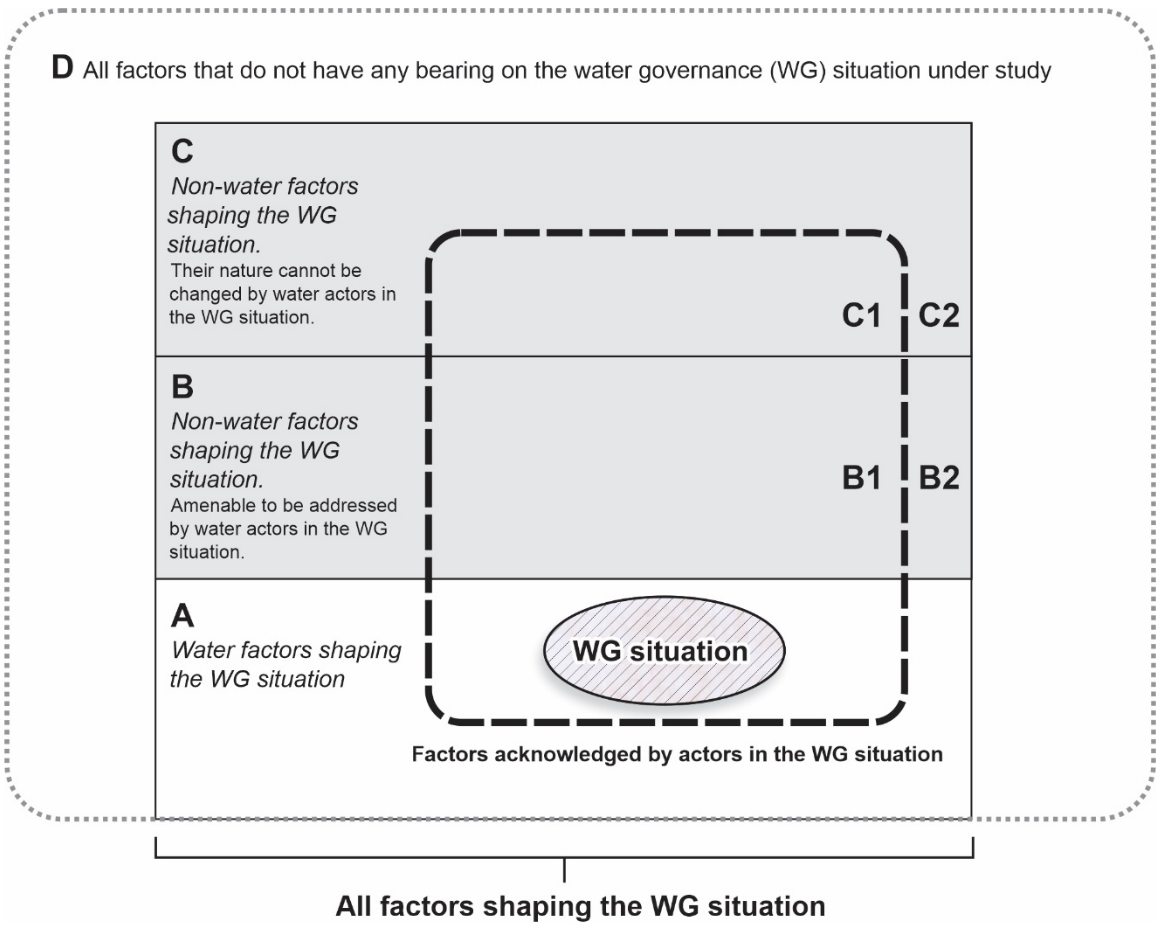
4.2.1 Characterizing the role of non-water factors in water governance situations

This framework is inspired by de Loë and Patterson's (2017a, b) call for the need to rethink how we draw boundaries when creating water governance arrangements, by paying more attention to external factors influencing water governance. The main insight underpinning our framework is that actors have different abilities to influence: (i) control and responsibility over a factor, deriving from a mandate; and (ii) the ability to influence a factor, without being in charge of it. Here we refer to "water factors" as those whose primary purpose (or mandate, in the case of actors) revolves around water resources and/or services. Hence, "non-water factors" are those whose primary purpose, or mandate, does not revolve around water, but that can influence water governance processes and outcomes nevertheless. Factors in the sustainable finance field are the non-water factors of interest in this study. This framework rests on four main building blocks: de Loë and Patterson's (2017a) exploration of the role of external factors; Rogers and Hall's (2003) recognition of the "external governance of water" dimension; UNWWAP's (2009) "water box" conceptual framework; and the Combined IAD-SES Framework (CIS) configuration of institutional analysis (McCord et al. 2017, Cole, Epstein, and McGinnis 2019).

Water governance is "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society" (Rogers and Hall 2003, 16). These systems can be found across the internal and external governance of water dimensions. The internal concerns activities of a broadly defined water sector (e.g., water resources management, water services supply), and the external consists of other sectors whose functioning shapes water governance (Rogers and Hall 2003). Rogers and Hall (2003) and UNWWAP (2009) rely on the "water sector" to draw the internal/external boundaries regarding water governance. The CIS differentiates influences coming from two types of factors: contextual factors, which set the stage for actors' interactions and can be changed by their outcomes; and exogenous shocks, which include wider climate patterns, demographic and technology trends, amongst others, that are beyond the control of actors interacting in the situation under study.

The diagnostic framework presented in Figure 6 differentiates factors shaping a water governance situation (found in the regions labelled "A", "B", "C") from those that do not (region labelled "D"). Water factors, i.e., those whose primary mandate revolves around water, are in A, and non-water factors are in B and C. B and C make up the "external governance of water" of a particular water governance situation. In this framework, type B factors potentially can be addressed by water actors in the situation; broader socio-economic objectives, such as economic development, are an example. The nature of type C factors cannot be changed by water actors in the situation. Thus, they are beyond such water actors' control. Examples include large-scale drivers of change such as global climate change. We sub-divide the regions B and C into (i) B1 and C1, to refer to factors that water actors in the situation acknowledge (located inside the dotted line box); and (ii) B2 and C2, to refer to those they do not acknowledge at a given time (located outside the dotted line box). As a diagnostic tool inspired in the CIS framework, our diagnostic framework can be used to analyse governance situations at various scales, e.g., municipal, national. With this framework we will classify factors in the sustainable finance field affecting water governance into Type B or Type C to identify which ones can represent opportunities for contributing to water policy objectives.

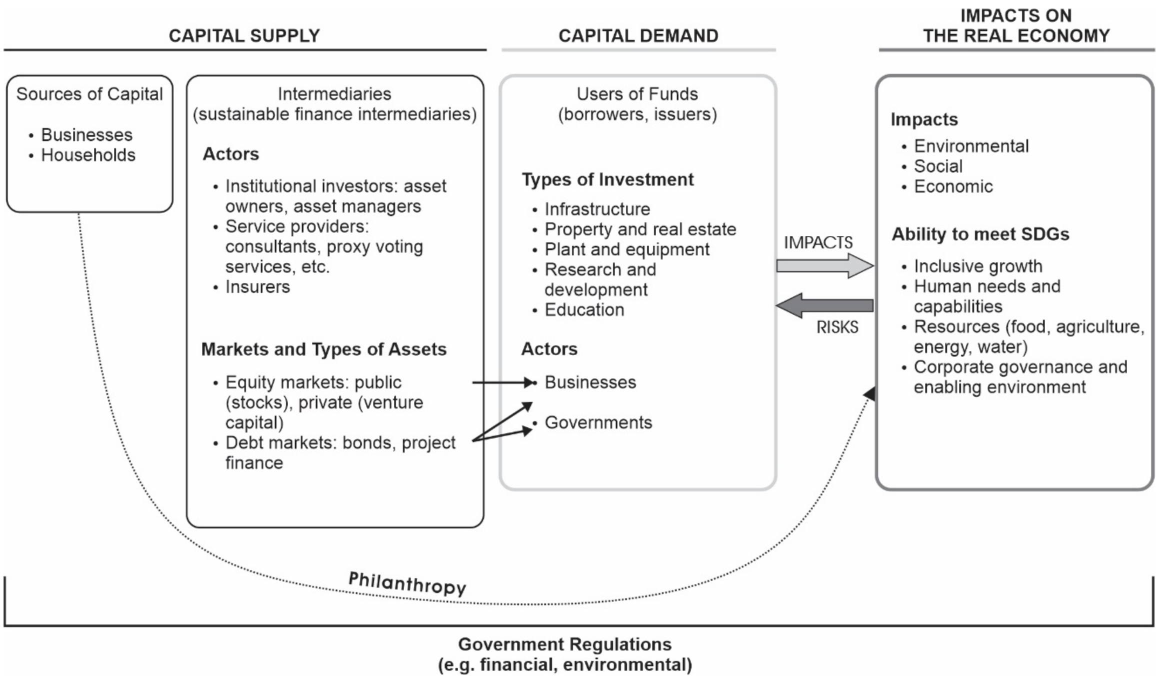
Figure 6: Framework for analysing the external governance of water



4.2.2 Characterizing sustainable finance factors

Corporations impact society through their operations, i.e., "inside-out" linkages, while social and environmental conditions influence corporations' activities, i.e., "outside-in" linkages (Porter and Kramer 2006). In the financial sector, the impacts of environmental issues on financial performance and decisions, e.g., environmental risks, represent outside-in links (Weber and Feltmate 2016a). Financial sector impacts on the environment (inside-out links) are mostly indirect; the impacts of their capital flows materialize through their investees' operations (Weber 2014, Weber and Feltmate 2016b) - Figure 7 illustrates this interdependency. Corporations' practices are to a great extent driven by the financial sector, particularly the access to capital through banks or the stock market (Schmidheiny and Zorraquin 1996). The financial sector can drive sustainable corporate practices through its capital allocation decisions, and thus contribute to sustainable development (Richardson 2003, Scholtens 2006). However, the financial sector can also harm the environment (Sullivan 2013, Martin and Clapp 2015). Scholars argue that the role of financial markets in fostering sustainable business practices is rather modest (Busch, Bauer, and Orlitzky 2016), but that better assessment of sustainable investments impacts can strengthen this role in positive ways (Vörösmarty et al. 2018).

Figure 7: The financial system and the real economy: supply, demand, and impact of private investment in sustainable development



Source: Adapted from Rohan (2015), UNGC and KPMG (2015), UNGC et al. (2015), UNEP Inquiry (2017)

The definition of the term "sustainable finance" is in flux, and in many cases is used interchangeably with "sustainable investing" and "responsible investment" (e.g.,TFI 2018, GSIA 2019). The UNEP Inquiry (2017) defines sustainable finance (SF) as financial services aligned with the SDGs and the Paris Agreement. Canada's Expert Panel on Sustainable Finance (EPSF 2018b, 3) defines SF as "capital flows (as reflected in lending and investment), risk management activities (such as insurance and risk assessment), and financial processes (including disclosures, valuation, and oversight) that assimilate environmental and social factors as a means of promoting sustainable economic growth and the long-term stability of the financial system". According to the PRI (n.d.), a responsible investment approach combines incorporation of environmental, social, and corporate governance (ESG) factors in portfolio building, and active ownership to improve investees' ESG performance. ESG incorporation consists of the strategies of ESG integration (focused in evaluating ESG impacts on risks and returns), screening (to exclude or include investments according to values), and thematic investing (aiming to contribute to ESG outcomes). Active ownership consists of two strategies to improve ESG practices: engagement (including requests for improving ESG disclosures), and proxy voting (through shareholder resolutions). While sustainable finance tends to refer to the use given to financial resources raised and allocated, responsible or sustainable investment refers more to investors' approaches to the consideration of ESG factors in the selection and management of investments (UNEP Inquiry and World Bank 2017).

Thus, here we use sustainable finance as an overarching term that encompasses two aspects: the supply of capital to contribute to sustainable development and mitigation of climate change impacts; and the incorporation of ESG factors in investments selection and management. These aspects broadly reflect the inside-out and outside-in linkages between finance and the environment and sustainable development reviewed earlier. Based on these definitions, Table 13 summarizes the sustainable finance sector, according to its two aspects relevant to environmental policies.

In this context, a SF factor is an actor, driver or institution characteristic of the SF field. For instance, green bonds can be understood as instruments that set the terms for the use of funds for specific "environmental" purposes. Likewise, institutional investors, and the SF networks within which they participate, are SF actors. Environmental risk management, and the financial materiality of such risks, are drivers of the activities of SF actors.

Table 13: Characterization of the two sustainable finance aspects relevant to environmental policies

<table>
<tr><th>Finance impact on the environment:
Capital flows financing sustainable development</th><th>Environment impact on finance:
Environmental risk management</th></tr>
<tr><td>

Destination of funds (e.g., SDG guided)
Instruments

Asset class: debt (available to private and public organizations), e.g., green bonds; equity (available to private companies only)
Approaches: thematic and norms-based investing; screening

Enablers/constrainers (e.g., voluntary standards, regulations)

</td><td>

Type of risks (e.g., water, climate change related)
Approaches to address risks

ESG integration, including screening
Engagement, including requests for improved risk disclosure

Enablers/constrainers (e.g., materiality by industry)

</td></tr>
</table>

4.3 Methodology

4.3.1 Empirical context

Ontario is the largest province in Canada, with 38% of the country's population (Statistics Canada 2016). Toronto, Ontario's capital city, is Canada's largest city, with a population of approximately three million (City of Toronto 2018). In Canada, provinces are responsible for water resources management, while municipalities are primarily responsible for water supply services. Financial sustainability of water systems is a priority in the municipal water sector (CMW Consortium 2014, CWN 2020b). This involves full cost recovery, through reducing operating expenses, increasing revenues, identifying options for financing capital investments, and proactive water asset management. Achieving efficiencies and resilience of water systems are also priorities, and they contribute to financial sustainability. The sector recognizes innovation and technologies as crucial to progress in these areas. Our research is grounded in two water governance situations where the following policy objectives are pursued:

- The financial sustainability of water systems, as defined by the Ontario's Safe Drinking Water Act, 2002, the Financial Plans regulation 453/07 and its guidelines. The act requires drinking water systems licensing, and addressing financial issues of municipal water systems. However, these issues continue largely unaddressed (OSWCA 2018).
- Water use reduction (WUR) of municipalities' industrial water users, which is defined in municipalities' water conservation and efficiency programs for industrial, commercial and institutional (ICI) users. Only five municipalities in Ontario (Toronto, York, Peel, Waterloo, and Guelph), among the largest in the province, have programs dedicated to ICI WUR, as part of their wider municipal water conservation and efficiency plans.

The core water actors in these governance situations are (a) municipal officials responsible for pursuing their ICI WUR objective, and for securing the finances of providing water services in their jurisdictions; and (b) provincial officials in the Ministry of Environment responsible for formulating and rolling out the Safe Drinking Water Act, and the municipal officials in charge of implementing it in their jurisdictions.

Our research is also grounded in the Canadian SF field. As is the case in the global SF field, Canadian investors integrate ESG factors in their decisions more for mitigating risks than for identifying opportunities to improve returns (GSIA 2019). Among environmental issues, climate change is most commonly considered in investors' decisions, followed by water and waste management (RIA 2018). Climate change is also the most important environmental issue in Canadian investors' engagements with investees (GSIA 2019). ESG integration in debt instruments, such as green bonds, has grown rapidly in the country in the last few years, mirroring its growth in the global markets (GSIA 2019). In Canada, sub-national bodies were the main green bond issuers, with Ontario, Quebec, and the cities of Ottawa and Toronto leading (RIA 2018). While these instruments are used and/or planned for addressing climate change impacts (reducing greenhouse gas emissions, primarily), it is a sign that the provincial and municipal governments are already experimenting with sustainable finance for supporting environmental objectives.

4.3.2 Data collection

We used three complementary qualitative data sources: documents (e.g., policies, strategies, reports), semi-structured key informant interviews, and personal observations collected through attending relevant events. In total, 107 documents, and interview transcripts and notes were collected between July 2018 and February 2020. Document collection and interviews took place iteratively. Data collection stopped when saturation was reached (Saumure and Given 2008). Data sources represented a variety of perspectives (multi-level, private vs. public sector) to ensure triangulation (Heath 2015). Data were collected to represent the two water governance situations and the Canadian SF field, particularly institutional investors centered in Toronto. The approach captured a snapshot of the current picture of the state of water policies and perspectives of the institutional investor community regarding environmental issues, particularly water.

Seventy-four documents in the form of policy statements, strategies, reports, and similar materials, were collected. Water-focused documents consisted of the policies setting the water objectives, and associated explanatory documents (e.g., guidelines, background notes), and progress reports produced by water actors. The SF documents included the following:

- The Canadian Expert Panel on Sustainable Finance interim and final reports, which explain the state of SF in Canada and chart a roadmap for financing the country's transition to a low-carbon economy. These reports are framed in the context of the Pan-Canadian Framework for Clean Growth and Climate Change (PCF) and the Federal Sustainable Development Strategy (FSDS), which align with the Paris Agreement and the SDGs, respectively.
- Reports by national and local SF networks Responsible Investment Association of Canada (RIA), Toronto Finance International (TFI), and the environmental and social factors committee of the institutional investor-led network Canadian Coalition for Good Governance (CCGG). These networks are centered in Toronto.
- Canada and Toronto SF profiles in global reports from the Global Sustainable Investment Alliance (GSIA), UNEP FI and PRI.
- Current SF policies, strategies, plans and reports by some of the largest Canadian institutional investors based in the Toronto financial centre: six out of the ten largest Canadian pension funds, representing asset owners, and the investment arms of the top five Canadian banks representing asset managers (see Table 14). Note that institutional investors' SF documents cover their investments across the world, not only in Canada.

Table 14: Acronyms list of institutional investors whose sustainable finance plans, strategies and reports are included in the document review

Acronym	**Name**
Pension funds	
CPPIB	Canada Pension Plan Investment Board
OTPP	Ontario Teachers' Pension Plan
OMERS	Ontario Municipal Employees Retirement System
HOOPP	Healthcare of Ontario Pension Plan
OPB	Ontario Pension Board
OPTrust	Ontario Public Service Employees Union (also known as OPSEU Pension Trust)
Banks	
RBC	Royal Bank of Canada
TD	Toronto Dominion Bank
CIBC	Canadian Imperial Bank of Commerce
Scotiabank	The Bank of Nova Scotia
BMO	Bank of Montreal

Twenty-two semi-structured key informant interviews contributed to the research reported in this study. An initial group of interviewees was identified through an initial document review. The snowball sampling technique (Morgan 2008b) was applied thereafter to identify other relevant key informants in their respective fields. Interviewees were mostly senior representatives of the units in their organizations directly engaged in the fields covered here (e.g., Managers and Directors); two interviewees held less senior roles in the SF sector but had years of experience on the environmental side of SF, and were referred to by other senior officials who were originally identified but that were unable to participate in the study. Twelve interviewees worked in the water sector, and 10 in the SF field. In the water sector, interviewees included decision-makers at the provincial and municipal level who were involved in establishing the policies and/or currently implementing them, as well as representatives from non-profit organizations working in the space. The SF side included interviewees from SF consultancies, networks and of institutional investors on the asset manager side. Asset owners for the most part did not respond to the study requests or did not want to be interviewed; their voices were captured in the document review and by attending to events where key people participated. The semi-structured interview format enabled interviewees to raise new points of discussion, while keeping the conversation bounded (Mason 2004). Interviews lasted thirty minutes on average. They were held over the phone, and were digitally recorded when permitted by the interviewees. The main author transcribed these recordings manually. The interview quotations used here were returned to interviewees, who verified them. Interviewees were assigned numbers to preserve anonymity. Two interviewees wished to be referred to by their job titles, which is indicated where applicable.

Summary notes taken at events by the first author (webinars, conferences), and personal observations reflecting on all data sources and the research process, supplemented the main data sources. All of the events attended included presentations by representatives of a set of the 11 institutional investors (Table 14) and members of the EPSF. The events all took place in Toronto. They were the Canadian Water Network's 2020 webinar on Financing Water Systems: Green Bonds and the Canada Infrastructure Bank; the 2019 Globe Capital; Ryerson CSR Institute: Understanding Responsible Investment panel (2019); Sustainalytics' Perspectives on ESG and Materiality (2018); and TFI's Capitalizing on Sustainable Finance Report Launch 2018.

