Assessing Foresight to Advance Management of Complex Global Problems

by

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Abstract

Many people do not like thinking about the future. If they do, over 50% of Canadians think "our way of life" (p. 7) will end within 100 years and over 80% of Canadians think "we need to change our worldview and way of life if we are to create a better future for the world" (Randle & Eckersley, 2015, p. 9). There is a good reason for this. Alarms have sounded over global urgent complex problems with potential for catastrophic consequences such as the development of artificial intelligence, climate change, mass extinction, nuclear war and pandemics (Marien & Halal, 2011). Society is also increasingly fragmenting as imminent crises build on lack of understanding, the sense of incapacity to act, fear, distrust, blame and a lack of hope. This struggle for humanity's survival is complicated by the turbulent global environment in which institutions continue to follow path-dependent trajectories set forth in a different time and context. Governments at various levels face a problem of "fit" between current structures and processes, that have not progressed sufficiently to meet changing needs of a global society mired in complexity and governance challenges.

However, hope exists. Incremental progress on many fronts and a massive amount of efforts and resources are being engaged worldwide. There are emerging fields, lenses and tools that can potentially alleviate complex problems and address this emergency. The purpose of this dissertation is to understand and assess dialogue-based foresight practices being applied towards complex problems in Canada to provide insights into how these practices can assist society to alleviate global urgent complex problems and their impacts, within this backdrop of looming crises.

Foresight, alternatively known as future studies or scenario-building, is a forward-looking practice recognized and used globally with over 100 research organizations focused on foresight, widespread usage by firms and over 18 countries involved in foresight activities (Berze, 2014b). Overall literature findings suggest foresight is widely and at least incrementally effective with a number of impacts in various areas (Calof, Miller, & Jackson, 2012; March, Therond, & Leenhardt, 2012; Meissner, Gokhberg, & Sokolov, 2013) but the extent of this effectiveness, the mechanisms involved, and the specific foresight benefits per type of project needs further

research and evidence. For instance, limited literature exists on whether foresight can transform complex situations and if so, under what conditions. Thus, opportunities exist for assessing and increasing foresight's impact.

This dissertation is a contextualized, systematic empirical study that taps into transdisciplinary literature and practice, case studies of how foresight has been used to address specific types of complex problems in Canada, as well as surveys and interviews with foresight experts and participants. This dissertation uses a foresight community scan and a comparative case study approach to provide practical and theoretical benefits to foresight and complex problem area stakeholders. The research focuses on studying the broad interactions of foresight and identifying the impacts of dialogue-based foresight projects on people and the outcomes of complex problems.

The dissertation concludes that dialogue-based foresight is a valuable and unique practice for ameliorating complex problems and their consequences. Insights are offered towards dialogue-based foresight's potential contributions within the context of other efforts directed at humanity's struggle for survival and global complex problems. These insights can then foster the further development and application of dialogue-based foresight on a global scale to alleviate complex problems and their effects. The dissertation outlines recommendations on key next steps to realize these potential contributions.

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List of Abbreviations

STEEP	Social, Technology, Ecology, Economy & Politics
GBFP	Georgia Basin Futures project
Fore-CAN	Foresight for Canadian Animal Health project
OCAD's Strategic Innovation Lab	sLab

Glossary

the Anthropocene – "a proposed term for the present geological epoch (from the time of the Industrial Revolution onwards), during which humanity has begun to have a significant impact on the environment" ("Anthropocene," n.d.).

Anticipation – "The form the future takes in the present" (Miller, 2018, p. 27). "Behaving in an anticipatory way means adjusting present behavior in order to address future problems" (Poli, 2010, p. 2).

Art – "works produced by human creative skill and imagination" ("art," n.d.).

Collaborate – "To work with another person or group in order to achieve or do something" ("collaborate," n.d.).

Complex adaptive system – An "entity consisting of many diverse and autonomous components or parts (called agents) which are interrelated, interdependent, linked through many (dense) interconnections, and behave as a unified whole in learning from experience and in adjusting (not just reacting) to changes in the environment" ("complex adaptive system (CAS)," n.d.).