4.3.3 Data analysis

Content analysis of data collected from the sources outlined above followed a deductive approach (Hsieh and Shannon 2005), with the diagnostic framework categories guiding where SF factors were positioned in respect to water governance situations. QSR NVivo 10 software facilitated data organization and coding. The process of analysis comprised two stages. First, we identified explicit links between the water governance situations and SF, as well as common themes across them where potential links could emerge, to identify SF factors relevant in the context of the water governance situations under study. Second, we mapped those SF factors in the external governance of water dimension of our diagnostic framework (Figure 6), to identify which SF factors could potentially be addressed and/or leveraged by water actors to advance their policy objectives.

Stage 1 was guided by our understanding of SF from the perspective of the financial sector's relationship with the environment, which consists of two aspects (Table 13). The coding tree consisted of two first-tier nodes, each with two second-tier nodes, and a total of 12 third-tier nodes, defined in Table 15. Our two first-tier nodes reflect the two SF aspects in Table 13. The four second-tier nodes reflect the two water governance situations and the SF aspect most closely aligned to each situation. The third-tier nodes organized the data in each of the second-tier nodes in terms of their purpose, ways to meet them, and issues enabling or constraining meeting their purpose (definitions in Table 15). This means that the third-tier categories under node 1.1 and node 2.1 were only applied to the data pertaining the financial sustainability of water systems, and the industrial WUR objectives, respectively. The third-tier categories under nodes 1.2 and 2.2 were applied to the same body of data about the SF field, to investigate both of its aspects in relation to the environmental component of ESG. After coding, the final step in Stage 1 of analysis was to compile in a table (Table 16) the main purposes, instruments, and enablers/constrainers found for each second-tier node (i.e, for each water policy objective and SF aspect). Any number of commonalities found across columns in Table 16 within each of the "capital flows for financing public water infrastructure and services" and the "financial water and environmental risk management" rows, are the SF factors to be classified as Type B or C factors in relation to each of the water governance situations. It is important to reinstate that because our focus is in SF factors, "water factors", i.e., Type A factors, were not coded as part of this research.

In summary, we derived a coding tree that could shed light on the SF factors that currently link (or that could potentially link) to a water governance situation, by focusing in the SF aspect most relevant to the particular objective pursued, or problem to be solved, in that situation. A current link is evidenced by explicit acknowledgement of SF factors in a water governance situation. SF factors that show potential for links are those with commonalities with water governance situations in terms of matching purpose, instruments and/or enabling/constraining considerations. Using the same three criteria across all second-tier nodes allowed highlighting of commonalities, even if there were no explicit mentions of water or SF in either field. Because the identification of SF factors lies in finding commonalities between SF and water policy elements in Table 16, all SF factors here could present opportunities to advance the objectives in the water governance situation.

In stage 2 of the analysis, the diagnostic framework (Figure 6) is used to assign the SF factors identified in Stage 1 to Type B or C. Characterizing an SF factor as Type B or C revealed the extent to which water actors in the governance situations can engage with these factors, or only respond (e.g., leverage) to them in advancing their water policy objectives. SF factors that were explicitly acknowledged in the water data were classified as B1 or C1, and SF factors where links could emerge from were classified as B2 or C2. For example, municipal documents discussing financial sustainability of water systems include passages about how water systems could be financed (e.g., government grants, green bonds). These passages would be coded under the "instruments" third-tier node, under node 1.1. Table 16's cell under the "instruments" column and "financial sustainability" row would contain the financing options considered in the municipal documents discussing financial sustainability of water systems. Most of the options are related to public funds, but some are related to SF, like green bonds. Because green bonds also appear in Table 16's cell under the "instruments" column and "capital flows aspect of SF" row, then green bonds are considered an SF factor that is acknowledged in the water governance situation.

Table 15: Coding tree nodes and definitions

Nodes definitions	Purpose (What for?)	Instruments (How?)	Considerations Enabling/Constraining
Node 1: Capital flows for financing public water infrastructure and services			
Node 1.1: Financial sustainability of water systems policy objective	Funding gaps/needs	Funding sources used and planned	Access to funding
Node 1.2: Capital flows aspect of SF	Objectives of funds for water and related environmental purposes	Financial instruments to allocate funds (e.g., debt, equity)	Allocation of funds
Node 2: Financial water and environmental risk management			
Node 2.1: Industrial water use reduction policy objective	Objectives of reducing companies' water use levels	Tools for encouraging companies' water use reduction (e.g., financial incentives, facilitate access to efficient technologies)	Companies' water use reduction (e.g., cost minimization, public image)
Node 2.2: Risk management aspect of SF	Purpose of managing water and related environmental risks	Approaches to managing water and related environmental risks (e.g., ESG integration, engagement)	Management of risks

4.4 Findings and analysis

This section focuses on non-water factors relevant to the implementation of the two water policy objectives under study. Factors that would be categorized as "Type A" in the framework, i.e., water factors, whose primary purpose or mandate revolve around water resources and/or services, are not a focus of this study. For instance, these included the municipal officials responsible for pursuing their ICI WUR objective, and for securing the finances of providing water services in their jurisdictions; and the provincial officials in the Ministry of Environment responsible for formulating and rolling out the Safe Drinking Water Act.

4.4.1 Identifying SF factors relevant to water governance situations

Table 16 summarizes the results of the first round of coding of water and SF data according to three criteria (purpose, instruments, enablers/constrainers) and under the lens of the two SF aspects. A summary of the table and its implications follows.

Table 16: Summary of main elements characterizing the two Ontario water governance situations and the SF aspects under study

	Purpose **(What for?)**	**Instruments** **(How?)**	**Enablers/Constrainers**
Capital flows for financing public water infrastructure and services			
Financial sustainability of water systems policy objective	• Making water infrastructure resilient to climate change and other drivers of change: Repair, upgrade, rebuild, replace aging infrastructure; build resilient new infrastructure	• Traditional funding sources: utility revenues, government grants and loans • Private financing o Debt: green bonds o Other private financing: public-private partnerships (P3), supported with blended finance (CIB supported); insurance and financial derivatives to build resilience to climate change into financial planning	*Enablers*: • Long-term asset management planning enables capital investment plans and funding plans, all crucial for long-term full cost recovery • Green infrastructure and low impact development • Other: possibility to create municipal corporations to manage water finances separately from the overall municipality's *Constrainers*: • Government grants, while available, not long-term or respond to specific events • Municipalities' cap on debt
Capital flows aspect of SF	• Transition to a low-carbon economy, in response to climate change drivers • Sustainable (particularly resilient) infrastructure, including green infrastructure • Resource efficiency, including water use reduction, as a climate-related opportunity	• Green bonds, sustainable bonds, transition bonds. Bonds can be issued by government or private companies • Blended finance for public-private partnerships: Public funds for de-risking investment projects for attracting private finance • Equity: public (funds/portfolios of screened corporations' equity); or	*Enablers*: • Federal regulatory framework supporting the transition to a low-carbon economy • International SF network: from agreements (SDGs, Paris), overarching SF networks (UNEP FI), investor-led networks (e.g., PRI, Climate Action 100+), disclosure initiatives (e.g., TCFD, CDP, SASB) • National SF network: RIA, CCGG, PRI Canada Network, TFI

	• Cleantech innovation (including water technologies) • Sustainable water and wastewater management category of proceeds, following the Green Bond Principles	private equity (venture capital) in clean technology start-ups • Other: Insurance	• Capital plans outlining a "pipeline of sustainable and resilient infrastructure projects" across sectors of the Canadian economy • Promoting Toronto as a global sustainable finance centre • Other: utilities and companies identifying the green credential of their project funding needs *Constrainers*: • For funding into water cleantech: Small water technology market due to low technology adoption rates (e.g., regulatory barriers, risk aversion, path-dependent procurement criteria) and water technology companies too small or at a very early stage, not ready for private investment
Financial water and environmental risk management			
Industrial water use reduction (WUR) policy objective	• ICI WUR saves the utility capital and operational costs in the long-term by deferring, downsizing, and/or eliminating the need for expenses on increasing water supply • Water supply services resiliency to risks posed by various drivers of change (e.g., climate change, population growth, changes in demand patterns)	• Economic incentives, particularly rebates to offset capital costs of water efficiency projects	*Enablers*: • Municipalities' capacity to build relationships with businesses • Companies' corporate social responsibility (CSR) strategies • Companies' return on investment: cost-reduction rationale favours savings in inputs; reduction of payback periods, by for instance stacking grants and incentives (e.g., municipal, provincial, and across water, energy, etc.) • Other: adoption of clean water technologies; repackage water in terms of water risk (in Ontario the risk lies mostly on wastewater) and enforce wastewater discharge regulations

			Constrainers: • Price of water is low and lower than other utilities, making the economic incentives (amounts, times, etc.) not attractive enough (the return on investment is considered low, and the payback time is perceived as long) • Other: the municipal scale is not very relevant for multinational or national corporations

Risk management aspect of SF	• Climate change related risk management
	• Water-related risks:
	  o Water risks related to climate change, such as risks posed by floods and droughts, in the context of the transition to a lower-carbon economy
	  o Water risks in general
		• ESG Integration (specifically environmental risk assessment and management)
		• Shareholder engagement is the main type of active ownership strategy used. Much of engagement revolves around requests for increased disclosure of environmental risks
		  o Water engagements in Canada tend to relate to extractive industries
			Enablers:
			• Financial materiality of water by industry and location of operations determines if water issues are considered in financial decision-making
			• International SF network, from agreements (Paris, SDGs), investor-led networks (e.g., PRI), disclosure initiatives (e.g., TCFD, CDP, SASB); guide ESG incorporation (for both integration and active ownership)
			• National SF network: RIA, CCGG, PRI Canada Network, TFI
			• Financial regulatory environment can facilitate investor an corporate financial disclosures

Securing funds for improving the resilience of water infrastructure, and thus of water services, is a priority for achieving the financial sustainability of water systems, as was clearly indicated by the president of Analytica Advisors (Interviewee 24) and MOE (2007a). Funds are needed for upgrading aging and building new infrastructure with resiliency specifications. Besides the funding sources traditionally accessed by utilities, such as revenues and government grants, water actors are aware of private funding options, including green bonds and public-private partnerships, and have started exploring them (Interviewees 11, 13, 21; CWN 2018, 2020b). Water policy highlights the importance of long-term asset management planning as a key component for achieving full cost recovery because it enables more accurate capital investment and funding plans (MOE 2007a, b). In the case of the industrial WUR objective, the purpose of managing businesses' water use is to contribute to (i) saving the utility (and the municipality) capital and operational costs in the long-term (PPG 2019); and to (ii) making the water supply more resilient to future risks, including climate change (Interviewee 4, York Region 2016). The utilities have used economic incentives, such as rebates, to try to change businesses' water using behaviour, by appealing to cost reductions (PPG 2019). However, the low price of water, compared to other utilities in Ontario, is hampering the attractiveness of the ICI programs (Interviewees 4, and 5, the water efficiency officer at the Waterloo region).

The transition to the low-carbon economy, framed at the global level by the Paris Agreement and the SDGs, guides the SF activities of local financial actors across both capital flows and risk management aspects of SF, according to the vast majority of documents (e.g., EPSF 2018b, TFI 2018). The accompanying international SF movement, including investor-led networks (e.g., PRI), and disclosure initiatives (e.g., TCFD, CDP), among others, are also important drivers of local SF activity (e.g., CIBC 2019, BMO GAM 2020). The data also pointed at the role that federal leadership, including regulation and planning, could play in directing local SF activity to contribute to local policy objectives. For instance, in the SF capital flows aspect, national capital plans outlining a pipeline of investable sustainable infrastructure projects per sector could add more certainty and spark interest among investors (EPSF 2018a). Among the many areas proposed for investment, investments in sustainable (resilient) infrastructure, resource efficiency, and cleantech innovation are particularly relevant (e.g., OTPP 2018, RBC GAM 2020b, CPPIB 2019). The financial instruments to transfer funds mostly mentioned in the data are debt, particularly green bonds and blended finance, where public funds de-risk the project to attract private finance and thus facilitate public-private partnerships (TFI 2018, CIB 2020). In the SF risk management aspect, climate change related risks, including water risks such as floods and droughts, are of importance to Canadian-based institutional investors (Interviewees 26, 27, e.g., CPPIB 2019, RBC GAM 2020a). The ways in which they have been managed are mainly through ESG integration, i.e. integrating them in financial analysis and decision-making, and shareholder engagement (RIA 2018, GSIA 2019).

We distinguish five SF factors across Table 16 relevant in the context of the water governance situations under study. In relation to the financial sustainability of water systems situation, we found three SF factors: one explicitly acknowledged, and two emerging from commonalities. Private debt and blended finance, particularly green bonds and public-private partnerships, is the SF factor explicitly acknowledged. The two SF factors that present commonalities with elements in this water governance situation are the resiliency of infrastructure to climate change, as a priority destination of SF capital flows; and capital investment planning, represented by capital project pipelines. Regarding the industrial WUR situation, there is no SF factor explicitly acknowledged, but two SF factors present commonalities. The first is the financial materiality of water, which links with other elements found in Table 16 such as the cost of water, water risks, engagement of investees, and businesses' CSR initiatives. The second SF factor is climate change risk management, as it poses challenges to the resilience of water supply services, and thus to those businesses relying on them. The following sub-section categorizes these five SF factors in terms of the diagnostic framework (Figure 6).

4.4.2 Mapping SF factors in the external governance of water

We found five SF factors to be relevant in the context of the water governance situations under study. Three of them can be defined as Type B in the external governance of water dimension portrayed in our diagnostic framework (Figure 6), and two as Type C factors.

4.4.2.1 Type B SF factors

Type B non-water factors (Figure 6) in the external dimension of a water governance situation are those which are amenable to be addressed and engaged by water actors in such situation. This means that water actors can engage with related SF actors to try and influence the effects of these factors over the water situation. Type B SF factors were only found in relation to the financial sustainability of water situation (Table 17). Private debt and blended finance was the only Type B SF factor explicitly acknowledged by water actors overall. The other two SF factors were B2 types; i.e., where connections can take place between water and SF actors because of the commonalities in terms of purpose, instruments and/or enablers (potential connections).

Table 17: Type B sustainable finance factors in two Ontario water governance situations

SF Factors	**Financial sustainability of water systems**	**Industrial water use reduction**
Type B1: Acknowledged by water actors	Private debt and blended finance (green bonds, public-private partnerships)	--
Type B2: other posing potential links	• Resiliency of infrastructure to climate change (sustainable infrastructure) • Capital investment planning (capital project pipelines)	--

Green bonds are the most prominent instance of private debt and blended finance acknowledged in the data. On the water side, references to private funding appeared on documents regarding implementation of the policy objective. The most common perspective in the water documents is illustrated by the CWN (2018, 8), which recommends to "issue green bonds (where possible) to fund climate change adaptation to expand funding of activities that achieve long-term environmental goals" in water utilities' operations. The interest in SF funding is captured by the questions addressed by the CWN (2020a)'s webinar: "should utilities embrace the growing popularity of green bonds? When are public-private partnerships and service agreements a viable option? Can debt financing improve stability?". Financial actors are interested in the municipal water sector in a context where provinces and municipalities have been the main issuers of green bonds in Canada, and where the demand for Canadian green bonds outstrips the supply. For instance, OPTrust (2018, 27) states that “we have now invested $181 million in Ontario and Quebec Green Bonds. These issuances are usually oversubscribed”. Interviewee 29 agrees that “there's a sort of bottleneck in terms of issuance”, which could be smoothed by more issuers, including utilities, “starting to issue green bonds when they identify the green credentials of what they're financing”. Financial actors see potential for increase in this type of investment in Canadian municipal water, because public ownership is maintained (favoured by public opinion), green bonds keep costs of financing down for municipalities, and there is a strong demand according to the Canadian Infrastructure Bank (CIB 2020) and RBC Capital Markets (2020) presenters in the Canadian Water Network’s webinar. Ottawa and Toronto’s most recent issuance included “sustainable water and wastewater management” among the use of proceeds (RBC Capital Markets 2020). Most banks’ SF frameworks in our data included a “sustainable water and wastewater” asset category, following the global Green Bond Principles for use of proceeds (e.g., Scotiabank 2019, RBC 2019, BMO Financial Group 2019). Noteworthy is that issuers are not legally bounded to use the proceeds in the green asset categories listed at issuance, according to participants at the Canadian Water Network webinar.

The CWN (2018), CWN (2020b) and MOE (2007a) agree that an important problem with water infrastructure in Canada is age-related deterioration, due in large part to historic underinvestment; thus, infrastructure renewal is an opportunity to build resilience. However, they acknowledge that “responding to extreme events and building more resilient infrastructure will be very costly”, and are therefore exploring less expensive options such as green infrastructure (CWN 2018, 37). Infrastructure resilience to climate change, also referred to as sustainable infrastructure across the documents, is a primary objective for SF capital flows. Institutional investors fund resilient infrastructure (e.g., Scotiabank 2019, BMO Financial Group 2019, RBC GAM 2020b), including water. For instance, OTPP (2019) states that it invested in Chile’s water utilities, and in the large desalination plant for water-stressed Sydney in Australia, contributing to both countries’ water resilience and SDG6. Investments addressing the water-energy nexus are also relevant. For example, the EPSF (2018b, 28) foresees investments to facilitate “large-scale emissions reductions in end-use applications such as […] water processing and pumping”. Green infrastructure is eligible for funding. To illustrate, the CIB (2020), which promotes blended finance, states that its “mandate is to invest $35 billion in new, revenue generating public infrastructure projects within four priority sectors: green infrastructure […]”, including in relation to water and wastewater.

Capital investment planning facilitates SF flows to sustainable infrastructure. For instance, the EPSF (2018a, 50) recommends to “partner with industry and the financial sector to develop a national Sustainable Infrastructure Plan, underpinned by […] project pipelines and capital plans for public-private co-investment”. The TFI (2018, 8) echoes the recommendation to “build a national pipeline of potential sustainable and resilient infrastructure projects in order to provide a signal and roadmap to the market of the large-scale sustainable investment opportunities available”, guided by the Pan-Canadian Framework for Climate Change. On the water side, the regulation requiring municipal water systems’ financial plans advises that they build on asset management, and capital investment plans (MOE 2007b). Interviewees 13 and 22 emphasized that municipal asset management plans are required by the Ontario Ministry of Infrastructure regulation 588/17, but that water asset management plans need to be improved.

4.4.2.2 Type C SF factors

Type C non-water factors (Figure 6) of the external dimension of a water governance situation are those whose nature cannot be changed by water actors in that situation, but that water actors can nevertheless respond and adapt to. Table 18 lists the two Type C SF factors identified during this analysis. Both factors were the C2 kind, i.e., where connections could take place because of the commonalities in terms of purpose, instruments and/or enablers (potential connection). Both SF factors were identified in relation to the industrial WUR situation. These factors are of the type C because, while there are commonalities, they do not imply a connection between water and SF actors, but the connection would be mediated by a water-using investee company.

Table 18: Type C sustainable finance factors in two Ontario water governance situations

SF Factors	Financial sustainability of water systems	Industrial water use reduction
Type C1: Acknowledged by water actors	--	--
Type C2: other posing potential links	--	• Financial materiality of water (water costs, water risks, engagement of investees) • Climate change risk management

The financial materiality of water varies by industry and also depends on the risks faced in the investee operations location. While water actors responsible for the policy of reducing industrial water use cannot change the financial materiality of water for an industry per se, they can take measures that can affect the risks businesses face in a location, which can in turn influence how material water is for corporations in their jurisdiction. Interviewee 11 captures this well by suggesting that the water policy-makers in Ontario should reframe water in terms of risk when communicating with industrial water users, particularly wastewater because that is where most of the water cost concentrates (e.g., compliance with regulations, surcharge payments). Interviewees 11 and 10 in the water sector recognize that water costs are not the main costs for businesses, but associated energy costs are (heating, cooling, transporting, treatment). Interviewees 5 and 8 recognize that water sector people are aware that the cost of water and the return on investment of reducing water use need to be higher for industries to be more interested in water use reduction measures.

In the SF sector, resource efficiency is also of interest. For example, RBC GAM (2020b), BMO Financial Group (2019) and TD Bank Group (2019) identify resource efficiency as an opportunity for investment (e.g., investment in cleantech), and to reduce operating costs and resource dependence, thus minimizing risks. A general perspective was that water is a material issue for important Canadian industries, e.g., mining, oil and gas, but those activities concentrate outside Ontario. Generally, water is a concern for Canadian investors (CCGG 2016, RIA 2018, RBC GAM 2019, CPPIB 2019). However, interviewees 28, 30, and 31 expressed that even when water is material, it is not necessarily front of mind for investors in Canada (and even less in relation to investees' operations in Ontario), and it tends to fall behind their interest on climate change. For industrial activity in Ontario, the perception was that water is very inexpensive and readily available, and thus, not a risk. For example, Interviewee 30 recognizes that "there is an impression from some [investment] people that water is not such a pressing issue in Canada". Interviewee 29 recognizes that "in Ontario often people don't consider water risks to be material for manufacturing companies, but it really is […] What we've seen in Ontario is water concern around, for example, bottling companies drawing down aquifers". Canadian investors engage with investee companies around the world regarding water. For instance, CPPIB (2019, 42) requests "increased reporting on water-related strategies and performance [and] improved and more comparable disclosure of water-related data" from investees. In any case, "water risks are considered when there is a material risk. This is particularly true for certain sectors like materials, energy, utilities, but when it's material for a particular company, we definitely sit down and look into how the company manages those water risks" (Interviewee 29).

Managing climate change risks is a common concern for water utilities and the SF sector. Ultimately, if a municipal water system is exposed to climate change risks, then companies that rely on that system are also exposed to such risks. Therefore, highlighting this dependence could bridge water actors and investors, in the case of an investee company heavily reliant on municipal water supply. The industrial WUR policy was partly set up to help the utilities' water services be resilient to climate change to continue servicing a growing economy and population. Interviewee 4 illustrates this municipal perspective well by expressing that their municipality is implementing water efficiency, in their own operations and promoting it among their ICI users, to contribute to their municipality's goal to adapt to and mitigate the effects of climate change. Climate risk management is the top environmental concern in Canada's SF sector. For instance, TD Bank Group (2019), RBC GAM (2020b) and BMO GAM (2020) identified climate-related risks as a top and emerging risk and are considering investee's exposure to it in their financial decisions. Investors' awareness of the physical risks, including water, posed by climate change is illustrated by OTPP (2018, 5): "real estate and infrastructure may be vulnerable to events like hurricanes and flooding, while agricultural assets are sensitive to water risks. All of these will likely drive up costs and hurt profitability".

4.5 Discussion

This section starts by summarizing the findings, specifically comparing the current vs. potential links; discusses how these links might strengthen; and the implications for water governance. The section ends summarizing the logic of the diagnostic procedure developed in this study to understand how SF relates to water governance, which can be followed to study the relationship of other sectors to water governance.

This study finds that SF factors can influence water governance situations to various extents and in different ways. This confirms earlier literature exploring the relationships between the financial sector and water governance (e.g., Larson et al. 2012, Conca 2015). By focusing on the practices of institutional investors, this study's systematic appraisal of SF factors in the external dimension of water governance situations contributes to Hogeboom *et al.*'s (2018) call for systematically addressing the role of institutional investors in sustainable water use. The connections in the Ontario policies' cases are still in early stages. Currently, only water actors in the financial sustainability of water systems situation are engaging with SF actors, by exploring ways to use green bonds and blended finance. This is consistent with other studies considering the use of blended finance and green bonds in the water sector (OECD 2018, Money 2018, UN World Water Assessment Programme 2019, UN-Water 2020). The findings suggest four potential links, based on commonalities. The links related to the capital flows aspect of SF (the resiliency of infrastructure to climate change, and capital investment planning) present more opportunities for water actors to engage them, than the links posed by the risk management aspect (the financial materiality of water, and climate risk management), i.e., Type B2 vs. C2, respectively. In other words, we could expect that SF factors could present more links and opportunities for advancing water policy objectives that are more aligned with the capital flows aspect of SF, than the risk management aspect. This is not surprising, as in the financial sustainability situation, municipal utilities themselves search for finance, thus being able to engage with SF actors directly. In the industrial WUR situation, the commonalities with SF are mediated by (i.e., indirect link) investor-owned water-using corporations, which are subject to a wide variety of drivers. While investors engage with their investees to change their behaviour regarding a financially material issue (e.g., minimize a risk), corporations' behaviour is not solely attributed to investors' influence. Because this holds across the risk management aspect of SF (Table 13), we expect that other water policy objectives targeting investor-owned water-using corporations' water practices would also find mediated links to SF actors.

"Shared drivers" affecting both the specific water governance situation and the non-water factors under study, can strengthen their linkages. Here, the transition to a low-carbon (i.e., green) economy objective, with building resilience as its core characteristic (both set in policies at the global and federal levels) was identified to drive the need for both water governance situations and the SF priorities. In this context, we could expect that the links between SF and the water situations could potentially strengthen because they are nested in larger trends manifested in initiatives such as the Paris Agreement and the SDGs, to which Canada has committed. This is consistent with Alaerts (2019) argument that the interests of the financial and water sectors will converge in the context of climate-related risks, climate change adaptation and resilience. Or at least, we could expect that water actors in the situations could leverage this common driver when engaging with SF factors. Further research is required to more formally account for these shared drivers and their implications for the links between a specific non-water sector and a water governance situation.

SF has great potential to influence future water decision-making, particularly regarding the governance of municipal water supply. The policies under study originally did not contemplate sustainable finance factors, nor did such factors appear to shape the form of the water policies. However, during the subsequent years of implementation, municipal water actors pursuing the financial sustainability of water systems started considering the potential of one SF factor (green bonds) to help them reach their objectives. While green bonds have not yet been deployed by Ontario municipalities to fulfill their financial sustainability of water systems objective, water actors in municipalities are in the process of learning about new SF actors and instruments. This is slowly developing into closer collaborations with new SF actors, which could potentially move the interactions between SF factors and water decision-makers from the policy implementation stage to other more defining policy-making stages, such as agenda setting or policy formulation stages (Howlett and Cashore 2014). The resulting institutions could potentially prioritize "bankable" water objectives in detriment of other water priorities not related to resource efficiency or financial sustainability. Also, closer connections could drive water actors to become aware of other factors (i.e., Type B2 factors turning into B1 types), and harness them, progressively growing their dependency on private financing. In turn, market governance arrangements would become more relevant to organize the increased reliance on private financing. This study's findings also have implications for SF actors. To ensure the sustainability credentials of their finances, SF actors should consider their position as large international sources of funding in relation to local projects which would receive the funding. While much needed funding would benefit reaching some local water objectives, it might also de-prioritize other local environmental or social objectives.

In the case of the SF financial aspect explored here, it is relevant to note that asset managers (e.g., banks) appeared to be more proactive in approaching municipal water actors, given the unmet demand for Canadian green bonds. While SF actors can become more involved in contributing to water objectives, e.g., water funds, their primary mandate, as mentioned in section 4.2.1, is still maximizing returns on investment. For instance, Newborne and Mason (2012) argue how corporations' mandates are set in the context of company law and codes of stock exchanges, regardless of their level of engagement with environmental risks or corporate social responsibility. Thus, SF actors can be understood a part of the external dimension of a water governance situation, which is the space where non-water factors can be located.

In terms of the diagnostic approach developed in this study, separating SF into its two aspects, i.e., the capital flows and the risk management aspects (Table 13), was useful to navigate the SF data by focusing on the aspect most relevant to each of the water governance situations under study. Differentiating between the factors water actors acknowledged SF factors (B1, C1) from those they did not (B2, C2), together with applying broad criteria across all data (purpose, instruments, enablers/constrainer in Table 16), and identifying SF factors based on commonalities found in Table 16, shed light on SF factors that could open opportunities for advancing water policy objectives. This is a novel approach to assessing SF's role in water governance, building on a diagnostic approach for context-specific enquiry of the role of "external" factors to water governance (de Loë and Patterson 2017a). This process allows us to go beyond explicit mentions of water in SF data, or of SF in water data, i.e., we can trace SF factors relevant for water even if they are not specifically (or exclusively) targeted to water issues. A caveat of this analysis process is that it does not necessarily capture SF elements in Table 16 that do not share commonalities with water governance situations, but that could present opportunities to advance water policy objectives. For example, familiarizing themselves with "international and national SF networks" (Table 16) could help water actors in engaging with SF factors, e.g., by mobilizing the framing, language, initiatives from those networks. Further research on how to systematically account for more SF factors beyond commonalities is required.

4.6 Conclusions

This chapter explores how we can account for relevant sustainable finance factors in governance solutions to water problems. Our aim was to highlight the relevance of questioning the boundaries of water governance situations to enable the identification of opportunities that sustainable finance factors can present to tackle water challenges. We argue that understanding water governance situations as constituted by internal and external dimensions, enables the identification of opportunities that non-water factors can open. Specifically, we argue that sustainable finance has great potential to significantly drive future decision-making around municipal water supply in the context of the water sector's chronic underfunding, and the transition to low-carbon economies. Thus, SF is an area that water governance scholars and practitioners need to take into account when creating governance arrangements to address water challenges. We used two water policy objectives at the municipal level in the Canadian province of Ontario as the core of two water governance situations.

Findings from this study establish that SF factors can be part of the external governance dimension of a water governance situation. In the case of the two water governance situations under study, SF factors can influence how water policy objectives are implemented in two ways: (i) by providing alternative ways of covering water funding gaps, as long as the objectives of funding demand and supply align; and (ii) by shaping the broader context for water use practices of investor-owned corporations, as long as water and/or related climate change risks are financially material to the corporation, and thus the investor. Through the analysis presented here, we demonstrate how to trace links between SF and water governance situations. Tracing these links allows analysts (i) to navigate the SF field focusing on the most relevant SF aspect for a specific water governance situation (i.e., the capital flows or risk management aspects); and (ii) to identify current and potential links beyond the explicit reference of water or SF in each sector by focusing on the three "commonalities" criteria (i.e., purpose, instruments, enabler/constrainers).

In this way, our study contributes to the water governance literature in three ways. First, it contributes to the literature calling for the need to further understand the role of external factors in water governance (e.g., Ingram 2008, Wiek and Larson 2012, Gober 2013, de Loë and Patterson 2017b, Tortajada and Biswas 2018, Biswas 2019). Second, our study adds to the literature calling for improvements to the ability to draw boundaries for more effective water governance solutions (e.g., Breen, Loring, and Baulch 2018, de Voogt and Patterson 2019, Egan and de Loë 2020). Our findings also add to the growing body of literature examining the relationship between the financial sector and the governance of water resources and services, both in terms of financing water infrastructure and services (e.g., Rees, Winpenny, and Hall 2008, Ruiters and Matji 2015, Furlong 2019), managing water risks (e.g., Sojamo et al. 2012, Conca 2015, Schmidt and Matthews 2018), or both (e.g., Alaerts 2019).

Our analysis also raises new questions. Global dynamics, such as the Paris Agreement and the SDGs, underpinning the green growth model, drive both SF and many water policies around the world. Further research is needed to understand how shared drivers shape the role of SF factors in the external dimension of a specific water governance situation (e.g., strengthening of existing links, emergence of new links). The link between water governance situations and the SF risk management aspect is mediated by investor-owned water using corporations, which are subject to a wide range of drivers besides investor mandates. Thus, more studies are needed to discern if the capital flows aspect of SF offers more opportunities for advancing water policy objectives in general. Regarding the attention to "commonalities", systematically accounting for other types of SF factors linked to water governance beyond the commonalities criteria is necessary. The analysis of commonalities could also be a first step in understanding current and potential links between water governance situations and other non-water sectors, but asserting its usefulness in other contexts requires further research.

Chapter 5

Conclusion

This chapter connects the preceding chapters' findings as a synthesis of the dissertation's contributions. I begin by restating the purpose and objectives of this study. Section 5.2 summarizes the findings across, and specific to, the three preceding chapters, and lays the ground for discussing the significant, original contributions to knowledge and to water policy practice (Section 5.3). In Section 5.4, I review the limitations encountered in completing this research, how these limitations were addressed, as well as potential future research paths extending from this study. The chapter closes with reflections about the research process and outcomes.

5.1 Purpose and objectives

The purpose of this research is to advance our ability to assess the boundaries of water governance responses by recognizing the external dimensions of water governance situations and the types of non-water factors that shape them. By doing so, this research aims to identify opportunities to help improving water governance responses to water problems. The purpose is realised by achieving the following three interrelated objectives:

1. Build a diagnostic framework that provides a map to account for the role of non-water factors in water governance situations, and to identify opportunities these factors can provide for improving the effectiveness of water governance responses to water problems, by drawing on institutional analysis and water governance literatures.
2. Diagnose the range of non-water factors at play in real-world water governance situations at different sub-national levels (municipal and provincial), by using the diagnostic framework developed in Objective 1.
3. Examine a specific non-water sector's relationship with water governance situations, and identify the sector's factors relevant for this situation by applying the diagnostic framework developed in Objective 1.

All chapters in this dissertation contributed to Objective 1. Chapters Two and Three contributed to Objective 2, while Chapter Four contributed to Objective 3.

5.2 Major findings

The research findings were organized in three interrelated chapters presented as manuscripts. The individual chapters were conceived to address the same overarching research problem, grounded in the same empirical context for facilitating integration of findings and contributions. The chapters address the problem from different, complementary angles, and each address two of the three research objectives, as mentioned in the preceding section. Each of the results chapters was written to be stand-alone journal articles. The chapters used two complementary approaches to identify non-water factors in water governance. In Chapters Two and Three I examined data that portrayed the water governance situations and explored the range of non-water factors acknowledged there. Chapter Four complemented this approach by examining data portraying a relevant non-water sector, sustainable finance specifically, to identify whether any sustainable finance factors were part of the external dimension of water governance. The case studies were water conservation and efficiency policies, and the financial sustainability of water systems policy at the subnational level in the empirical context of the Canadian province of Ontario. The diagnostic framework (Figure 1) developed in Chapter One was applied in Chapters Two, Three and Four to account for the role of non-water factors in specific water governance situations, and their potential to open opportunities for solving water problems. The external governance dimension of a water governance situation contains Types B and C factors. Type B are non-water factors that can be addressed and engaged by water actors to solve a water problem around which water governance arrangements are formed. They are mostly characterized for being socio-economic objectives, e.g., economic development. Type C are non-water factors whose nature cannot be changed by water actors, but that water actors can adapt to. These factors are mostly characterized for being broad drivers of change, e.g., climate change.

5.2.1 Cross-cutting findings

The main revelation across the chapters in this thesis is that the diagnostic framework developed here is useful and relevant to understanding a variety of non-water factors influencing water governance situations at different scales. The diagnostic framework was also useful and relevant to identify the non-water factors that have the potential to open opportunities for improving water governance arrangements to more effectively solve water problems and advance water objectives. Three main interrelated aspects can be emphasized regarding the framework: the primary mandate of a factor in relation to a specific water governance situation under study determines whether it is a non-water factor in relation to that specific situation; non-water factors are part of water governance; and, the analytical generalizability of non-water factors categories.

The evidence shows that many actors and institutions serve multiple objectives, of which water-related objectives are just a sub-set. In this sense, the “primary mandate” criterion for defining whether factors are water or non-water (Section 1.4.2) is crucial and implies that a factor is water or non-water relative to the specific water governance situation under study. Non-water factors can be part of water governance, specifically, of the external dimension of a specific water governance situation. The categories of non-water factors, i.e., drivers of change and socio-economic objectives, borrowed from the UNWWAP (2009), captured the evidence well. Findings in Chapter Two added “organizational objectives” as another type of factors outside the water box, to account for the multi-objective nature of organizations such as municipalities, and the objectives of any other organization involved (e.g., businesses). While these three categories can be generalized, the non-water factors found to be at play in the case studies are specific instances relevant to those specific cases (e.g., data analytics development in Chapter Two). In other words, non-water factors shaping particular water governance situations vary according to the specific situation under analysis. Thus, the significance of a diagnostic tool as the framework developed in this study, to help water decision -makers to understand the non-water factors relevant in their own situations. Certain non-water factors, such as economic development, are expected to be influential across water governance situations defined around public policies, because economic development is a common objective of governments of different levels around the world. However, future research of a wide variety of water policy objectives could illuminate whether a consistent set of non-water factors tends to influence specific types of water governance situations.

The following are other major findings of this study. An important finding across all chapters is that non-water factors can explain water governance processes and outcomes, and thus understanding the external governance dimension of water governance situations is relevant for better steering water governance arrangements to more efficiently address water problems and advance water sustainability. In all chapters non-water factors influenced the situations in which water governance activities, including policy making, occurred. The evidence across chapters suggested various ways in which this influence took place. Non-water factors of both Types B and C drove policy formulation, i.e., the need to set a water policy objective, or to continue pursuing an existing one (e.g., climate change, population growth); and they drove policy implementation; i.e., how the water policy was pursued, i.e., approach of the policy and/or how it was implemented (e.g., economic development, green bonds). In other words, non-water factors shape different aspects of how water policy objectives were pursued. In this research, they influenced the approach used to meet policy objectives (e.g., water efficiency, rather than conservation), and implementation options to achieve them (e.g., rebates for industrial water use reductions, rather than specific regulations). Evidence about non-water factors influence over water policy implementation is found across Chapters Two, Three and Four, while evidence about their influence over the need for the water policy objective is only traced in Chapters Two and Three. Future research could shed light over whether SF factors could also influence the need for, or conception of, a specific type of water policy objective. Generally, further work is needed to find out whether there are other ways in which non-water factors influence how water policy objectives are pursued, and to more systematically assess the nature of the links themselves (see the future research section in this chapter).

Across the chapters, the economic development and GHG emissions reduction objectives were important drivers, although in different ways. Economic development was reported as the "ultimate driver" by interviewees in Chapter Three: Ontario's WUR policy ultimately responded to economic development drivers, which explains why it falls short on its water efficiency, and particularly water conservation, claims, constraining this policy's contribution to water sustainability. In Chapter Four, economic development was present in the form of green growth and transition to a low-carbon economy. Green growth was not considered a non-water factor in Chapter Four because this chapter focused on factors within the SF sector. However, green growth was present as a "shared driver" shaping both SF and water governance. Further research is needed to better account for the role of shared drivers in linking non-water factors and water governance situations. Similarly, GHG emissions reduction was not considered a non-water factor in Chapter Four either because this chapter focused on factors within the SF sector. GHG emissions reduction's presence as a shared driver was latent in that green growth (i.e., transition to a low-carbon economy) implies economic development with reduced GHG emissions; and it is a driver behind the SF factor resiliency of infrastructure to climate change. In Chapters Two and Three, GHG emissions reduction was the non-water factor that offered the most obvious and/or attractive opportunity for water policy-makers to contribute to advancing their policy objectives.

From across the empirical cases, it became evident that water actors, i.e., policy- and decision-makers in the water governance situations under study, do consider the impact of non-water factors over their policy objectives to various extents and in various ways. Furthermore, the evidence suggests that water actors have started harnessing non-water factors as opportunities to address their water objectives. For example, municipal officers considered offering joint water and energy conservation programs for industrial water users, and approaching SF actors to explore green bonds; granted, this seems a nascent practice. This finding is consistent with CWN (2020b) and CMW Consortium (2014) surveys of priorities in the Canadian water municipal sector, which identify a growing emphasis on finding "co-benefits" with other sectors. While water actors in the empirical setting are aware of the co-benefits idea, they do not seem to systematically approach them or take advantage of them in the context of a specific water governance situation. A potential explanation is that their consideration of non-water factors is not due to an explicit decision to look into non-water factors as a source of opportunities, but rather a result of their work within multi-objective organizations, such as municipalities or provinces.

The finding across chapters indicate that water decision-makers in the empirical setting examined already considered non-water factors in their activities, and some engage with them, to various extents, challenges an assumption in the literature that water actors have a narrow water-centric perspective. This assumption might be more a reflection of the level at which researchers have tended to focus. While water actors responsible for water resources tend to work at the watershed level, those responsible for water services tend to operate at the municipal or higher levels. Governments, at whichever level, pursue multiple objectives. Thus, water actors responsible for water services in organizations pursuing multiple objectives acknowledge that their work ultimately contributes to a variety of objectives. In this way, this study contributes another perspective to the literature arguing that water practitioners and scholars use a water-centric perspectives in organizing and analyzing water governance responses to water problems (e.g., UNWWAP 2009, Gupta et al. 2013, de Loë and Patterson 2017b). While water decision-makers are already considering, and in some cases harnessing, non-water factors, the research found that they do not necessarily account for them systematically, e.g., there were no dedicated sections in the documents assessing non-water factors specifically (non-water factors presence was traced across the evidence through this study's focused enquiry). Therefore, portraying non-water factors as potential additional opportunities, and applying the diagnostic framework developed in this study to account for the non-water factors in their water governance situations, could help address water challenges.