Complex problems – The definition is identical to "wicked problems" as defined by Rittel & Weber (1973) with 10 defining characteristics.

Complexity science – Can be described as the study of a non-equilibrium state which has the following traits: interactivity, non-linearity, at the edge of chaos, with "sticky" behaviour along path dependant trajectories leading to tipping points, at which point self-organization and emergence through attractors generate global order and patterns (Gray & Gill, 2009; Johnson, 2009; Levin et al., 2012; Rogers et al., 2013; Sanderson, 2009; Stenvall & Kaivo-Oja, 2013; Westley et al., 2011).

Craft – "an activity involving skill in making things by hand" ("craft," n.d.).

Dialogue-based foresight – A foresight approach focused on both process and product outputs. The process reflects an open, honest and engaged exchange of viewpoints and ideas to "learn by revealing their perceptions and assumptions" (McLean & Egan, 2008, p. 252).

Effectiveness – "The degree to which objectives are achieved and the extent to which targeted problems are" addressed ("effectiveness," n.d.).

Efficiency – "The ability to do something or produce something without wasting materials, time, or energy"("efficiency," n.d.).

Foresight – The application (or practice) "of a systematic, participatory, future-intelligence-gathering and medium-to long-term vision-building process aimed at enabling present-day decisions and mobilizing joint actions" (European Commission Research Directorate General, 2001, p. 13).

Foresight approach – "The process that one employs in conducting a foresight project is the approach" (Bishop, Hines, & Collins, 2007, p. 2).

Foresight exercise – One or more stages, phases or steps of a foresight approach, e.g., scanning.

Futures literacy – also similar to foresight literacy "understanding the nature of the future and the role it plays in what we see and do." Why and how we "use the future" in the present (Miller, 2018, p. 22).

Foresight method or activity – "…a systematic means that a professional uses to generate a product" (Bishop et al., 2007, p. 3).

Foresight project – "The futures project is the largest unit of professional work. It includes the sum total of the objectives, the team, the resources and the methods employed in anticipating and influencing the future" (Bishop et al., 2007, p. 2).

Health and societal health needs – "a state of complete physical, cognitive, emotional, social and spiritual wellbeing" (Royal College of Physicians and Surgeons of Canada, 2012, p. 3).

Managing or addressing complex problems – "…to handle, direct, govern, or control in action or use" ("manage," n.d.). One or more actions regarding complex problems, e.g..: Frame, create, alter/shape, forecast/monitor and prepare, transition, and/or evaluate progress.

Multiple perspectives – Several different mental views or prospects ("perspective," n.d.).

Output – The result produced by a process.

Outcome – Consequences of something or achievements made.

Planetary health – "planetary health is the health of human civilisation and the state of the natural systems on which it depends" (Whitmee et al., 2015, p. 1978).

Science – "the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment" ("science," n.d.).

Tool – "the application of knowledge to the achievement of particular goals or to the solution of particular problems" (Moore, 1972, p. 5).

Transformative change – "Transformation is comparable to second-order change where some of the rules that govern the system change in response to the novelty (Watzlawick et al. 1974), hence spreading its impact. This transformation is a type of change that cascades across the panarchy, altering relationships at different scales" (Moore & Westley, 2011, p. 2).

Urgent complex problems – Problems which meet the conditions of both Horn and Weber's definition of social messes and Levin et al's definition of super wicked problems as per having a strong urgency to be addressed due to the potentially devastating consequences for human well-being.

Well-being – Health, happiness and the attainment of a high quality of life.

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Section 1 Foundations for the Dissertation

This dissertation is a voyage of discovery into a community and area of practice surrounded by ambiguity as well as potential. As in any voyage, significant planning and ground work sets the scene and the experience. For instance, defining the purpose of the trip, identifying and researching the places to potentially visit, and deciding upon and arranging for the practicalities, such as how to travel, are critical. Foresight is not an easy field to comprehend or research. One could argue its value is in its intricacies. As such, this initial section of the dissertation contextualizes the research results and provides appropriate grounding to appreciate them. Chapter 1 to 6 provide an introduction, literature reviews, a conceptual framework and a research design. These chapters are the basis for the research conducted and presented in Chapters 7 to 12. Sections 2, 3 and 4 are comprised of Chapters 7 to 12.