The difference in approaches applied, and levels (municipal and provincial) studied in Chapters Two and Three (they apply the same "inside-out" approach explained in Section 1.7, i.e., taking a water governance as a starting point to explore the range of non-water factors at play, thus addressing Objective 2), and between them and Chapter 4 (which applies an "outside-in approach, i.e., focuses on one non-water sector, thus addressing Objective 3), allow for additional cross-chapter comparisons. Chapters Two and Three suggest that water policies can be used instrumentally to achieve other objectives, which raises an important issue around the meaning of the term "water policies". In Chapter Two, the industrial water efficiency programs were cross-sectoral solutions. In Chapter Three, the analysis found that non-water factors are crucial to understanding the orientation of the Ontario water use reduction policy towards water efficiency measures, rather than to water conservation measures. In particular, Chapter Three highlights that the Ontario water use reduction policy appears to serve primarily a non-water socio-economic objective, i.e., economic development, rather than a water one. This type of situation is important to take into account when evaluating other water governance arrangements in terms of their efficacy in solving water problems and advancing water objectives.

Also, in Chapters Two and Three, Type B non-water factors, e.g., GHG reductions, represented opportunities to advance water policy objectives. Water actors could only respond and adapt to the impacts of Type C drivers, such as climate change and population growth suggested by the literature. However, in Chapter Four it became evident that Type C factors, i.e., the factors whose nature cannot be changed by water actors in a water governance situation, were also amenable to be harnessed, although in a different way: leveraged, rather than addressed and engaged with, as in the case of Type B factors. For instance, the concepts, terminology, etc. related to the factors financial materiality of water (involving water costs, water risks, engagement of investees), and climate change risk management, could potentially be mobilized by water actors in the situation to find common language with industrial water users that are investor-owned. The diagnostic framework (Figure 1) accommodated this because it was designed to be a diagnostic tool flexible enough to allow for new kinds of factors, while remaining internally conceptually consistent.

Regarding the levels where relevant non-water factors were located, it is important to start with a reminder that the water policy objectives under study were pursued at the municipal and provincial levels. The water governance arrangements around these policy objectives were themselves multi-level, e.g., provincial and transboundary water actors and institutions are key in defining the Ontario water use reduction policy. Non-water factors were found at the global or international level (Type C), and at national or sub-national levels (Type B). In Chapters Two and Three, Type C factors were predominantly global drivers (e.g., climate change), while Type B were all non-water objectives being pursued at the same level as the water policy objective under study. These were other policy and organizational objectives at the municipal or provincial level (e.g., cost-saving rationale of the businesses operating within the municipality or province). Comparatively, in the case of Chapter Four, Type C factors were also at the global level (in that the financial materiality of water, and climate change risk management, are concepts mobilized globally), while Type B factors were at the Canadian federal level. This difference reflects the multi-objective nature of the municipal and provincial governments: each trying to juggle multiple objectives while attempting to efficiently allocate their resources to achieve them. In other words, water officials and institutions in municipal and provincial governments contribute to the broader objectives of their organizations and are accountable to them, rather than to the "water sector" as a whole. SF in the empirical setting of Canada is a sector driven at the federal level, where local players are also active in the global SF field. This picture regarding scales reinforces the idea of the polycentric and multi-level nature of water governance.

In summary, the diagnostic framework developed in this study has proved useful and relevant across all the different approaches applied and empirical levels (municipal and provincial) studied in Chapters Two, Three, and Four. The study findings establish that non-water factors shape water governance situations processes and outcomes, in particular how water policy objectives are pursued and the subsequent water sustainability implications. A key implication is that governing water policy objectives is ultimately not just a water sector task. However, non-water sectors have not necessarily accounted for their role: the external governance of water has been mostly a space of unintended consequences. By explicitly recognizing the role of this external dimension, and accounting for its composition through a diagnostic framework, water actors are enabled to better engage with non-water actors to turn unintended consequences into purposeful opportunities.

5.2.2 Chapter-specific findings

In addition to the findings already covered in the preceding cross-cutting findings section, analysis in Chapter Two revealed an additional class of non-water factors. "Organizational objectives" is the new class of non-water factors, besides the ones originally posed by the UNWWAP (2009), i.e., socio-economic objectives and drivers of change. This new class is important because it reinforces that decision-makers are subject to pressures originating within the organizations they are part of, which can also shape how they make decisions and implement policy (e.g., municipalities' cost-efficiency and cost-effectiveness mandate).

Findings in Chapter Four establish that sustainable finance (SF) factors can be part of the external governance dimension of a water governance situation. SF factors can influence how water policy objectives are implemented in two ways: (i) by providing alternative ways of covering water funding gaps, as long as the objectives of funding demand and supply align; and (ii) by shaping the broader context for water use practices of investor-owned corporations, as long as water and/or related climate change risks are financially material to the corporation, and thus the investor. Chapter Four found that a water governance situation and the financial flows aspect of SF could be directly related. For instance, green bonds were the only SF factor that was explicitly acknowledged in a water governance situation, specifically in the financial sustainability of water systems situation. However, Chapter Four found that a water governance situation and the risk management aspect of SF tends to be mediated by the activities of investee corporations. Analysis in this chapter demonstrates how to trace links between SF and water governance situations. Tracing these links allows analysts (i) to navigate the SF field focusing on the most relevant SF aspect for a specific water governance situation (i.e., the capital flows or risk management aspects); and (ii) to identify current and potential links beyond the explicit reference of water or SF in each sector by focusing on the three "commonalities" criteria (i.e., purpose, instruments, enabler/constrainers). These, and the cross-cutting findings explained earlier, lay the ground for the significant and original contribution to knowledge of this study.

5.3 Contributions

5.3.1 Scholarly contributions

The insights from this thesis contribute in different ways to several strands of the water governance literature. The thesis also contributes to the institutional analysis literature. The water governance literature strands can be divided in two groups according to the extent this thesis contributes to them: first, this thesis directly addresses the gaps highlighted by these literatures; second, this thesis also provides insights that add to these bodies of literature in more general terms.

This thesis mainly contributes to literatures calling for (a) the need for further understanding external factors in water governance (e.g., Ingram 2008, Wiek and Larson 2012, Gober 2013, de Loë and Patterson 2017b, Tortajada and Biswas 2018, Biswas 2019); and (b) the need to improve the ability to draw boundaries for more effective water governance solutions, (e.g., Blomquist and Schlager 2005, Breen, Loring, and Baulch 2018, de Voogt and Patterson 2019, Egan and de Loë 2020). In this context, this study's significant original contribution to knowledge is advancing the understanding of the external dimension of water governance. It does so through developing and applying a diagnostic framework that enables accounting for the role of non-water factors in specific water governance situations' processes and outcomes, and their potential to afford opportunities to advance the water objectives pursued in such situations. In other words, I argue that a diagnostic framework built around the concept of an external dimension of a water governance situation is a useful way to account for the role of non-water factors and their potential in addressing problems targeted by specific water governance situations. This approach is novel because it brings together concepts and frameworks not used in conjunction before. The development of this framework rests on the following novel approaches, implemented across chapters, unless otherwise stated:

- Proposing the water vs. non-water distinction as the primary analytical distinction of external factors at play in water governance situations. This distinction more clearly directs the attention to the type of interactions and drivers of interest in the literature (i.e., cross-sectoral, global drivers of change). Only then non-water factors can be qualified as in the internal/external dimensions of a specific water governance situation. Relying only on an internal/external distinction diffuses the attention by also capturing water factors that are external to a water governance situation, but that are ultimately not of interest in the context of the research problem addressed here.
- Elaborating on Rogers and Hall's (2003) "external governance of water" dimension, by characterizing it in terms of Types B and C factors, which are geared to differentiate the non-water factors that can actually be engaged and addressed by water actors in a water governance situation to advance their policy objectives. The differentiation between Type B and C non-water factors hinges ultimately on the notion of water actors' ability to influence, i.e., control deriving from a mandate vs. the ability to influence without being in charge. In this sense, this thesis argues that non-water factors are part of the "external governance of water" dimension of a governance situation, and that this dimension influences the processes and outcomes of water governance situations. Explicitly in Chapter Two, the diagnostic framework proposed here maps the Rogers and Hall (2003) "external governance of water" dimension to the CIS institutional analysis framework's (McCord et al. 2017, Cole, Epstein, and McGinnis 2019) contextual variable governance systems (GS) and exogenous shocks variables related ecosystems (ECO) and social, economic, and political settings (S), which are also sub-systems in the SES framework (McGinnis and Ostrom 2014).
- Operationalizing the UNWWAP's (2009) "water box" framework into scholarly work, and asserting its academic usefulness. The water box distinction of two types of factors outside the water box, i.e., broad drivers of change and socio-economic objectives, was particularly useful to guide the exploration into the range of non-water factors at play in a water governance situation. Chapter Two suggests considering an additional class: "organizational objectives", as discussed in the chapter-specific findings (Section 5.2.2).
- Expanding on the analytical diagnostic framework developed by de Loë and Patterson (2017a), specifically their "external factors to a water governance action situation" concept, by integrating it with the following building blocks: the Rogers and Hall (2003) and UNWWAP (2009) concepts, and the CIS framework in the ways explained in the previous bullet points By doing this, this study also adds to the emerging literature on diagnostic approaches to assess the boundaries of water governance situations (e.g., Garrick et al. 2013, Hinkel et al. 2015, Egan and de Loë 2020).

- Arguing that sustainable finance is an area that water governance scholars and practitioners need to take into account when creating governance arrangements to address water problems because of its growing importance in current global efforts to transition to low-carbon economies. Chapter Four devises an analysis process that traces links between sustainable finance and water governance situations. This process allows (i) to navigate the SF field focusing on the most relevant SF aspect for a specific water governance situation (i.e., the capital flows or risk management aspects); and (ii) to identify current and potential links beyond the explicit reference of water or SF in each sector by focusing on the three "commonalities" criteria (i.e., purpose, instruments, enabler/constrainers).
- Situating the building blocks mentioned in the preceding bullet points, in the context of the conceptual foundation set by the problemshed and polycentric governance concepts, to build the diagnostic framework (Figure 1). The conceptual foundations provide the overarching understanding of the dynamics of water governance, as explained in Section 1.3.1, while the building blocks are the specific elements in the architecture of the diagnostic framework developed in this study. The study confirms the usefulness of the problemshed and polycentric governance concepts: for instance, the governance of a water policy objective reflects a problemshed, with polycentric governance as its defining property. In this sense, decisions made in multiple other governance systems affect how decisions are made and institutions are crafted in a water governance situation. While decisions are made in other governance systems to govern their own policy areas, they end up having unintended consequences for water.

This research also contributes new understanding to the role of non-water factors in specific water governance situations, and thus contributes to the literature tracing water governance arrangements in practice, rather than to the "normative" water governance literature, as called for by Woodhouse and Muller (2017), Zwarteveen et al. (2017), and Jiménez et al. (2020). Specifically, it responds to calls for systematically mapping "the actual workings of particular institutional, financial and organizational governance arrangements and processes" (Zwarteveen et al. 2017, 8), and tracking the ecological, socio-economic and political causes of water problems and decision-making processes around them (de Loë and Patterson 2017b). Chapters Two, Three, and Four contribute to efforts to systematically map the actual workings of water governance arrangements, via the development of a diagnostic framework focused on the role of non-water factors. These chapters also make individual contributions to the following strands of the water governance literature. Chapter Two adds to the broader literature about the governance of water use reduction in urban municipalities (e.g., de Loë et al. 2001, Wolfe 2008, Furlong and Bakker 2011, Sauri 2013). Chapter Three adds to the literature about the governance of water quantity in Ontario (e.g., Kreutzwiser et al. 2004, Mitchell et al. 2014, Sandhu et al. 2019). Chapter Four adds to the growing body of literature examining the relationship between the financial sector and the governance of water resources and services, both in terms of financing water infrastructure and services (e.g., Rees, Winpenny, and Hall 2008, Ruiters and Matji 2015, Furlong 2019), managing water risks (e.g., Sojamo et al. 2012, Conca 2015, Schmidt and Matthews 2018), or both (e.g., Alaerts 2019).

Finally, this thesis also contributes to the institutional analysis literature. Specifically, McGinnis (2019) recognizes that it is necessary to systematically reflect on the boundaries of environmental governance systems and situations to improve the rigour of institutional analysis. Zooming in and out of the situation to identify external factors relevant to a specific situation is an appropriate procedure in this regard, as suggested and operationalized by de Loë and Patterson (2017a), and as called for by McGinnis (2019). Scholars in the Bloomington School of institutional analysis have produced and applied a variety of diagnostic frameworks, which include variables to account for external drivers. However, not enough attention has been paid to these external factors, despite their being crucial to understanding system functioning (McGinnis 2019). Thus, Chapter Two contributes to this literature by addressing the need to pay attention to external drivers, represented by the exogenous variables S and ECO in the SESF, and the contextual variables in the CIS. This in turn contributes in systematically reflecting on the boundaries of environmental governance systems and situations to improve the rigour of institutional analysis. In the context of understanding the role of non-water factors in water governance situations, Chapter Two suggests paying attention to objectives (particularly socio-economic and organizational) as a way to clearly identify and define the governance systems (GS) at play, and their associated actors (GS1, GS2) and institutions (GS5, GS6).

5.3.2 Recommendations for water policy makers

To address water problems, it is necessary to account for their cross-scale and multi-level connections in a systemic way by integrating different interests over water (Bullock et al. 2009, Brandes and O'Riordan 2014, Seegert et al. 2014). Traditionally, water policy- and decision-makers have addressed water problems with water tools (e.g., water regulations) because those are the instruments they have control over. However, in an increasingly interconnected world, traditional water governance approaches are proving ineffective to solve water challenges, as evidenced by slow progress on the sustainable development goal on water SDG6 (UN-Water 2018b). It is promising that water decision-makers have started acknowledging and engaging with non-water factors, as shown in the evidence. More could be done to make the analysis of non-water factors a more standard practice by water decision-makers leading water governance arrangements to solve water problems. The diagnostic framework developed in this study (Figure 1) to understand the external dimension of a water governance situation, is a step in that direction. As noted earlier, the external governance of water has been mostly a space of unintended consequences from decisions made in other non-water policy areas. Thus, the recommendations for practice revolve around making the external governance of water work for water decision-makers addressing water problems, i.e., enabling water actors to turn unintended consequences into purposeful opportunities.

This research has highlighted the relevance of explicitly exploring the role of non-water factors in water governance, in finding additional opportunities to contribute to solving water problems, including advancing water policy objectives. An implication of this research is that, ultimately, water actors cannot always solve water problems or reach water policy objectives alone. Thus, I propose three complementary sets of recommendations: (i) accounting for non-water factors in water governance arrangements, led by water actors; (ii) implementing synergies and co-benefits, led by authorities and implemented collaboratively across sectors; (iii) building capacity in the water sector for cross-sectoral engagement.

First, in practical terms, this study makes the case for expanding the water decision-makers' toolbox with the explicit analysis of non-water factors, i.e., to incorporate harnessing non-water factors to the standard problem solving strategies of water decision-makers, including policy-makers. Regarding the process of accounting for non-water factors at play in the first place, water actors can bring together participants in the water governance situation to reflect on the various factors driving their water governance processes and outcomes. Collaboratively, they map non-water factors and their role, by using the diagnostic framework proposed in this study (Figure 1). In this way, actors in the governance situation expand the scope of the dotted line box in Figure 1, and thus of potential new opportunities to tackle water problems. This reflection exercise could take place on a regular basis to account for evolving dynamics, and update, for instance, water policy implementation plans if new opportunities become apparent. For instance, the ground is fertile for this type of exercise in the empirical case of the Canadian municipal sector, as the sector recognizes it is a priority to "identify the full range of key drivers and associated risks that impact progress in municipal water management", in order to "develop strategies for adapting to climate change, demographics and socio-economic factors" (CMW Consortium 2014, 5). Once the influence of non-water factors has been acknowledged, and the extent to which they can be harnessed or not (i.e., Types B or C factors) has been assessed, water actors narrow down a list of non-water factors to be engaged (a sub-set of Type B factors), and reach out to actors responsible for them to work out win-win solutions based on co-benefits. In that sense, in order to garner other sectors' support for water policy objectives, water policy -makers should more clearly articulate how such water objectives also contribute to those sectors' socio-economic objectives.

Second, while water actors can initiate cross-sectoral collaboration on a case by case basis, an integrated approach to water problems can only be sustained in time if it is supported by leadership of authorities. The authorities and/or leadership in local governments end up deciding over trade-offs among multiple socio-economic and organizational objectives, to which they allocate their limited resources. Thus, they are in the capacity to prioritize synergies, and proactively lead the materialization of co-benefits amongst water and other socio-economic objectives in their jurisdictions. The role of water actors could be to present the relevance of water objectives in the context of other objectives, and propose ideas for synergies and win-win scenarios, to inform and facilitate decision-making, as described in the previous paragraph.

Third, capacity needs to be built in the water sector to enable it to better grasp the implications of non-water factors for water governance, and to communicate and engage successfully with other sectors to harness synergies. Three components that can contribute to building this capacity are to expand the roles and responsibilities descriptions of water actors; provide training to understand other sectors; and incorporate human resources with diverse backgrounds. While water actors have tried to account for non-water factors in their plans, it currently appears that engaging with other sectors is a stretch of their current role descriptions and the practicalities of their everyday tasks. In order to propose synergies, water actors would need to have carried out an analysis as the one proposed in this study, and established initial relationships with other sectors to propose feasible synergy scenarios for authorities to support. In that sense, explicitly formalising a responsibility for exploring co-benefits with other sectors in water sector job descriptions, could encourage this practice. Multi-disciplinary, globally minded teams would facilitate connection with other sectors. For instance, as noted earlier, the financial sector is truly global, while the water sector tends to focus more on local dynamics (even if aware of cross-sector connections). In the context of the findings of this study, training in economic development, financial instruments, and global sustainable development trends could be useful if links with sustainable finance will strengthen, which is expected due to the rapid growth of the sector. As Alaerts (2019, 21) puts it, "the central impediment to financing [in the water sector] is of institutional rather than financial nature", and capacity building is key in strengthening water institutions to harness trends in fields such as sustainable finance.

The recommendations deriving from this research have current relevance in the context of the need to accelerate progress towards achieving SDG6 globally. In July, 2020, UN Water launched the SDG6 Global Acceleration Framework as part of the 2020 High-Level Political Forum, to identify ways to accelerate the achievement of SDG6 in the 10 years to 2030 (SDG Knowledge Platform 2020). The Acceleration Framework (UN-Water 2020) highlights that the bottleneck to progress in SDG6 is the problem addressed by this research: “decisions taken in other sectors […] often do not consider the associated impacts on water availability and water quality, and that issues do not receive the necessary political attention”. A crucial action pillar of the Acceleration Framework is engagement across-sectors and levels. Four of the five accelerators it identifies resonate with the findings and contributions to scholarship and practice of this study: (i) optimizing financing for water, including innovative financing such as blended finance; (ii) capacity development, with education, training and attracting a skilled workforce on the technical side but also policy, governance and finance, amongst others; (iii) innovation on ways of working, governance and business models, besides technological and other types of innovation; (iv) integrated governance, to “recognize interlinkages, forge cooperation, build on complementarities […] to maximize synergies and minimize trade-offs across and within sectors” (UN-Water 2020, 12). In the context of governance, success would entail that “efficient mandates for SDG 6 delivery in all sectors are established, institutions are strengthened to deliver and intersectoral coordination mechanisms operate effectively” (UN-Water 2020, 13). Thus, the findings, contributions, and recommendations from this research are timely to contribute to this global debate, by proposing ways to systematically identify relevant factors across sectors and start materializing synergies and co-benefits.

5.4 Study limitations and ideas for future research

5.4.1 Limitations

The main study limitations related to the methodological aspect, particularly in relation to data collection from interviews. More interviews were planned for all chapters, but difficulties of reaching potential interviewees or getting them to participate presented challenges within the study’s timeframe. Still, interviews continued to be pursued until participation from representatives from all relevant types of actors was secured, and saturation was reached. Securing interviews to capture the sustainable investment side in Chapter Four was particularly challenging. I was able to reach directly, and through contacts, members of the SF community that represented consultancy companies, investor networks, and asset managers. However, it proved very difficult to establish contact with asset owners (e.g., pension funds), or when contact was established in person during a public event, to get any response from them to participate in the study. As attempts to get asset owners to participate in the study were not yielding results, I targeted SF public events where they, and members of the Canadian Expert Panel of Sustainable Finance, would speak about the sector. These events were the 2019 Globe Capital; Ryerson CSR Institute: Understanding Responsible Investment panel (2019); Sustainalytics’ Perspectives on ESG and Materiality (2018); and TFI’s Capitalizing on Sustainable Finance Report Launch 2018. Attending these events, and collecting the documents outlining their SF plans, strategies and reports, ensured that asset owners’ voices were present in the study, and helped to get a wider perspective of the sector overall.

Two main drawbacks were found when working towards Objective 3 of this research, i.e., focusing on a specific non-water sector. First, if the sector is highly globalized, like the financial sector, it is challenging to differentiate which specific drivers are relevant to the water governance situation under study. When analyzing data from the SF field, most plans, strategies and reports produced by investors refer to the whole of their investment activities across the world, with not much granular detail referring specifically to their investment in Canadian assets. This type of data would have been desirable, but their global perspectives are still useful as they are also applicable to their investment activities in the empirical setting in this study. Second, exploring an entire sector for potential relevant factors can be done in several ways, which can yield varying results. In the case of SF in Canada, this challenge was tackled by searching in the academic literature for how the SF field can be understood in relation to the environment, complemented with a focus on the actors and institutions most relevant to the water governance situations under study (in this case, the focus is in the Toronto financial centre). In this sense, the intent was not to have a comprehensive picture of the SF sector in the country or province, but to have a more targeted approach to the sector.

5.4.2 Ideas for future research

This study raises the question of what ultimately makes a policy a "water" one: meeting a water objective, or does using a water tool or issue (e.g., water efficiency) to pursue other non-water objectives (e.g., economic development) also make a policy a water one? Such question highlights the need to further develop the concept of "water factors", and understand under which conditions they can change to primarily serve non-water objectives. This study also suggests the following areas for future research, explained below: standardizing the appraisal of the relationship between non-water factors and water governance situations; exploring the role of shared drivers in shaping these relationships; paying more attention to divergences and challenges (and not only commonalities); and establishing whether the capital flows aspect of sustainable finance presents more opportunities for water objectives than the risk management aspect.

In Section 1.4.3, water factors were defined as actors or institutions whose primary purpose (or mandate, in the case of actors) revolves around water resources and/or services, and non-water factors as those whose primary purpose or mandate does not revolve around water, but which nevertheless can influence water governance processes and outcomes. This definition was useful to approach our analysis of non-water factors. The analysis highlighted that some institutions, despite appearing to primarily respond to a water objective, can primarily respond to a non-water objective. Such is the case of Ontario's Water Opportunities and Water Conservation Act (WOWCA), which was established that primarily responded to an economic development objective. This insight highlights the need to more clearly differentiate when a policy's objective is to solve a water problem, compared to a policy using water as a tool, or area of application, to solve other problems. For instance, the industrial water use reduction programs run by municipalities are primarily water programs: their objective is water use reduction, and they also contribute to economic development objectives. This differentiation is relevant to better account for interactions of water with a variety of non-water factors (e.g., broader societal goals), and thus direct water governance arrangements to be more conducive to water sustainability. Developing further the concept of "water factors", building on the definition posed here, would add more nuance to our understanding of what "water policies" entails. This question also brings attention to how "hybrid institutions", i.e., institutions that respond to water and non-water drivers, form and to which drivers they ultimately respond most to. In that sense, a potential future line of inquiry is to better understand what drives institutions to primarily respond to water or non-water objectives, e.g., power dynamics at play in water and non-water actors' interactions. The analysis of non-water factors can provide a first step in this regard, by identifying which institutions are hybrid ones.

While non-water factors found in this study's water governance cases were appraised in a systematic manner under the Types B and C typology, their links to water governance were captured according to how they were portrayed in the data, or the approach applied in the specific chapter (e.g., the commonalities criteria in Chapter Four). A more detailed understanding of non-water factors could benefit from a more standardized appraisal of the nature of their link to water governance processes and outcomes. The literature review in Chapter One highlighted Daniell and Barreteau's (2014) classification of "flows of externalities" to help explain the unintended consequences of multi-level, cross-scale, and rescaling interactions in water governance. Daniell and Barreteau (2014) classify these flows (i.e., unintended consequences) in six types, including physical (e.g., water flows, pollution flows, food trade); political and social control (e.g., political reform, legitimacy, that sway the allocation of decision-making power); human (e.g., people moving across spatial or administrative levels); and financial (e.g., investment flows, budget transfers). They propose each of these types as variables that can be added to the Ostrom school's IAD and SES frameworks. However, they do not specify how these variables could integrate within the IAD or SESF, e.g., whether those flows take place within and/or amongst action situations. Future work could extend the framework devised in this study by operationalizing Daniell and Barreteau's (2014) typology of flows. These two elements are compatible: the design and architecture of the framework devised here is also grounded in the Ostrom school frameworks of institutional analysis.

The following future research ideas emerge from the work in Chapter Four (exploration of a specific non-water sector). First, in an increasingly connected world, global dynamics, such as the Paris Agreement and the SDGs, underpinning the green growth model, can drive non-water factors and water policies around the world. More attention is needed to formally account for the role of shared drivers in shaping the function of non-water factors in the external governance dimension of a water governance situation (e.g., strengthening of existing links, emergence of new links). This in turn could open new windows of opportunity for water decision-makers to leverage. Second, relying on the "commonalities" criteria to help identifying factors in a specific non-water sector, currently (or potentially) linking to a water governance situation, was relevant in the context of broadening the range of opportunities for meeting water objectives. Whilst the application of this criteria did enable the identification of important non-water factors (e.g., investment in resilient infrastructure objective), it does not necessarily grasp divergences or challenges. This study identified non-water factors that are shaping water governance situations, whether they currently enable or constrain the water policy objective. The logic is that even addressing constrainers could still open opportunities to advance water objectives. Thus, future work could devise a way to also pay attention to divergences and their implications for achieving water policy objectives. Finally, regarding sustainable finance as a source of factors in the external governance dimension of water governance situations, more studies are needed to discern if the capital flows aspect can pose more opportunities for water policy objectives than the risk management aspect of sustainable finance. This is relevant because the link between water governance situations and the risk management aspect is mediated by investor-owned water using corporations, who are subject to a wide range of drivers besides investor mandates.

5.5 Reflections

The journey of doctoral studies has been one of personal and professional growth for me. I arrived in Canada for the first time with work experience in the water service sector globally, and particularly Latin America, but no knowledge of the Canadian water sector. I learn about Canadian water governance at the university and about the Canadian water sector more generally in the graduate inter-disciplinary Collaborative Water Program by the Water Institute at the University of Waterloo. I also attended the Canadian Water Summit, public events about the Great Lakes run by the International Joint Commission, and consistently joined events of several environmental groups in the Toronto area. All this together helped me understand the wider context for my study, from both academic and practitioners' perspectives. It was inspiring to meet many people in the sector that very deeply care about water and the environment, and it was interesting to see how important water, in this case the Great Lakes, was to many aspects of people's lives in the basin, e.g., jobs, recreation, identity. Originally from Lima, Peru, I loved living by the Pacific Ocean. Living in Toronto through my doctoral studies, I grew very fond of walks along the shores of Lake Ontario and summer visits to the Georgian Bay. With time I could start to understand the strong connection that people living in the basin have to the lakes. However, despite the many policy mechanisms at the basin, municipal, provincial, federal and transboundary levels to protect the lakes, evidence in this study confirms that there are other societal concerns that are more valued than water conservation and sustainability. It is my hope to contribute with this study in any way to guide dialogue towards turning trade-offs and unintended consequences of other sectors over water into purposeful opportunities and synergies.

Towards the end of my studies, I wrote part of my doctoral dissertation during the COVID-19 pandemic, which presented many challenges. Along the spirit of this dissertation that aimed to locate opportunities to advance water sustainability, in the midst of isolation and uncertainty, I decided to hold onto the opportunities that could emerge from this time. It was not easy, but it was possible with the support of colleagues, friends and family, in Canada and abroad. I take all the learnings from this time into the future.

In this ever more interconnected world, accounting for how other sectors impact water and how water contributes to other sectors, is necessary to achieve water policy objectives and sustainability. Moving forward, I aim to work in research or practice that allows me to contribute to materialize synergies between water and environmental objectives and other societal objectives.

REFERENCES CITED

Ackrill, R., and A. Kay. 2011. "Multiple streams in EU policy-making: the case of the 2005 sugar reform." *Journal of European Public Policy* 18 (1):72-89.

Akhmouch, A. 2012. "Water governance in Latin America and the Caribbean: a multi-level approach." *OECD Regional Development Working Papers* 2012/04.

Akhmouch, A., and F. Nunes-Correia. 2016. "The 12 OECD principles on water governance - When science meets policy." *Utilities policy* 43:14-20.

Alaerts, G. 2019. "Financing for water -Water for financing: A global review of policy and practice." *Sustainability (Switzerland)* 11 (3).

Alcott, B. 2005. "Jevons' paradox." *Ecological Economics* 54 (1):9-21.

Alias, A.H., C.A. Boyle, and S. Hassim. 2017. "Water demand management: A review on the mechanisms to reduce water demand and consumption." *International Journal of Civil Engineering and Technology (IJCIET)* 8 (3):554–564.

Aligica, P., and V. Tarko. 2012. "Polycentricity: From Polanyi to Ostrom, and beyond." *Governance: An International Journal of Policy, Administration, and Institutions* 25 (2):237-262.

Allan, J.A. 2005. "Water in the environment/socio-economic development discourse: sustainability, changing management paradigms and policy responses in a global system." *Government and Opposition* 40 (2):181-199.

Anderies, J., M. Janssen, and E. Ostrom. 2004. "A Framework to Analyze the Robustness of Social-ecological Systems from an Institutional Perspective." *Ecology and Society* 9 (1).

Asian Development Bank. 2013. *Thinking about Water Differently: Managing the Water–Food–Energy Nexus*. Mandaluyong City, Philippines: Asian Development Bank.

Balpataky, K. 2018. "Ontario NDP promises new water strategy." Water Canada, accessed 30 April 2018. https://www.watercanada.net/ontario-ndp-promises-new-water-strategy.

Batchelor, C., C. Linstead, M. Dhar, S. Roy, and R. May. 2014. "Do water-saving technologies improve environmental flows?" *Journal of Hydrology* 518:140-149.

Baumann, D.D., J.J. Boland, and J.H. Sims. 1984. "Water conservation: The struggle over definition." *Water Resources Research* 20 (4):428-434.

Bayliss, K. 2013. "The financialization of water." *Review of Radical Political Economics* 46:292-307.

Benidickson, J. 2017. "The evolution of Canadian water law and policy: Securing safe and sustainable sbundance." *McGill Journal of Sustainable Development Law* 13 (1):59 - 104.

Biswas, A.K. 2019. "Why water is not in the international political agenda." *International Journal of Water Resources Development* 35 (2):177-180.

Biswas, A.K., and C. Tortajada. 2010. "Future water governance: problems and perspectives." *International Journal of Water Resources Development* 26 (2):129-139.

Biswas, A.K., C. Tortajada, and P. Rohner. 2018. *Assessing Global Water Megatrends*. Singapore: Springer.

Bithas, K. 2008. "The European policy on water use at the urban level in the context of the Water Framework Directive. Effectiveness, appropriateness and efficiency." *European Planning Studies* 16 (9):1293-1311.

Blatter, J.K. 2008. "Case study." In *The SAGE Encyclopedia of Qualitative Research Methods*, edited by L. Given. Thousand Oaks, California: SAGE.

Blomquist, W., K.S. Calbick, and A. Dinar. 2005. *Institutional and Policy Analysis of River Basin Management, World Bank Policy Research Working Paper 3525*. Washington, D.C.: World Bank, Agriculture and Rural Development Department. Reprint, Not in File.

Blomquist, W., and E. Schlager. 2005. "Political pitfalls of integrated watershed management." *Society and Natural Resources* 18 (2):101-117.

Bloom. 2018. Bloom bakcgrounder. Bloom Centre for Sustainability.

Bloor, M., and F. Wood. 2006. *Keywords in Qualitative Methods: A Vocabulary of Research Concepts*. California: Sage.

BMO Financial Group. 2019. *Sustainable Financing Framework*: BMO Financial Group.

BMO GAM. 2020. *Responsible Investment: 2019 Review*: BMO Global Asset Management.

Brandes, O.M., and J. O'Riordan. 2014. *Decision-Maker's Brief: A Blueprint for Watershed Governance in British Columbia*. Victoria, BC: POLIS Project on Ecological Governance, University of Victoria.

Breen, S., P. Loring, and H. Baulch. 2018. "When a water problem is more than a water problem: Fragmentation, framing, and the case of agricultural wetland drainage." Review of FA. *Frontiers in Environmental Science* 6:1-8.

Brooks, D., C. Maas, O.M. Brandes, and L. Brandes. 2015. "Applying water soft path analysis in small urban areas: four Canadian case studies." *International Journal of Water Resources Development* 31 (4):750-764.

Brooks, D.B., O.M. Brandes, and S. Gurman. 2009. *Making the most of the water we have: The soft path approach to water management*: Earthscan.

Brown, K., and D.J. Hess. 2017. "The politics of water conservation: identifying and overcoming barriers to successful policies." Review of FA. *Water Policy* 19:304-321.

Bullock, A., W. Cosgrove, W. van der Hoek, and J. Winpenny. 2009. "Getting out of the box – linking water to decisions for sustainable development." In *The United Nations World Water Development Report 3: Water in a Changing World*, 3-23. Paris and London: UNESCO and Earthscan.

Busch, T., R. Bauer, and M. Orlitzky. 2016. "Sustainable development and financial markets: Old paths and new avenues." *Business and Society* 55 (3):303-329.

Carter, N. 2007. *The Politics of the Environment. Ideas, Activism, Policy.* 2nd ed: Cambridge University Press.

Castro, J.E. 2007. "Water governance in the 21st century." *Ambiente y Sociedade* 10 (2):97-118.

CCGG. 2016. *Member Survey: CCGG's Role in Environmental and Social Matters*: Canadian Coalition for Good Governance.

Cesano, D., and J.E. Gustafsson. 2000. "Impact of economic globalisation on water resources: A source of technical, social and environmental challenges for the next decade." Review of FA. *Water Policy* 2 (3):213-227.

CGLG. 2006. Annex 2001 Implementing Agreements. Frequently Asked Questions. edited by The Council of Great Lakes Governors.

Charmaz, K. 2006. *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*. Thousand Oaks, CA: Sage.

CIB. 2020. "Canada Infrastructure Bank: Water and Wastewater." Financing Water Systems: Green Bonds and Canada Infrastructure Bank, Canadian Water Network Webinars.

CIBC. 2019. *Sustainability Report*: CIBC.

City of Guelph. 2016. "2016 Water Efficiency Strategy Update."

City of Toronto. 2011. *Water Efficiency Plan Update - 2011*.

City of Toronto. 2018. "Toronto at a glance." accessed 11 November 2019. https://www.toronto.ca/city-government/data-research-maps/toronto-at-a-glance/.

City of Toronto. n.d. "Water efficiency for business." accessed 11 February 2018. https://www.toronto.ca/services-payments/water-environment/how-to-use-less-water/water-efficiency-for-business/.

Clapp, J., and P. Stephens. 2019. "Financialising nature." In *Routledge Handbook of Global Sustainability Governace*, edited by A. Kalfagianni, D. Fuchs and A. Hayden, 12. London: routledge.

Clarke-Sather, A. 2015. "Hydrosocial governance and agricultural development in semi-arid Northwest China." In *Negotiating Water Governance: Why the Politics of Scale Matter*, edited by Emma S. Norman, Christina Cook and Alice Cohen, 247-262. Farnham: Ashgate.

Cleaver, F., and J. de Koning. 2015. "Furthering critical institutionalism." *International Journal of the Commons* 9 (1):1-18.

Clement, F. 2010. "Analysing decentralised natural resource governance: proposition for a "politicised" institutional analysis and development framework." *Policy Sciences* 43 (2):129-156.

Clement, F. 2012. "For critical social-ecological system studies: integrating power and discourses to move beyond the right institutional fit." *Environmental Conservation* 40 (1):1-4.

CMW Consortium. 2014. *2014 Canadian Municipal Water Priorities Report: Towards Sustainable and Resilient Water Management*: Canadian Water Network's Canadian Municipal Water Consortium.

Cohen, A., and S. Davidson. 2011. "The watershed approach: challenges, antecedents, and the transition from technical tool to governance unit." *Water Alternatives* 4 (1):1-14.

Cole, D., G. Epstein, and M. McGinnis. 2019. "Combining the IAD and SES frameworks." *International Journal of the Commons* 13 (1):1-32.

Conca, K. 2015. "Which risks get managed? Addressing climate effects in the context of evolving water-governance institutions." *Water Alternatives* 8 (3):301-316.

Cook, C., A Cohen, and E.S. Norman. 2015. "Conclusion: negotiating water governance." In *Negotiating Water Governance: Why the Politics of Scale Matter*, edited by Emma S. Norman, Christina Cook and Alice Cohen, 299-305. Farnham: Ashgate.

Cooley, H., N. Ajami, M.L. Ha, V. Srinivasan, J. Morrison, K. Donnelly, and J. Christian-Smith. 2013. *Global Water Governance in the 21st Century*. Oakland, CA: Pacific Institute.

Cosgrove, W.J., and D.P. Loucks. 2015. "Water management: Current and future challenges and research directions." *Water Resources Research* 51:4823-4839.

Costanza, R., and H.E. Daly. 1992. "Natural capital and sustainable development." *Conservation Biology* 6 (1):37-46.

Costanza, R., B. Low, E. Ostrom, and J. Wilson. 2001. *Institutions, Ecosystems, And Sustainability*. Edited by R. Costanza, *Ecological Economics*. Boca Raton: CRC Press.

Council of Great Lakes Industries. 2015. *A Water Stewardship Tool for Great Lakes Industry: Final Project Report to the Great Lakes Protection Fund*.

CPPIB. 2019. *2019 Report on Sustainable Investing: Investing Responsibly for CPP Contributors and Beneficiaries*: CPP Investment Board.

Craft, J., and M. Howlett. 2012. "Policy formulation, governance shifts and policy influence: location and content in policy advisory systems." Review of FA. *Journal of Public Policy* 32 (2):79-98.

Creswell, J.W. 2003. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, California: SAGE.

Creswell, J.W. 2007. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Thousand Oaks, CA: Sage.

CWN. 2018. *Balancing the Books: Financial Sustainability for Canadian Water Systems*: Canadian Water Network's Municipal Water Consortium.

CWN. 2020a. "CWN Webinars. Financing Water Systems: Green Bonds and the Canada Infrastructure Bank." Canadian Water Network, Last Modified 11 February 2020, accessed 1 March 2020. https://cwn-rce.ca/events/webinars/cwn-webinars/.