Chapter 1 establishes the topic and the need for the research. It outlines the concepts involved, research question to be addressed, parameters, assumptions, approach, and significance of the dissertation. The plan for the overall dissertation is visually depicted at the end of the chapter.

The three literature review Chapters 2 to 4, follow the introduction. These chapters review concepts and literature in five areas. Chapter 2 presents complex problems and the context in which they are found in Canada, including complex adaptive systems. It then reviews foresight as a human endeavor that demands a particular understanding of how to study individuals and what they may need to work with complex problems and their implications.

Chapter 3 reviews foresight as a tool, “the application of knowledge to the achievement of particular goals or to the solution of particular problems” (Moore, 1972, p. 5), to address change and to provide assistance and support mechanisms for people. It tracks a detailed history and current state of play regarding foresight as a concept applicable to theory and practice. Building on the context provided in Chapter 2, this chapter lays out broad information on different mechanisms available for people to use in the process of alleviating complex problems and their consequences. As foresight is the tool or mechanism to be researched in this

dissertation literature on foresight is offered: what it is, how it developed, how it has been used, and the elements of the practice.

Chapter 4 presents information related to foresight's use for the long-term well-being of humanity. Topics within this chapter include a review of the use of foresight for complex societal problems, how foresight has been assessed, how foresight can be considered to have stronger impacts, and ways to strengthen the literature. A conceptual map is then offered to illustrate the interrelation of the five areas covered in the literature reviews.

Chapter 5 conceptualizes the information into a framework that is then operationalized into a research design in Chapter 6. In addition to a conceptual framework and related assumptions, eleven propositions are presented and causality is addressed.

Chapter 6 outlines the research design. This includes how projects will be selected for a comparative case study, a description of data collection and analysis methods, strengths and limitations of the design, and ethics.

Sections 2 "Research Findings and Preliminary Analysis and Discussion", 3 "In-depth Analysis and Dissertation Review" and 4 "Implications from the Findings" will be presented as detailed discussions of each section and will take place at the opening of sections as they occur.

Chapter 1: Introduction

The current transformation of society can be described as being on the verge of revolutionary change but is more troublesome than other transitions due to the heightened nature of its global scale and potentially catastrophic impact on the world population. Although society historically transforms slowly with small evolutionary changes such as those found in changing beliefs or new knowledge, in certain periods society undergoes more significant revolutionary changes especially in certain regions, for example, from the agricultural age of production to the industrial age (Gersick, 1991). The Anthropocene, "a proposed term for the present geological epoch (from the time of the Industrial Revolution onwards), during which humanity has begun to have a significant impact on the environment" recognizes the extent and swiftness of human influenced changes to the earth ("Anthropocene," n.d.). Epochs are typically 3 million years apart. The proposed epoch would begin approximately 11,000 years after the previous one known as the Holocene (Owen, 2010). Globalization, scope of development of new technologies, the growth of the world population, and the pace of change are unprecedented and have contributed to the development of the current struggle for humanity's existence. Primarily, the misaligned development of society with the capacity of complex human systems to adequately address societal advances in a turbulent context is not only contributing to the global emergency but fomenting a range of difficult, complex problems, or 'wicked' problems as defined by Horst Rittel and Melvin M. Webber in 1973.

Furthermore, the uncertainty, risk, awareness and overall anxiety associated with the current age and globalization compounds the wicked problems nations, regions and global society confront individually and overall (Beck, 2009; Farazmand, 2009; Giddens, 1990; Malone, Morton, & Halperin, 1996; Van Der Bly, 2005). Wicked problems have been identified as being symptoms of other problems, novel and unique, and without a stopping rule. The solutions to these problems cannot be found by trial and error, are not necessarily correct or false, and do not have an incalculable number of options (Conklin, 2006; Rittel & Webber, 1973). Others also use the term social mess to refer to the interrelatedness of wicked problems (Horn & Weber, 2007).