CWN. 2020b. *Water Management Trends in Canadian Municipalitites: A snapshot*: Federation of Canadian Municipalities.
Daniel, M.A., and S. Sojamo. 2012. "From risks to shared value? Corporate strategies in building a global water accounting and disclosure regime." *Water Alternatives* 5 (3):636-657.
Daniell, K.A., and O. Barreteau. 2014. "Water governance across competing scales: coupling land and water management." *Journal of Hydrology* 519:2367-2380.
Davidson, S, L., and R.C. de Loë. 2014. "Watershed governance: transcending boundaries." *Water Alternatives* 7 (2):367-387.
de Loë, R., L. Moraru, R. Kreutzwiser, K. Schaefer, and B. Mills. 2001. "Demand side management of water in Ontario municipalities: status, progress, and opportunities." *Journal of the American Water Resources Association* 37 (1):57-72.
de Loë, R.C. 2013. "Make it material: power players need water risk to be real on their terms." *Water Canada* August 9:Online.
de Loë, R.C., and R.D. Kreutzwiser. 2005. "Closing the groundwater protection implementation gap." *Geoforum* 36:241-256.
de Loë, R.C., and R.D. Kreutzwiser. 2007. "Challenging the status quo: the evolution of water governance in Canada." In *Eau Canada: The Future of Canada's Water*, edited by K. Bakker, 85-103. Vancouver: University of British Columbia Press.
de Loë, R.C., and J.J. Patterson. 2017a. "Boundary judgments in water governance: diagnosing internal and external factors that matter in a complex world." *Water Resources* 32 (2):565-581.
de Loë, R.C., and J.J. Patterson. 2017b. "Rethinking water governance: moving beyond water-centric perspectives in a connected and changing world." *Natural Resources Journal* 57 (1):75-99.
de Voogt, D.L., and J.J. Patterson. 2019. "Exogenous factors in collective policy learning: the case of municipal flood risk governance in the Netherlands." Review of FA. *Journal of Environmental Policy and Planning* 21 (3):302-319.
Delgado-Serrano, M.M., and P.A. Ramos. 2015. "Making Ostrom's framework applicable to characterise social ecological systems at the local level." *International Journal of the Commons* 9 (2):808-830.
Delmas, M., and O.R. Young. 2009. *Governance for the Environment: New Perspectives*. New York: Cambridge University Press.
Dennis, E.M., and E. Brondizio. 2020. "Problem framing influences linkages among networks of collective action situations for water provision, wastewater, and water conservation in a metropolitan region." Review of FA. *International Journal of the Commons* 14 (1):313-328.
ECO. 2011. *Engaging Solutions. 2010/2011 Annual Report Supplement*: Environmental Commissioner of Ontario.
ECO. 2017. *Every Drop Counts: Reducing the Energy and Climate Footprint of Ontario's Water Use*. 2 vols. Vol. 1, *Annual Energy Conservation Progress Report 2016/2017*: Environmental Commissioner of Ontario.
Egan, A.J., and R. de Loë. 2020. "Thinking outside the "water box" in the Detroit River Area of Concern." Review of FA. *Journal of Great Lakes Research* 46 (6):1726-1739.
Environment and Climate Change Canada. 2016. *Pan-Canadian Framework on Clean Growth and Climate Change*: Government of Canada.
Environment and Climate Change Canada. 2019. *Achieving a Sustainable Future: A Federal Sustainable Development Strategy for Canada 2019 to 2022*: Government of Canada.
EPSF. 2018a. *Final Report of the Expert Panel on Sustainable Finance: Mobilizing Finance for Sustainable Growth*: Environment and Climate Change Canada.
EPSF. 2018b. *Interim Report of the Expert Panel on Sustainable Finance*: Environment and Climate Change Canada.

Epstein, G., A. Bennett, R. Gruby, L. Acton, and M. Nenadovic. 2014. "Studying power with the social-ecological system framework." In *Understanding Society and Natural Resources*, edited by M.J. Manfredo, J.J. Vaske, A. Rechkemmer and E.A. Duke, 111-135. Rotterdam: Springer Netherlands.
Fedchun, Z., and H. Brodie-Brown. 2017. "Modernizing water management in the face of uncertainty: Protecting water quantity in Ontario." Latornell Conservation Symposium, Nottawasaga, Ontario.
Fisher, D.R., and W. Freudenburg. 2001. "Ecological modernization and its critics: Assessing the past and looking toward the future." *Society and Natural Resources* 14 (8):701–709.
Fox, N.J. 2008. "Postpositivism." In *The SAGE Encyclopedia of Qualitative Research Methods*, edited by L. Given, 659-664. Thousand Oaks, California: SAGE.
Freeman, A. 2016. "Canada has 20 percent of the planet's freshwater. But some worry there's not enough to go around.". The Washington Post, accessed 26 September 2018. https://www.washingtonpost.com/news/worldviews/wp/2016/10/14/canada-has-20-percent-of-the-planets-freshwater-but-some-worry-theres-not-enough-to-go-around.
Furlong, K. 2019. "Trickle-down debt: Infrastructure, development, and financialisation, Medellín 1960–2013." Review of FA. *Transactions of the Institute of British Geographers* (September):1-14.
Furlong, K., and K. Bakker. 2011. "Governance and sustainability at a municipal scale: The challenge of water conservation." Review of FA. *Canadian Public Policy* 37 (2):219-237.
Garrick, D., L. De Stefano, F. Fung, J. Pittock, E. Schlager, M. New, and D. Connell. 2013. "Managing hydroclimatic risks in federal rivers: a diagnostic assessment." *Philosophical Transactions of the Royal Society A: Mathematical, Physical & Engineering Sciences* 371 (20120415).
Gibson, C.C., E. Ostrom, and T.K. Ahn. 2000. "The concept of scale and the human dimensions of global change: a survey." *Ecological Economics* 32 (2):217-239.
Gifford, R. 2011. "The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation." *American Psychologist* 66 (4).
Gilbride, P., and C. Maas. 2012. *Walking the Water Soft Path: York Region Water Strategy Puts Theory into Practice*: Polis Project on Ecological Governance.
Gleick, P.H. 2000. "The changing water paradigm: a look at twenty-first century water resources development." *Water International* 25 (1):127-138.
GLSL Regional Body. 2007. *Great Lakes-St.Lawrence River Basin Water Conservation and Efficiency Objectives*.
Gober, P. 2013. "Getting outside the water box: the need for new approaches to water planning and policy." *Water Resources Management* 27 (4):955-957.
Godden, L., R.L. Ison, and P.J. Wallis. 2011. "Water governance in a climate change world: appraising systemic and adaptive effectiveness." *Water Resources Management* 25:3971-2976.
Government of Ontario. 2005. Places to Grow Act, 2005, S.O.2005, c.13.
Government of Ontario. 2010. "Speech from the Throne." accessed 3 December 2019. http://www.videodelivery.gov.on.ca/player/download.php?file=http://www.media.gov.on.ca/4261ca31285eb70f/en/transcripts/page.html.
Government of Ontario. 2019. "About Ontario." accessed 27 June 2020. https://www.ontario.ca/page/about-ontario.
Grafton, R.Q., M. Mclindin, K. Hussey, P. Wyrwoll, D. Wichelns, C. Ringler, D. Garrick, J. Pittock, S. Wheeler, S. Orr, N. Matthews, E. Ansink, A. Aureli, D. Connell, L. De Stefano, K. Dowsley, S. Farolfi, J. Hall, P. Katic, B. Lankford, H. Leckie, M. Mccartney, H. Pohlner, N. Ratna, M.H. Rubarenzya, S.N. Sai Raman, K. Wheeler, and J. Williams. 2016. "Responding to global challenges in food, energy, environment and water: Risks

and options assessment for decision-making." *Asia and the Pacific Policy Studies* 3 (2):275-299.

Gritsenko, D. 2018. "Explaining choices in energy infrastructure development as a network of adjacent action situations: The case of LNG in the Baltic Sea region." *Energy Policy* 112 (June 2017):74-83.

GSIA. 2019. *2018 Global Sustainable Investment Review*: Global Sustainable Investment Alliance.

Gupta, J., A. Akhmouch, W. Cosgrove, Z. Hurwitz, J. Maestu, and O. Ünver. 2013. "Policymakers' reflections on water governance issues." *Ecology and Society* 18 (1):35-42.

Gupta, J., and C. Pahl-Wostl. 2013. "Global water governance in the context of global and multilevel governance: its need, form, and challenges." *Ecology and Society* 18 (4):53-62.

Hartley, J. 2004. "Case study research." In *Essential Guide to Qualitative Methods in Organizational Research*, edited by C. Cassell and G. Symon, 323-333. Thousand Oaks.

Heath, L. 2015. "Triangulation: Methodology." In *International Encyclopedia of the Social & Behavioral Sciences*, edited by J.D Wright, 639-644. Elsevier.

Heikkila, T., and K. Andersson. 2018. "Policy design and the added-value of the institutional analysis development framework." *Policy and politics* 46 (2):309-324.

Heikkila, T., E. Schlager, and N.A. Davis. 2011. "The role of cross-scale institutional linkages in common pool resource management: assessing interstate river compacts." *The Policy Studies Journal* 39 (1):121-145.

Heikkila, T., S. Villamayor-Tomas, and D. Garrick. 2018. "Bringing polycentric systems into focus for environmental governance." *Environmental Policy and Governance* 28 (4):207-211.

Hepworth, N. 2012. "Open for business or opening Pandora's box? A constructive critique of corporate engagement in water policy: an introduction." *Water Alternatives* 5 (3):543-562.

Hering, J.G., D.L. Sedlak, C. Tortajada, A.K. Biswas, C. Niwagaba, and T. Breu. 2015. "Local perspectives on water." *Science* 349 (6247):479-480.

Hinkel, J., M.E. Cox, M. Schlüter, C.R. Binder, and T. Falk. 2015. "A diagnostic procedure for applying the social-ecological systems framework in diverse cases." *Ecology and Society* 20 (1):32-44.

Hoff, H. 2011. "Understanding the Nexus: Background paper for the Bonn2011 Nexus Conference." Bonn2011 Conference The Water, Energy and Food Security Nexus, Stockholm.

Hogeboom, R.J., I. Kamphuis, and A.Y. Hoekstra. 2018. "Water sustainability of investors: Development and application of an assessment framework." *Journal of Cleaner Production* 202:642-648.

Hooghe, L., and G. Marks. 2003. "Unravelling the central state, but how? Types of multi-level governance." *American Political Science Review* 97 (2):233-243.

Hooghe, L., and G. Marks. 2010. "Types of multi-level governance." In *Handbook on Multi-Level Governance*, edited by H. Enderlein, S. Walti and M. Zürn, 17-31. Northhampton, MA: Edward Elgar Publishing.

Hornberger, G., D.J. Hess, and J. Gilligan. 2015. "Water conservation and hydrological transitions in cities in the United States." Review of FA. *Water Resources Research* 51 (6):4635-4649.

Howlett, M. 2009. "Governance modes, policy regimes and operational plans: a multi-level nested model of policy instrument choice and policy design." *Policy Sciences* 42:73-89.

Howlett, M., and B. Cashore. 2014. "Conceptualizing Public Policy." In *Comparative Policy Studies: Conceptual and Methodological Challenges*, edited by I. Engeli and C.R. Allison, 17-34. London: Palgrave MacMillan.

Hsieh, H., and S.E. Shannon. 2005. "Three approaches to qualitative content analysis." *Qualitative Health Research* 15 (9):1277-1288.

Huitema, D., and S. Meijerink. 2014. "The politics of river basin organisations: institutional design choices, coalitions and consequences." In *The Politics of River Basin Organisations Coalitions, Institutional Design Choices and Consequences*, edited by D. Huitema and S. Meijerink, 1-37. Chelenham, UK: Edward Elgar.

Hutton, G., and M. Varughese. 2016. *The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene*. Washington, D.C.: Water and Sanitation Program, The World Bank Group.

Ingram, H. 2008. "Beyond universal remedies for good water governance: a political and contextual approach." Water For Food: Quantity and Quality in a Changing World, Zaragoza, Spain, June 24-27, 2008.

Jaffee, D., and R. Case. 2018. "Draining us dry: scarcity discourses in contention over bottled water extraction." Review of FA. *Local Environment* 23 (4):485-501.

Jiménez, A., P. Saikia, R. Giné, P. Avello, J. Leten, B.L. Lymer, K. Schneider, and R.C. Ward. 2020. "Unpacking water governance: A framework for practitioners." *Water (Switzerland)* 12 (3):1-21.

Johnson, R.B. 2014. Mixed Methods Research Design and Analysis With Validity: A Primer. edited by University of South Alabama Department of Professional Studies, USA.

Jones, K., and D. Henderson. 2010. *The Water Opportunity for Ontario*.

Juwana, I., N. Muttil, and B.J.C Perera. 2012. "Indicator-based water sustainability assessment - A review." *Science of the Total Environment* 438:357-371.

Kemp, R., S. Parto, and B.L. Gibson. 2005. "Governance for sustainable development: moving from theory to practice." *International Journal of Sustainable Development* 8 (1/2):12-30.

Kingdon, J.W. 2003. *Agendas, Alternatives and Public Policies*. 2nd edition ed. New York: Longman.

Kooiman, J. 2003. *Governing as Governance*. London, United Kingdom: SAGE Publications Ltd.

Kreutzwiser, R.D., R.C. de Loë, J. Durley, and C. Priddle. 2004. "Water allocation and the Permit to Take Water Program in Ontario: challenges and opportunities." *Canadian Water Resources Journal* 29 (2):135-146.

Kreutzwiser, R.D., and R.B. Feagan. 1989. "Municipal utilization of water demand management: the Ontario experience." *Water Resources Bulletin* 25 (3):667-674.

Lange, P., P. Driessen, A. Sauer, B. Bornemann, and P. Burger. 2013. "Governing towards sustainability - conceptualizing modes of governance." *Journal of Environmental Policy and Planning* 15 (3):403-425.

Larson, W.M., P.L. Freedman, V. Passinsky, E. Grubb, and P. Adriaens. 2012. "Mitigating corporate water risk: Financial market tools and supply management strategies." *Water Alternatives* 5 (3):582-602.

Lemos, M.C., and A. Agrawal. 2006. "Environmental governance." *Annual Review of Environment and Resources* 31:297-325.

Lemos, M.C., and A. Agrawal. 2009. "Environmental governance and political science." In *Governance for the Environment: New Perspectives,* edited by M. Delmas and O.R. Young. New York: Cambridge University Press.

Loiseau, E., L. Saikku, R. Antikainen, N. Droste, B. Hansjürgens, K. Pitkänen, P. Leskinen, P. Kuikman, and M. Thomsen. 2016. "Green economy and related concepts: An overview." *Journal of Cleaner Production* 139:361-371.

Lubell, M. 2013. "Governing institutional complexity: the ecology of games framework." *Policy Studies Journal* 41 (3):537-559.
Maas, C. 2009a. "An executive summary (revision 2)." In *H_2Ontario: A Blueprint for a Comprehensive Water Conservation Strategy*.: POLIS Project on Ecological Governance.
Maas, C. 2009b. *H_2Ontario: A Blueprint for a Comprehensive Water Conservation Strategy. Version 1.0*. Victoria, BC: POLIS Project on Ecological Governance.
Maas, C. 2009c. *H_2Ontario: A Blueprint for a Comprehensive Water Conservation Strategy. Version 2.0*: POLIS Project on Ecological Governance.
Maas, C. 2009d. Media release: Coalition urges Ontarians to support development of a world-class water strategy. edited by POLIS Project on Ecological Governance.
Mabry, L. 2008. "Case study in social research." In *The SAGE Handbook of Social Research Methods*, edited by P. Alasuutari, L. Bickman and J. Brannen, 214-227. London: SAGE.
Martin, S.J., and J. Clapp. 2015. "Finance for Agriculture or Agriculture for Finance?" *Journal of Agrarian Change* 15 (4):549-559.
Mason, J. 2004. "Semistructured Interview." In *The Sage Encyclopedia of Social Science Research Methods*, edited by M. Lewis-Beck, A. Bryman and T. Futing Liao, 1021-1022. Thousand Oaks: Sage Publications.
Maxwell, J.A. 1992. "Understanding and validity in qualitative research." *Harvard Educational Review* 62:279–300.
McClearn, M. 2015. "Water fight: Bottles, wells, big business." The Globe and Mail, accessed 16 May 2017. https://www.theglobeandmail.com/report-on-business/nestle-water-ontario-dispute/article27509298/.
McClenaghan, T. 2010. "Ontario Water Opportunities and Water Conservation Act - What's next for Bill 72." Canadian Environmental Law Association, accessed 8 February 2019. http://www.cela.ca/sites/cela.ca/files/Ontario_Water_Opportunities_and_Water_Conservation_Act_Nov_2010.pdf.
McCord, P., J. Dell'Angelo, E. Baldwin, and T. Evans. 2017. "Polycentric Transformation in Kenyan Water Governance: A Dynamic Analysis of Institutional and Social-Ecological Change." *Policy Studies Journal* 45 (4):633-658. doi: 10.1111/psj.12168.
McGinnis, M. 2019. "Beyond a precarious balance: Improving the scientific rigor and policy relevance of institutional analyses from the Bloomington School." In *Ostrom's Tensions: Reexamining the Political Economy and Public Policy of Elinor C. Ostrom*, edited by R.Q. Herzberg, P. Boettke and P. Aligica, 19-74. Arlington, VA: Mercatus Center at George Mason University.
McGinnis, M.D. 2011a. "An introduction to IAD and the language of the Ostrom Workshop: a simple guide to a complex framework." *The Policy Studies Journal* 39 (1):169-183.
McGinnis, M.D. 2011b. "Networks of adjacent action situations in polycentric governance." *Policy Studies Journal* 39 (1):51-78.
McGinnis, M.D. 2016. *Updated Guide to IAD and the Language of the Ostrom Workshop: A Simplified Overview of a Complex Framework for the Analysis of Institutions and their Development*.
McGinnis, M.D., and E. Ostrom. 2011. "Reflections on Vincent Ostrom, public administration, and polycentricity." *Public Administration Review* 72 (1):15-25.
McGinnis, M.D., and E. Ostrom. 2014. "Social-ecological system framework: initial changes and continuing challenges." *Ecology and Society* 19 (2):30.
Meadowcroft, J. 2007. "Who is in charge here? Governance for sustainable development in a complex world." Review of FA. *Journal of Environmental Policy and Planning* 9 (3-4):299-314.
Meadows, D.H., D.L. Meadows, J. Randers, and W.B. III Behrens. 1972. *The Limits to Growth*. New York: Universe Books.

Mekonnen, M.M., and A.Y. Hoekstra. 2011. "The green, blue and grey water footprint of crops and derived crop products." *Hydrology and Earth System Sciences* 15 (5):1577-1600.
Menard, C., A. Jimenez, and H. Tropp. 2018. "Addressing the policy-implementation gaps in water services: The key role of meso-institutions." *Water International* 43:13-33.
Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Synthesis*. Washington, DC, USA: Island Press.
Mincey, S.K., M. Hutten, B.C. Fischer, T.P. Evans, S.I. Stewart, and J.M. Vogt. 2013. "Structuring institutional analysis for urban ecosystems: a key to sustainable urban forest management." *Urban Ecosystems* 16:553-571.
Mitchell, B., C. Priddle, D. Shrubsole, B. Veale, and D. Walters. 2014. "Integrated water resource management: lessons from conservation authorities in Ontario, Canada." *International Journal of Water Resources Development* 30 (3):460-474.
MMAH. 2019. *A Place to Grow. Growth Plan for the Greater Golden Horseshoe*: Ontario Ministry of Municipal Affairs and Housing.
MOE. 2007a. *Financial Plans Guideline: Toward Financially Sustainable Drinking-Water and Wastewater Systems*: Ontario Ministry of the Environment.
MOE. 2007b. O.Reg. 453/07: Financial Plans, under Safe Drinking Water Act, 2002, S.O.2002, c.32. Ontario Ministry of the Environment.
MOE. 2012a. "Ontario's water conservation and efficiency goals, objectives and programs (in accordance with the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement)." Ontario Ministry of the Environment.
MOE. 2012b. Policy Decision Notice: Stewardship – Leadership – Accountability. Managing Ontario's Water Resources for Future Generations (EBR 010-6350). Ontario Ministry of the Environment.
MOE. 2020. "Updating Ontario's Water Quantity Management Framework." Ontario Ministry of the Environment, Conservation and Parks, accessed 1 September 2020. https://ero.ontario.ca/notice/019-1340.
MOE, and MNR. 2009. *Stewardship, Leadership, Accountability. Safeguarding and Sustaining Ontario's Water Resources for Future Generations. Proposal Paper*: Ontario Ministry of the Environment and Ontario Ministry of Natural Resources.
Mol, A.P.J., and D.A. Sonnenfeld. 2000. "Ecological modernisation around the world: an introduction." In *Ecological Modernisation Around the World: Persectives and Critical Debates*, edited by A.P.J. Mol and D.A. Sonnenfeld, 3-14. London: Frank Cass Publishers.
Molle, F. 2006. *Planning and Managing Water Resources at the River-Basin Level: Emergence and Evolution of a Concept, Comprehensive Assessment Research Report*. Colombo, Sri Lanka: International Water Management Institute.
Mollinga, P.P. 2020. "Knowledge, context and problemsheds: a critical realist method for interdisciplinary water studies." *Water International*:1-28.
Mollinga, P.P., R.S. Meinzen-Dick, and D.J. Merrey. 2007. "Politics, plurality and problemsheds: a strategic approach for reform of agricultural water resources management." *Development Policy Review* 25 (6):699-719.
Money, A. 2018. *Hybridity and Blended Finance*. Marseille, France: World Water Council.
Moon, K., and D. Blackman. 2014. "A guide to understanding social science research for natural scientists." *Conservation Biology* 28 (5):1167-1177.
Morgan, D. 2008a. "Sampling." In *The SAGE Encyclopedia of Qualitative Research Methods*, edited by L. Given, 799-800. Thousand Oaks, California.
Morgan, D. 2008b. "Snowball sampling." In *The SAGE Encyclopedia of Qualitative Research Methods*, edited by L. Given, 815-816. Thousand Oaks, California.
Moss, T., and J. Newig. 2010. "Multilevel water governance and problems of scale: setting the stage for a broader debate." *Environmental Management* 46:1-6.

Newborne, P., and N. Mason. 2012. "The private sector's contribution to water management: re-examining corporate purposes and company roles." *Water Alternatives* 5 (3):603-618.
Norman, E., K. Bakker, and C. Cook. 2012. "Introduction to the themed section: water governance and the politics of scale." *Water Alternatives* 5 (1):52-61.
North, D.C. 1990. *Institutions, Institutional Change and Economic Performance*. Edited by J. Alt and D.C. North, *The Political Economy of Institutions and Decisions*. Cambridge: Cambridge University Press.
OECD. 2016. *Water, Growth and Finance: Policy Perspectives*: Organisation for Economic Co-operation and Development.
OECD. 2018. *Financing Water: Investing in Sustainable Growth*. Vol. 11, *OECD Environment Policy Papers*: Organisation for Economic Co-operation and Development.
Office of Economic Policy. 2019. *Ontario Population Projections, 2018-2046*: Ontario Ministry of Finance.
OPTrust. 2018. *2018 Responsible Investing Report: Leading Change, Driving Value*: OPSEU Pension Trust.
Orach, K., and M. Schlüter. 2016. "Uncovering the political dimension of social-ecological systems: Contributions from policy process frameworks." *Global Environmental Change* 40:13-25.
Ostrom, E. 2005. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press.
Ostrom, E. 2007. "A diagnostic approach for going beyond panaceas." *Proceedings of the National Academy of Sciences* 104 (39):15181-15187.
Ostrom, E. 2009. "A general framework for analyzing sustainability of social-ecological systems." *Science* 325 (4):419-422.
Ostrom, E. 2011. "Background on the Institutional Analysis and Development framework." *Policy Studies Journal* 39 (1):7-27.
Ostrom, E. 2012. "Nested externalities and polycentric institutions: Must we wait for global solutions to climate change before taking actions at other scales?" *Economic Theory* 49 (2):353-369.
Ostrom, E., and M. Cox. 2010. "Moving beyond panaceas: a multi-tiered diagnostic approach for social-ecological analysis." *Environmental Conservation* 37 (4):451-463.
Ostrom, V., C.M. Tiebout, and R. Warren. 1961. "The organization of government in metropolitan areas: A theoretical inquiry." *American Political Science Review* 55 (4):831-42.
OSWCA. 2018. *The State of Ontario's Water and Wastewater Infrastructure*: Ontario Sewer & Watermain Construction Association.
OTPP. 2018. *2018 Climate Change Report*: Ontario Teachers' Pension Plan.
OTPP. 2019. *2019 Responsible Investing Report*: Ontario Teachers' Pension Plan.
OWC Alliance. 2010. Public campaign launched to promote conservation path for Ontario's Water Opportunities Act. Toronto, Ontario: Ontario Water Conservation Alliance.
Özerol, G., M. Kruijf, M.C. Brisbois, C. Cassiano Flores, P. Deekshit, C. Girard, C. Knieper, S. Jalal Mirnezami, M. Ortega-Reig, P. Ranjan, N.J.S. Schroeder, and B. Schroeter. 2018. "Comparative studies of water governance: a systematic review." *Ecology and Society* 23 (4).
Pablo-Romero, M.P., A. Sánchez-Braza, and J.M. González-Limón. 2015. "Covenant of Mayors: Reasons for Being an Environmentally and Energy Friendly Municipality." *Review of Policy Research* 32 (5):576-599.
Pahl-Wostl, C. 2009. "A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes." *Global Environmental Change: Human and Policy Dimensions* 19 (3):354-365.

Pahl-Wostl, C., K. Conca, A. Kramer, J. Maestu, and F. Schmidt. 2013. "Missing links in global water governance: a process-oriented analysis." *Ecology and Society* 18 (2):33 online.
Pahl-Wostl, C., G. Holtz, B. Kastens, and C. Knieper. 2010. "Analyzing complex water governance regimes: the Management and Transition Framework." *Environmental Science and Policy* 13 (7):571-581.
Peel Region. 2012. *Water Efficiency Strategy Update*.
Perez, I., M. A. Janssen, A. Tenza, A. Giménez, A. Pedreño, and M. Giménez. 2011. "Resource intruders and robustness of social-ecological systems: An irrigation system of Southeast Spain, a case study." *International Journal of the Commons* 5 (2):410-432.
Petridou, E. 2014. "Theories of the policy process: Contemporary scholarship and future directions." *Policy Studies Journal* 42 (S1):12-32.
Porter, M., and M. Kramer. 2006. "Strategy and society: The link between competitive advantage and corporate social responsibility." *Harvard Business Review* 84 (12):78-92.
PPG. 2019. *Municipal Water Efficiency Eco-Cluster. Summary Report*: Toronto and Region Conservation Authority and GTAA Partners in Project Green.
PRI. "An introduction to responsible investment." UN Principles for Responsible Investment, accessed 8 September 2018. https://www.unpri.org/pri/an-introduction-to-responsible-investment.
Provision Coalition. 2017. Canadian food loss and waste case study series: Campbell Company of Canada.
Rahaman, M.M., and O. Varis. 2005. "Integrated water resources management: evolution, prospects and future challenges." *Sustainability: Science, Practice and Policy* 1 (1).
RBC. 2019. Our Commitment to Sustainable Finance.
RBC Capital Markets. 2020. "Green Bonds for the Water Sector." Financing Water Systems: Green Bonds and Canada Infrastructure Bank, Canadian Water Network Webinars.
RBC GAM. 2019. *An Evolving Landscape: 2019 Responsible Investment Survey. Executive Summary*: RBC Global Asset Management.
RBC GAM. 2020a. *2019 Corporate Governance and Responsible Investment Annual Report*.
RBC GAM. 2020b. *Our Approach to Responsible Investment*: RBC Global Asset Management.
Rees, J., J. Winpenny, and A.W. Hall. 2008. *Water financing and governance*. TEC Background Papers No.12 ed, *Global Water Partnership Technical Committee (TEC) Background Papers*. Stockholm: Global Water Partnership.
Region of Waterloo. 2014. *Water Efficiency Master Plan (2015-2025)*.
RIA. 2018. *2018 Canadian Responsible Investment. Trends Report*: Responsible Investment Association.
Richardson, B.J. 2003. "Financing environmental change: A new role for Canadian environmental law." *McGill Law Journal* 49:145-199.
Rockström, J., M. Falkenmark, T. Allan, C. Folke, L. Gordon, A. Jägerskog, M. Kummu, M. Lannerstad, M. Meybeck, D. Molden, S. Postel, H.H.G. Savenije, U. Svedin, A. Turton, and O. Varis. 2014. "The unfolding water drama in the Anthropocene: Towards a resilience-based perspective on water for global sustainability." *Ecohydrology* 7 (5):1249-1261.
Rockström, J., M. Falkenmark, C. Folke, M. Lannerstad, J. Barron, E. Enfors, L. Gordon, J. Heinke, H. Hoff, and C. Pahl-Wostl. 2014. *Water Resilience for Human Prosperity*. New York: Cambridge University Press.
Rogers, P., and A.W. Hall. 2003. *Effective Water Governance*. TEC Background Papers No. 7 ed, *Global Water Partnership Technical Committee (TEC) Background Papers*. Stockholm, Sweden: Global Water Partnership. Reprint, Not in File.
Rohan, S. 2015. *Integrating the Economy and the Environment: An Overview of Canadian Capital Markets*: Shareholder Association for Research and Education.

Rosenzweig, C., W. Solecki, S.A. Hammer, and S. Mehrotra. 2010. "Cities lead the way in climate-change action." *Nature* 467 (7318):909-911.
Ruiters, C., and M. Matji. 2015. "Water institutions and governance models for the funding, financing and management of water infrastructure in South Africa." Review of FA. *Water SA* 41 (5):660-676.
Saldaña, J. 2011. *Fundamental of Qualitative Research: Understanding Qualitative Research*. New York, New York: Oxford University Press, Inc.
Saldaña, J. 2013. *The Coding Manual for Qualitative Researchers*. 2nd ed. Los Angeles: Sage.
Saleth, R.M., and A. Dinar. 2004. *The Institutional Economics of Water: A Cross-Country Analysis of Institutions and Performance*. Cheltenham, UK: Edward Elgar.
Sandelowski, M. 1994. "Focus on qualitative methods. The use of quotes in qualitative research." *Research in Nursing and Health* 17 (6):479-482.
Sandhu, G. 2018. "Bulk Water Pricing Framework to Foster Sustainable Water Management in Ontario." Master of Environmental Studies, School of Environment, Enterprise and Development, University of Waterloo.
Sandhu, G., M.O. Wood, H. Rus, and O. Weber. 2019. "Bulk water extraction charge calculator: a tool for sustainable water management in Ontario." *Canadian Water Resources Journal*:1-18.
Saumure, K., and L. Given. 2008. "Data Saturation." In *The SAGE Encyclopedia of Qualitative Research Methods*, edited by L. Given, 195-196. Thousand Oaks, California: SAGE.
Sauri, D. 2013. "Water conservation: Theory and evidence in urban areas of the developed world." *Annual Review of Environment and Resources* 38:227-248.
Saxe, D. 2018. "Saving water, energy and greenhouse gases." Ontario Water Works Association Water Efficiency Committee Fall Workshop, Mississauga.
Sayre, N.F. 2009. "Scale." In *A Companion to Environmental Geography*, edited by N. Castree, D. Demeritt, D. Liverman and B.L. Rhoads. Blackwell.
Schmidheiny, S., and F. Zorraquin. 1996. *Financing Change: The Financial Community, Eco-Efficiency, and Sustainable Development*. Cambridge, MA: MIT Press.
Schmidt, J., and N. Matthews. 2018. "From state to system: Financialization and the water-energy-food-climate nexus." Review of FA. *Geoforum* 91:151-159.
Scholtens, B. 2006. "Finance as a driver of corporate social responsibility." *Journal of Business Ethics* 68 (1):19-33.
Schreier, M. 2012. *Qualitative Content Analysis in Practice*. London: SAGE Publications.
Scotiabank. 2019. *Scotiabank's Climate Commitments*: Scotiabank.
SDG Knowledge Platform. 2020. "Official launch of the SDG 6 Global Acceleration Framework." accessed 13 July 2020. https://sustainabledevelopment.un.org/hlpf/2020/sdg6accelerationframework.
Seegert, J., T. U. Berendonk, C. Bernhofer, F. Blumensaat, I. Dombrowsky, C. Fuehner, J. Grundmann, N. Hagemann, T. Kalbacher, F. D. Kopinke, R. Liedl, M. Leidel, C. Lorz, F. Makeschin, D. Markova, S. Niemann, G. Rostel, J. Schanze, N. Scheifhacken, N. Schuetze, C. Siebert, C. Stefan, B. Strehlitz, G. Teutsch, C. Weigelt, H. Weiss, O. Kolditz, D. Borchardt, and P. Krebs. 2014. "Integrated water resources management under different hydrological, climatic and socio-economic conditions: results and lessons learned from a transdisciplinary IWRM project IWAS." *Environmental Earth Sciences* 72 (12):4677-4687.
Sjah, T., and C. Baldwin. 2014. "Options for future effective water management in Lombok: A multi-level nested framework." *Journal of Hydrology* 519 (Part C):2448-2455.
Sojamo, S., M. Keulertz, J. Warner, and A. Allan. 2012. "Virtual water hegemony: the role of agribusiness in global water governance." *Water International* 37 (2):169-182.

Sørensen, E., and J. Torfing. 2007. "Governance network research: towards a second generation." In *Theories of Democratic Network Governance*, edited by E. Sørensen and J. Torfing, 1-24. New York, USA: Palgrave Macmillan.
SSE. 2019. "Toronto Stock Exchange joins United Nations Sustainable Stock Exchanges." Sustainable Stock Exchanges Initiative, accessed 17 April 2020. https://sseinitiative.org/all-news/toronto-stock-exchange-joins-united-nations-sustainable-stock-exchanges/.
Statistics Canada. 2016. "Population and dwelling count highlight tables, 2016 Census." accessed 10 November 2019. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-p.
Statistics Canada. 2017. *Municipalities in Canada with the largest and fastest-growing populations between 2011 and 2016*: Minister of Industry.
Sullivan, S. 2013. "Banking nature? The spectacular financialisation of environmental conservation." *Antipode* 45 (1):198-217.
Swyngedouw, E. 1997. "Neither global nor local: 'glocalization' and the politics of scale." In *Spaces of Globalization: Reasserting the Power of the Local*, edited by K.R. Cox. New York: Guilford Press.
Swyngedouw, E. 2000. "Authoritarian governance, power, and the politics of rescaling." *Environment and Planning D: Society and Space* 18 (1):63-76.
TD Bank Group. 2019. *2019 ESG Report*.
TFI. 2018. *Capitalizing on Sustainable Finance: A Growth Opportunity for Toronto's Financial Sector*.
Toronto Water. 2019. "Toronto Water budget notes." In *2019 Operating Budget and 2019-2028 Capital Plan*. City of Toronto.
Torres Guevara, L.E., A. Schlüter, and M.C. Lopez. 2016. "Collective action in a tropical estuarine lagoon: Adapting Ostrom's SES framework to Ciénaga Grande de Santa Marta, Colombia." *International Journal of the Commons* 10 (1):334-362.
Tortajada, C., and A.K. Biswas. 2018. "Impacts of megatrends on the global water landscape." *International Journal of Water Resources Development* 34 (2):147-149.
Tovilla, E., and K. Webb. 2017. "Examining the emerging environmental protection policy convergence in the Ontario municipal drinking water, wastewater and stormwater sectors." *Water Quality Research Journal of Canada* 52 (3):209-228.
TRCA. 2008. *GTAA Partners in Project Green: A Pearson Eco-Business Zone Strategy*: Toronto and Region Conservation Authority.
UN-Water. 2016. *Water and Sanitation Interlinkages across the 2030 Agenda for Sustainable Development*. Geneva.
UN-Water. 2018a. *Progress on Water-Use Efficiency. Piloting the monitoring methodology and initial finidngs for SDG indicator 6.4.1*.
UN-Water. 2018b. *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation 2018*. New York: United Nations Publications.
UN-Water. 2020. *The Sustainable Development Goal 6 Global Acceleration Framework*. Geneva.
UN World Water Assessment Programme. 2003. "The world's water crisis." In *Water for People, Water for Life: The United Nations World Water Development Report*, 4-22. Barcelona, Spain: United Nations Educational, Scientific and Cultural Organization (UNESCO) & Berghahn Books.
UN World Water Assessment Programme. 2012. *The United Nations World Water Development Report 4: Managing Water under Uncertainty and Risk*. Edited by UN World Water Assessment Programme. Paris: UNESCO.
UN World Water Assessment Programme. 2019. *The United Nations World Water Development Report 2019: Leaving No One Behind*. Edited by UN World Water Assessment Programme. Paris: UNESCO.

UNEP. 2011. *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers*: UN Environment Programme.
UNEP Inquiry. 2017. *Accelerating Financial Centre Action on Sustainable Development*. Geneva: UN Environment Inquiry: Design of a Sustainable Financial System.
UNEP Inquiry, and World Bank. 2017. *Roadmap for a Sustainable Financial System*: UN Environment Programme.
UNEP IRP. 2012. *Measuring Water Use in a Green Economy. A Report of the Working Group on Water Efficiency to the International Resource Panel.*: UN Environment Programme International Resource Panel.
UNEP IRP. 2016. *Options for decoupling economic growth from water use and water pollution. Report of the International Resource Panel Working Group on Sustainable Water Management.*: UN Environment Programme International Resource Panel.
UNESCO. 2016. "Sustainable development." UN Educational, Scientific and Cultural Organization. http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/sustainable-development/.
UNGC, and KPMG. 2015. *SDG Industry Matrix for Financial Services*: United Nations Global Compact and KPMG.
UNGC, UNCTAD, UNEP FI, and PRI. 2015. *Private Sector Investment and Sustainable Development: The current and potential role of institutional investors, companies, banks and foundations in sustainable development*.
UNWWAP. 2009. *The United Nations World Water Development Report 3: Water in a Changing World*. Edited by UN World Water Assessment Programme. Paris and London: UNESCO and Earthscan.
Van den Bergh, J.C.J.M. 2001. "Ecological economics: themes, approaches, and differences with environmental economics." *Regional Environmental Change* 2 (1):13-23.
Vatn, A. 2005a. *Institutions and the Environment*. Northampton, MA: Edward Elgar.
Vatn, A. 2005b. "Policies for a sustainable future." In *Institutions and the Environment*, 415-434. Northampton, MA: Edward Elgar.
Vatn, A. 2015. "Markets in environmental governance. From theory to practice." *Ecological Economics* 117:225-233.
Verschuren, P., and H. Doorewaard. 2010. *Designing a Research Project*. 2nd ed. The Hague: Eleven International Publishing.
Vickers, A. 2001. *Handbook of Water Use and Conservation: Homes, Landscapes, Business, Industries, Farms*. Amherst, Massachusetts: Waterplow Press. Reprint, Not in File.
Villamayor-Tomas, S., P. Grundmann, G. Epstein, T. Evans, and C. Kimmich. 2015. "The water-energy-food security nexus through the lenses of the value chain and the institutional analysis and development frameworks." *Water Alternatives* 8 (1):735-755.
Vörösmarty, C.J., A.Y. Hoekstra, S.E. Bunn, D. Conway, and J. Gupta. 2015. "Freshwater goes global." *Science* 349 (6247):478-479.
Vörösmarty, C.J., C. Pahl-Wostl, S.E. Bunn, and R. Lawford. 2013. "Global water, the anthropocene and the transformation of a science." *Current Opinion in Environmental Sustainability* 5 (6):539-550.
Vörösmarty, C.J., V. Rodriguez Osuna, D.A. Koehler, P. Klop, J.D. Spengler, J.J. Buonocore, A.D. Cak, Z.D. Tessler, F. Corsi, P. Green, and R. Sanchez. 2018. "Scientifically assess impacts of sustainable investments." *Science* 359 (6375):523-526.
Weber, O. 2014. "The financial sector's impact on sustainable development." *Journal of Sustainable Finance and Investment* 4 (1):9.
Weber, O., and B. Feltmate. 2016a. "The direct and indirect impacts of banking on sustainable development." In *Sustainable Banking: Managing the Social and Environmental Impact of Financial Institutions*. Toronto, ON: University of Toronto Press.

Weber, O., and B. Feltmate. 2016b. *Sustainable Banking: Managing the Social and Environmental Impact of Financial Institutions*. Toronto, ON: University of Toronto Press.

Weber, O., and G. Hogberg-Saunders. 2018. "Water management and corporate social performance in the food and beverage industry." *Journal of Cleaner Production* 195:963-977.

Weible, C., and P. Sabatier. 2017. *Theories of the Policy Process*. 4th. ed. ed. Boulder, CO.

Wiek, A., and K.L. Larson. 2012. "Water, people, and sustainability - a systems framework for analyzing and assessing water governance regimes." *Water Resources Management* 26 (11):3153-3171.

Winpenny, J. 2005. "Tackling the problem: lines of approach " In *Managing Water as an Economic Resource*, 21-28. London: Routledge.

Wolfe, S. 2008. "Capacity, capability, collaboration, and commitment: how social networks influence practitioners ofo municipal water demand management policy in Ontario, Canada." Review of FA. *Environmental Practice* 10 (2):42-52.

Wolfe, S., and D. Brooks. 2017. "Mortality awareness and water decisions: a social psychological analysis of supply-management, demand-management and soft-path paradigms." *Water International* 42 (1):1-17.

Woodhouse, P., and M. Muller. 2017. "Water Governance—an Historical Perspective on Current Debates." *World Development* 92:225-241.

World Commission on Environment and Development. 1987. *Our Common Future*. London, ON: Oxford University Press. Reprint, Not in File.

World Economic Forum. 2016. *The Global Risks Report 2016*. 11th ed. Geneva.

World Economic Forum. 2017. *The Global Risks Report 2017*. 12th ed. Geneva.

World Economic Forum. 2019. *The Global Risks Report 2019*. 14th ed. Geneva.

Wutich, A., A. White, D.D. White, K.L. Larson, A. Brewis, and C. Roberts. 2014. "Hard paths, soft paths or no paths? Cross-cultural perceptions of water solutions." *Hydrology and Earth System Sciences* 18 (1):109-120.

WWF. 2018. *Banking on Financial Solutions to Save our Basins*: World Wide Fund for Nature.