Globalization not only contributes to the risk of a crisis associated with complex problems but is transforming how people see the world; from many separate nation states to one unified and interdependent world (McGrew, 1992). The concept can “be defined as the intensification of worldwide social relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa” (Giddens, 1990, p. 64). A similar concept “the global village" was coined by Marshall McLuhan in the 1960s, in reference to the development of communication technology bringing individuals into closer connection with one another (McLuhan, n.d., p. 1). Although the individual terms *society*, *global* and *international* have been around for centuries and *globalization* and *the global village* have been in use mostly since the 1980s, *global society* as a concept has only been defined with dimensions and as a sphere in itself in the early 1990s (Anheier, Glasius, & Kaldor, 2001; McGrew, 1992; Van Der Bly, 2005).

In addition to its relevance to areas such as business, environment, politics, and health care, a strong global civil society has developed. “Global civil society is the sphere of ideas, values, institutions, organisations, networks, and individuals located between the family, the state, and the market and operating beyond the confines of national societies, polities, and economies” (Anheier et al., 2001, p. 17). In 2010 the number of international non-governmental organizations, as identified in the Union of International Associations (UIA) database, totalled over 55,000; indicating an increase of over 30,000 new organizations in 20 years (“Union of International Associations,” 2001; “Union of International Associations,” 2010). A substantial number of these organizations are addressing complex global problems.

The challenge/dilemma of achieving sustainability is a commonly cited example of a complex global problem. Many organizations and academics recognize that a primary and time sensitive concern is sustainable development of the planet. Limitless growth of the human population was identified as leading to catastrophe by Thomas Malthus in 1798 and the concept of limits to growth and resource consumption have been documented extensively in the last fifty years. Sustainability and sustainable development are commonly used in many different contexts and timelines and projections of resource exhaustion are abundant as the alarm bells continue to ring (Jackson, 2009; Nidumolu, Prahalad, & Rangaswami, 2009; “Shaping-the-Future,” 2010;

"Vision 2050," 2010; "Who will feed China," 1994; World Commission on Environment and Development, 1987).

At the same time, sustainable provision of health care, stability of the financial system, climate change, maintenance of peace and security and reduction of poverty (Bhide, 2010; Joseph Rowntree Foundation, 2009) have been identified as continuing forces of the sustainable development crisis, even if these problems are not necessarily defined and agreed upon. Some problems are not recognized as such by groups of people or individuals and if they are recognized the level of importance assigned to them or the reason attributed for the problem is dissimilar among problem definers. For example, an individual in the Middle East may not identify the cause of instability in the region as a quest for democracy but an issue related to Western cultural or political influences. A European or North American country or individual therein may have an alternate explanation.

Problems may be more critical to a specific geographical location or they may be inextricable, but they still require global attention. At minimum, the quality of life of individuals worldwide is threatened as interlinked yet unique communities transition through these difficult times. Due to interlinkages and interdependence in global society as well as the advances in technology and globalization, many problems could eventually affect a significant proportion - if not all - of the world population. They may be irreversible or involve high costs (like human lives lost, loss of natural and human resources), are extremely difficult to solve, and overall must be addressed within a pressing timeframe or the likelihood increases that societal transformation and impacts of the problems are devastating and/or irreversible (e.g., volatile climate changes, nuclear conflict, pandemics). Furthermore, most problems have endured while impacts seem to worsen. Besides that, many of these problems may remain unresolvable while new problems continue to arise (Joseph Rowntree Foundation, 2009). Even if only some problems are of critical importance to humanity, and even if these remain unsolvable, they need to be managed in such a way that society can exist, provide a quality of life and hopefully progress.

There is a tremendous volume of effort focused on resolving single problems, groups of problems and advancing society in general. This is evident in the volume of scholarly articles

written on the various topics, the private, public and non-profit sector organizations focusing on various elements of several of the problems, and the individuals at all levels of society contributing to the solution. However, the dynamic quality of the multitude of activities and knowledge generated and how these efforts interrelate is difficult to assess, synthesize, evaluate and ultimately ascertain at a global level. Even so, the efforts are not enough (Kanninen, 2013; Jose Ramos, 2011).