WWF, BCG, and ING. 2018. *Seizing the Water Opportunity: How private and public capital can join forces to secure sustainable water supplies and improve freshwater ecosystems*: World Wide Fund for Nature.

Wynn, G. 2010. "Foreword: Making waves." In *What is Water? The History of a Modern Abstraction*, edited by J. Linton. Vancouver: UBC Press.

Xiao, Y., L. Fang, and K.W. Hipel. 2018. "Centralized and decentralized approaches to water demand management." *Sustainability (Switzerland)*.

Yin, R.K. 2009. *Case Study Research: Design and Methods*. 4th edition ed. Vol. 5, *Applied Social Research Methods Series*. Thousand Oaks, California: Sage Publications.

Yin, R.K. 2013. *Case Study Research: Design and Methods*. 5th ed. Thousand Oaks, California: SAGE.

York Region. 2016. *Long Term Water Conservation Strategy. Updated March 2016*.

York Region. 2018. *Long Term Water Conservation Strategy. Annual Report, March 31, 2018*.

Young, O.R. 2002. *The Institutional Dimensions of Environmental Change: Fit, Interplay, and Scale*. London, England: The MIT Press.

Young, O.R., L.A. King, and H. Schroeder. 2008. "Summary for policy makers." In *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers*, edited by O.R. Young, L.A. King and H. Schroeder, xiii-xix. Cambridge, Massachusetts, USA: The MIT Press.

Zeegers, M., and D. Barron. 2015. *Milestone Moments in Getting your PhD in Qualitative Research*. Kidlington: Elsevier.

Zwarteveen, M., J.S. Kemerink-seyoum, M. Kooy, J. Evers, T. Acevedo Guerrero, B. Batubara, A. Biza, A. Boakye-ansah, S. Faber, A. Cabrera Flamini, G. Cuadrado-quesada, E. Fantini, J Gupta, S. Hasan, R. Horst, H. Jamali, F. Jaspers, P. Obani, K. Schwartz, Z. Shubber, H. Smit, P. Torio, M. Tutusaus, and A. Wesselink. 2017. "Engaging with the politics of water governance." *Wiley Interdisciplinary Reviews: Water*:1-9.

APPENDIX A

List of documents reviewed

Order	Document name	Source	Document Type	Year
Municipal water governance situations				
1	2018 Annual and Summary Report. Water Services	City of Guelph	Report	2019
2	City of Guelph Water Smart Business Program. Terms and conditions	City of Guelph	Framework	n.d.
3	City of Guelph Water Efficiency Strategy Update	C3 Water Inc. for the City of Guelph	Strategy	2016
4	City of Guelph Water Efficiency Strategy Update. Appendix A: Business Cases	C3 Water Inc. for the City of Guelph	Strategy	2016
5	City of Guelph Water Efficiency Strategy Update. Business Research Report	C3 Water Inc. for the City of Guelph	Report	2015
6	Water, water conservation	City of London	Websites	n.d.
7	Water efficiency for business, capacity buyback program, industrial water rate program, sewer surcharge rebate program	City of Toronto	Websites	n.d.
8	2019 Operating Budget and 2019-2028 Capital Plan	City of Toronto	Report	2019
9	Factsheets of capacity buyback program, industrial water rate, sewer surcharge rebate	City of Toronto	Factsheets	2018
10	Water Efficiency Plan Update	City of Toronto	Report	2011
11	Partners in Project Green website	Partners in Project Green	Websites	n.d.
12 - 15	Municipal Water Efficiency Eco-Cluster. Case Studies	Partners in Project Green	Report	2019
16	Municipal Water Efficiency Eco-Cluster. Summary Report	Partners in Project Green	Report	2019
17	Outside the Water Box: Innovative Public-Private Parnerships	Partners in Project Green	Presentation	2017
18	Customizing water efficiency solutions for industrial manufacturing	Cerbu, A.; Meliton, E. in Environmental Science and Engineering	Magazine article	

19	Building a network of water stewardship initiatives	Meliton, E.; Cerbu, A. in World Water: Stormwater Management	Magazine article	2015
20	Partners in Project Green: A Pearson eco-business zone	Sharma, C. in Plan Canada	Magazine article	2009
21	Water Smart Programs - website	Region of Peel	Websites	n.d.
22 - 23	Water Smart Programs for Businesses	Region of Peel	Pamphlet / Flyer	2017
24	Water Efficiency Strategy Update	Region of Peel	Strategy	2012
25	Conserving water	Region of Waterloo	Websites	n.d.
26	Water Efficiency Master Plan (2015-2025)	Region of Waterloo	Plan	2014
27	Waterloo WET Program	Region of Waterloo	Pamphlet / Flyer	
28	Water saving and protection incentives for businesses	York Region	Websites	n.d.
29	Long Term Water Conservation Strategy. Annual Report	York Region	Report	2018
30	Long Term Water Conservation Strategy	York Region	Strategy	2016
31	Multi-year Budget for the City of London 2016-2019. Water and Wastewater Treatment	City of London	Report	2016
32	Water Efficiency Program Update	City of London	Report	2015
33 - 34	Water and wastewater for business	Halton Region	Websites	n.d.
35 - 36	Sustainable Halton Water and Wastewater Master Plan (and other documentation)	Aecom, for Halton Region	Plan	2011
37	Water efficiency	Region of Durham	Websites	n.d.
38	Region of Durham Efficient Community. Final Report	Region of Durham	Report	2008
39	Minister's annual report on drinking water	Ontario Ministry of the Environment	Report	2019
40	Regulation decision notice: Financial Plans Regulation for the Municipal Drinking Water Licence Program and Financial Plans Guidance Document for Municipal Drinking-Water Systems and Municipal Wastewater Systems (EBR 010-0490)	Environmental Registry of Ontario	Policy consultation	2007

41	Toward Financially Sustainable Drinking-Water and Wastewater Systems (SDWA guidelines)	Ontario Ministry of the Environment	Policy	2007
42	Financial Plans (O.Reg. 453/07)	Ontario Ministry of the Environment	Act / Regulation	2007
43	Safe Drinking Water Act (SDWA)	Ontario Ministry of the Environment	Act / Regulation	2002
44 - 45	Financing Water Systems: Green Bonds & Canada Infrastructure Bank	Canadian Water Network	Presentation	2020
46	Balancing the Books: Financial Sustainability for Canadian Water Systems	Canadian Water Network, for the Canadian Municipal Water Consortium	Report	2018

Order	Document name	Source	Document Type	Year
Provincial water governance situation				
47 - 52	Letters regarding water efficiency and policies in four ministries (energy, municipal affairs, natural resources, research and innovation)	Ontario Water Conservation Alliance	Letters	2009, 2010
53	Water Conservation and Efficiency Program Annual Review	Ontario Ministry of Natural Resources and Forestry	Report	2018
54	Ontario's water conservation and efficiency goals, objectives and programs (in accordance with the Great Lakes - St. Lawrence River Basin Sustainable Water Resources Agreement)	Ontario Ministries of the Environment, and Natural Resources	Program /policy	2012
55	Stewardship- Leadership - Accountability. Managing Ontario's Water Resources for Future Generations. EBR Registry Number: 0-10-6350	Ontario Ministry of the Environment	Policy consultation	2012
56	2010/2011 Annual Report Supplement	Environmental Commissioner of Ontario	Report	2011
57	Comment on Throne Speech	Council of Canadians	Websites	2010
58	Comments to Water Opportunities and Water Conservation Act (EBR 010-9940)	Environmental Registry of Ontario	Policy consultation	2010
59	The Water Opportunity for Ontario	Jones, K.; Henderson, D., for	Report	2010

		the Government of Ontario		
60	Awash with potential. Ontario's provincial water conservation and efficiency strategy	Maas, C.; Elton, K. in Canadian Water Treatment magazine	Magazine article	2010
61	Ontario Water Opportunities and Water Conservation Act - What's next for Bill 72	McClenaghan, T., for the Ontario Water Conservation Alliance	Presentation	2010
62 - 64	Speech from the Throne - launch of the Open Ontario Plan (including the Water Opportunities Act)	Office of the Premier of Ontario	Press release	2010
65	Water Opportunities Act, 2010	Ontario Ministry of the Environment	Act / Regulation	2010
66	Water Opportunities and Water Conservation Act, 2010	Ontario Ministry of the Environment	Act / Regulation	2010
67	Water Opportunities and Water Conservation Act, 2010. EBR Registry Number: 010-9940	Ontario Ministry of the Environment	Policy consultation	2010
68 - 70	Response to proposed Ontario's Water Opportunities Act	Ontario Water Conservation Alliance	Press release	2010
71	Safeguarding and Sustaining Ontario's Water resources for Future Generations. Proposal Paper	Ontario Ministries of the Environment, and Natural Resources	Policy consultation	2009
72 - 73	H2Ontario - A Blueprint for a Comprehensive Water Conservation Strategy (and executive summary)	Ontario Water Conservation Alliance	Report	2009
74	Coalition urges Ontarians to support development of a world-class water strategy	Ontario Water Conservation Alliance	Press release	2009
75	Great Lakes-St. Lawrence River Basin. Water Conservation and Efficiency Objectives	Great Lakes- St. Lawrence River Water Resources Regional Body	Agreement	2007
76	Annex 2001 Implementing Agreements	Council of Great Lakes Governors	Agreement	2006
77	Annex 2001 Implementing Agreements. Frequently Asked Questions	Council of Great Lakes Governors	Factsheets	2006
78	Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement	Great Lakes- St. Lawrence River Basin States and Provinces	Agreement	2005

79	Water management: policies, guidelines, provincial water quality objectives	Ontario Ministry of the Environment and Energy	Policy	1994
47 - 52	Letters regarding water efficiency and policies in four ministries (energy, municipal affairs, natural resources, research and innovation)	Ontario Water Conservation Alliance	Letters	2009, 2010
53	Water Conservation and Efficiency Program Annual Review	Ontario Ministry of Natural Resources and Forestry	Report	2018
54	Ontario's water conservation and efficiency goals, objectives and programs (in accordance with the Great Lakes - St. Lawrence River Basin Sustainable Water Resources Agreement)	Ontario Ministries of the Environment, and Natural Resources	Program /policy	2012
55	Stewardship- Leadership - Accountability. Managing Ontario's Water Resources for Future Generations. EBR Registry Number: 0-10-6350	Ontario Ministry of the Environment	Policy consultation	2012
56	2010/2011 Annual Report Supplement	Environmental Commissioner of Ontario	Report	2011
57	Comment on Throne Speech	Council of Canadians	Websites	2010
58	Comments to Water Opportunities and Water Conservation Act (EBR 010-9940)	Environmental Registry of Ontario	Policy consultation	2010
59	The Water Opportunity for Ontario	Jones, K.; Henderson, D., for the Government of Ontario	Report	2010
60	Awash with potential. Ontario's provincial water conservation and efficiency strategy	Maas, C.; Elton, K. in Canadian Water Treatment magazine	Magazine article	2010
61	Ontario Water Opportunities and Water Conservation Act - What's next for Bill 72	McClenaghan, T., for the Ontario Water Conservation Alliance	Presentation	2010
62 - 64	Speech from the Throne - launch of the Open Ontario Plan (including the Water Opportunities Act)	Office of the Premier of Ontario	Press release	2010
65	Water Opportunities Act, 2010	Ontario Ministry of the Environment	Act / Regulation	2010
66	Water Opportunities and Water Conservation Act, 2010	Ontario Ministry of the Environment	Act / Regulation	2010

67	Water Opportunities and Water Conservation Act, 2010. EBR Registry Number: 010-9940	Ontario Ministry of the Environment	Policy consultation	2010
68 - 70	Response to proposed Ontario's Water Opportunities Act	Ontario Water Conservation Alliance	Press release	2010
71	Safeguarding and Sustaining Ontario's Water resources for Future Generations. Proposal Paper	Ontario Ministries of the Environment, and Natural Resources	Policy consultation	2009
72 - 73	H2Ontario - A Blueprint for a Comprehensive Water Conservation Strategy (and executive summary)	Ontario Water Conservation Alliance	Report	2009
74	Coalition urges Ontarians to support development of a world-class water strategy	Ontario Water Conservation Alliance	Press release	2009
75	Great Lakes-St. Lawrence River Basin. Water Conservation and Efficiency Objectives	Great Lakes- St. Lawrence River Water Resources Regional Body	Agreement	2007
76	Annex 2001 Implementing Agreements	Council of Great Lakes Governors	Agreement	2006
77	Annex 2001 Implementing Agreements. Frequently Asked Questions	Council of Great Lakes Governors	Factsheets	2006
78	Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement	Great Lakes- St. Lawrence River Basin States and Provinces	Agreement	2005
79	Water management: policies, guidelines, provincial water quality objectives	Ontario Ministry of the Environment and Energy	Policy	1994

Order	**Document name**	**Source**	**Document Type**	**Year**
Sustainable finance sector - Canada				
80	Interim Report of the Expert Panel on Sustainable Finance	Environment and Climate Change Canada	Report	2018
81	Final Report of the Expert Panel on Sustainable Finance	Environment and Climate Change Canada	Report	2019
82	Responsible Investment Strategies. Summary Criteria	BMO Global Asset Management	Framework	2020

83	Responsible Investment 2019 Review	BMO Global Asset Management	Report	2020
84	Sustainable Financing Framework	BMO Financial Group	Framework	2019
85	2019 Sustainability Report and Public Accountability Statement	BMO Financial Group	Report	2019
86	CIBC 2019 Sustainability Report	CIBC	Report	2019
87	Responsible Investing Policy	CIBC Asset Management	Framework	n.d.
88	Our Commitment to Sustainable Finance	RBC	Framework	2019
89	Our Approach to Climate Change	RBC Global Asset Management	Framework	2020
90	Investing in a Sustainable Future	Patrick, L. at RBC Capital Markets	Websites	2019
91	Our Approach to Responsible Investment	RBC Global Asset Management	Framework	2020
92	2019 Corporate Governance and Responsible Investment Annual Report	RBC Global Asset Management	Report	2020
93	Scotiabank's Climate Commitments	Scotiabank	Framework	2019
94	2019 Environment, Social and Governance (ESG) Report	Scotiabank	Report	2019
95	Scotia Global Asset Management Responsible Investment Policy	Scotiabank Global Asset Management	Framework	2018
96	Sustainable Investing Approach	TD Asset Management	Framework	2015
97	2018 Sustainable Investing Annual Review Summary	TD Asset Management	Report	2018
98	2019 Environmental, Social and Governance Report	TD Bank Group	Report	2019
99	Policy on Responsible Investing	CPP Investment Board	Framework	2010
100	2019 Report on Sustainable Investing	CPP Investment Board	Report	2019
101	Proxy Voting Principles and Guidelines	CPP Investment Board	Framework	2020
102	Statement of Guidelines and Procedures on Proxy Voting	Healthcare of Ontario Pension Plan (HOOPP)	Framework	2019
103	Responsible Investing Policy	Healthcare of Ontario Pension Plan (HOOPP)	Framework	2019
104	Proxy Voting Guidelines	OMERS	Framework	2018

105	Sustainable Investing Policy	OMERS	Framework	2020
106	Sustainable Investing	OMERS	Websites	n.d.
107	2018 Annual Report	Ontario Pension Board	Report	2018
108	Statement of Investment Policies and Procedures	Ontario Pension Board	Framework	2018
109	Responsible Investing	Investment Management Corporation of Ontario (for Ontario Pension Board)	Websites	n.d.
110	Proxy Voting Guidelines	OPTrust	Framework	2019
111	Climate Change Action Plan	OPTrust	Plan	2018
112	2018 Responsible Investing Report	OPTrust	Report	2018
113	Statement of Responsible Investing Principles	OPTrust	Framework	2019
114	Responsible Investing	OPTrust	Websites	n.d.
115	Major investments	Ontario Teachers' Pension Plan (OTPP)	Websites	n.d.
116	Our Approach to Sustainability Disclosures	Ontario Teachers' Pension Plan (OTPP)	Framework	2016
117	2018 Climate Change Report	Ontario Teachers' Pension Plan (OTPP)	Report	2018
118	2019 Responsible Investing Report	Ontario Teachers' Pension Plan (OTPP)	Report	2019
119	Corporate Governance Principles and Proxy Voting Guidelines	Ontario Teachers' Pension Plan (OTPP)	Framework	2020
120	Responsible Investing Principles in Practice	Ontario Teachers' Pension Plan (OTPP)	Report	n.d.
121	Member Survey: CCGG's Role in Environmental and Social Matters	Canadian Coalition for Good Governance	Report	2016
122	The Directors' E&S Guidebook	Canadian Coalition for Good Governance	Framework	2018
123	UN PRI Canada Network	PRI	Websites	n.d.
124	Capitalizing on Sustainable finance: A growth opportunity for Toronto's financial sector	EY and Corporate Knights, for Toronto	Report	2018

		Finance International		
125	Leadership in Sustainable Finance - The Economic Opportunity for the Toronto Financial Centre	Toronto Finance International	Press release	2018
126	A Primer for Environmental and Social Disclosure	TMX Toronto Stock Exchange, and CPA Chartered Professional Accountants Canada	Framework	2014
127	Leveraging Sustainable Finance Leadership in Canada: Opportunities to align financial policies to support clean growth and a sustainable Canadian economy	Bak, C., for the International Institute for Sustainable Development	Report	2019
128	ESG Integration in the Americas: Markets, Practices, and Data	CFA Institute and the PRI	Report	2018
129	2018 Global Sustainable Investment Review	Global Sustainable Investment Alliance	Report	2019
130	Drip, drip, drip: Water is a leading ESG concern	RBC Global Asset Management	Websites	2020
131	An Evolving Landscape: 2019 Responsible Investment Survey. Executive Summary	RBC Global Asset Management	Report	2019
132	2018 Canadian Responsible Investment Trends Report	Responsible Investment Association	Report	2018
133	Accelerating Financial Centre Action on Sustainable Development: How International Cooperation can Scale up Green and Sustainable Finance	UN Environment Inquiry into the Design of a Sustainable Financial System	Report	2017
134	Fiduciary Duty in the 21st Century	UNEP Finance Initiative and the PRI	Report	2019

APPENDIX B

Semi-structured interview guide

The following are questions that serve as “starters”, when speaking to interviewees about the water governance situations and/or sustainable finance. The specific set of prompt questions for each interviewee was drawn from the following list, according to the topic that the interviewee had experience on (many interviewees had direct experience and/or knowledge in more than one aspect covered in this study). These questions were then complemented with follow up questions that emerged in each conversation.

<u>Water governance situations questions</u>

- What are the drivers promoting the water policy objective in your jurisdiction (e.g., municipality, province)?
    - How did this water policy objective come to be (e.g., collaborative process)?
    - Were there any cross-sectoral considerations, and if so, how important were they?
- How is this policy objective being implemented? (e.g., regulatory approach, economic incentives)
- What are the main enablers and barriers for the implementation of this objective?
- Are there any other objectives that the jurisdiction is pursuing with work in this water policy objective?

Applicable to the municipal programs promoting industrial water efficiency:

- What is the nature of industrial water use in your municipality?
- What are the drivers for businesses to adopt water conservation and efficiency practices in your municipality?
- What has been the uptake of these programs by industrial water users? What type of businesses tend to participate?
- To what extent current regulations (e.g., wastewater discharge standards, water permits, or any other) or policies (e.g., rebates) enable or constrain industries to take action on water?

<u>Sustainable finance related questions</u>

- In which area of SF is your organization most active in, and you have most experience on?
    - What is the extent of sustainable finance related work in your organization?
- What are the most active aspects of SF in Canada, and particularly among institutional investors based in Toronto?
    - What are the main drivers of SF activity in the country, and around which issues?

    - How important are international SF trends and initiatives (e.g., CDP, PRI) in shaping the local SF landscape, and in which way?
    - What type of institutional investors are most active regarding ESG, and water, in Canada and Ontario?
- How do water risks or issues fare compared to various ESG interests of the largest Canadian institutional investors?
    - Which aspects of corporate (investees) water use are most salient for Canadian institutional investors?
    - Has your organization had other stakeholders (e.g., NGOs, policy-makers, regulators) proactively approached you for partnerships to work on water issues?
    - What is the potential for SF actors in the country to get more interested in the water regulatory framework?
- Which areas of the water sector in Ontario and Canada pose the largest opportunities for SF?
- What SF aspects can pose opportunities and/or challenges for the water sector in Ontario and Canada?
    - How can local governments make the most of these opportunities/address the challenges?