The added scope, scale and complexity of global transformation suggest that progress within a short timeframe is a seemingly impossible goal. Current governance regimes are also being taxed in their abilities to keep up with the current milieu and the management of complex problems. Public management reform has been an increasingly addressed topic (Canadian Centre for Management Development, 2000; Lodge & Wegrich, 2014; Pal, 2013; Pollitt, 2011). Intentions may be noble but activities or outcomes aimed at particularly global problems may have mixed benefits, for instance, development of new technology that benefits society but can also be harmful to the environment, or overall unanticipated harmful effects, such as some new pharmaceuticals (Westley et al., 2011). In some situations, the goals may be at odds with the long-term collective good but beneficial in some ways in the immediate term, such as resource extraction.

Other difficulties in achieving progress include: (i) knowledge ambiguity of problems, actions, or long-term effects, e.g., policy impacts; (ii) conflicting and changing values, ideologies and/or beliefs, e.g., conservative vs. liberal; (iii) interrelated and cumulative effects, e.g., smart phones' wide-reaching societal impact; and, (iv) changing knowledge or circumstances, e.g., health effects of different foods. Significant barriers to alleviating this crisis also include efforts maintaining powerful interests, challenges to recognizing the existence of this crisis, and globally integrated complex systems. Thus, significant and ongoing efforts are in place to address complex global problems, but alleviation of global and related issues is extremely difficult to achieve within a complex environment. Furthermore, the researcher has observed it is not clear which tools, methods, lenses or approaches are more effective and efficient relative to other tools, methods, lenses and approaches and under which circumstances.

The global community as well as individual nations are not adequately prepared to deal with these urgent complex problems. Systems, cultures and people are inherently slow to adapt and most practices within the current "toolbox", including technologies, approaches, methods, lenses and areas of study, to address problems were developed for different contexts and dissimilar problems. A significant number of relatively new "tools" continue to evolve while being applied to complex problems over the last several decades, such as, foresight, evaluation, design and modes of governance. However, several developmental issues and ambiguity surround the use of these tools/approaches and an assessment of their use and effects or potential effects on complex problems/urgent complex problems is at a very early stage.

It is important to assess and refine ways in which to address complex global problems and their impacts. For example, approaches need to be appropriate to the contextual environment to make meaningful progress in a timely fashion. Also, some efforts may be hindering progress or having little to no effect while others advance progress but could be improved or used more widely. As significant progress is so difficult to achieve, anticipating and preparing for the potential effects of complex global problems and the transitions society may undergo is also wise and prudent.

Collaborating efficaciously is necessary in consideration of the scope and intricacy of the transformation and issues involved. Cooperation has already proven to be a key factor in resolving global and national issues (Ostrom, 2000, 2010; Stanford Social Innovation Review, 2011; E. Trist, 1977). For instance, cooperation among various organizations and countries exist in the United Nation's efforts to meet Sustainable Development Goals, responding to depletion of the ozone layer, addressing health crises such as SARS, reducing conflicts such as ISIS, and in various research initiatives. Nationally, for example, cooperation has been necessary to reach various intergovernmental agreements, make progress on reconciliation with Indigenous peoples, and recover from the financial crisis of 2008.

One can theorize that the culmination of the use of many tools and approaches old and new could create a tipping point in favour of alleviating urgent complex problems or one of the new tools or approaches could result in significant advancement in addressing these problems.

This approach, however, assigns significant resources and impacts on human well-being partially to chance. In consideration of limited available resources for problems, a looming timeline, the value of humanity, and tools that could result in both negative as well as positive impacts on complex problems, a gamble on a potential positive eventuality in itself may not be enough.

It is important for society to comprehend the emerging ways in which to work with complex problems and their effects. Noteworthy are the global efforts in this regard being led by the United Nations and many agencies as a part of meeting the Sustainable Development Goals. Indicative of this importance, efforts have been expended to define, describe, assess and improve these tools. Yet, in the context of complexity and with the number of different tools applied to diverse contexts of complex problems, these tasks are difficult to accomplish and much work remains (Draimin & Rajasekaran, 2015). One feasible way to tackle this situation is through examining a distinct tool in a particular context and within a specific timeframe.

In deciding which tool to study, foresight as a lens and mechanism is a promising choice. It has several features identified as important in addressing complexity and complex problems. For example, diverse arrays of practitioners are accustomed to working with groups of individuals to address and prepare for uncertainty and the unknown. Furthermore, foresight has provided broad incremental benefits in the past and holds strong potential for further development (Calof & Smith, 2012). For instance, foresight traversing both the sciences and the arts while building on many fields of knowledge and associated methods demonstrates flexibility and a strong capacity to grow. Dialogue-based foresight in particular offers a range of both process and output benefits which incorporate engaging individuals and attending to conflicts and values, thus resulting in incremental benefits in, for example, social, cognitive and creative capacities.

Dialogue-based foresight, although not necessarily identified as dialogue-based, is already being applied to complex problems and is being put forth as a transformative practice. It may also be a way to help communities transition through difficult times. Dialogue-based foresight is rarely treated as a foresight type in the literature because it is frequently assumed to be an inherent part of foresight (Borch, 2013), but this dissertation argues true dialogue is often

not utilized in foresight practice. The examination of dialogue-based foresight as applied to specific global complex problems would provide further information regarding this type of foresight's value and offer preliminary insights into addressing urgent complex problems. Although it is beyond the scope of this dissertation to complete a global study, a national study can be completed as a sample for the global context.

The scope of this type of study can be defined by, for example, temporal, geographical, and cultural parameters. Complex problems are by their nature intricate, interconnected and transcend national boundaries. Yet, this does not mean only international efforts or research at a global level can address them. Rather several efforts at various levels of society are required and directed at these problems as the world is composed of multiple interconnected adaptive systems and states. Thus, a national and/or community approach targeting complex problems can be significant in alleviating the problem for that geographical territory and for providing guidance for international efforts.

Selecting Canada as the geographical and political space offers insight into how one of the most advanced countries in the world is addressing these types of problems. Canada is also in the unique position of being a multicultural, natural resource rich, and in some areas an environmentally pristine country that faces urgent complex problems from this distinct vantage point. As a Canadian, the researcher is better equipped to studying foresight within this cultural and institutional context. Due to globalization and the resulting smaller yet very interviewed global community Canada has many similarities to other developed countries. Furthermore, many aspects of foresight are similar across countries which are continually learning from each other. As such, the findings from a study of foresight in Canada also are partially generalizable to a global context.

Having one cultural and institutional context in a study allows for these factors to remain constant for a comparative study. To understand the impact of foresight projects within a specific problem area, it is helpful to understand the context before the foresight project took place and after the foresight project was completed. For example, if the project lasted two years, roughly

four years pre-foresight project allows for gauging context initially and about four years facilitates assessment of medium term impacts of the project.

Foresight is an evolving field that is taking root worldwide but has not yet been accepted as a mainstream practice. Both research and practice in this area is increasing at a fast rate. However, the researcher has observed current information on foresight use, especially in terms of complex problems in Canada, is scattered and incomplete at best. Partial information can be located per a handful of research studies or potentially through the search for specific projects. In addition, the field in general could benefit from a contextualized aggregate assessment and an opportunity to examine ways in which foresight could be thought of as having increased national positive impacts on complex problems and their consequences. This dissertation research aims to understand and assess one practice employed in addressing complex problems (dialogue-based foresight) in Canada with the ultimate objective being to offer insights into how this practice can possibly assist society in its efforts to alleviate non-urgent and urgent complex intersecting global/national/local problems. This objective will be accomplished by answering the questions of how foresight practices have been used to address Canadian complex problems and what can foresight contribute to the work on these problems.

This dissertation consists of 12 chapters within four sections. The first chapter provides a background and outlines the study's research questions, assumptions and parameters. The next three chapters are literature reviews of three broad topic areas: complex problems and complex situations; foresight as a concept, lens and a mechanism for change as well as to offer support and assistance to people; and the use of foresight for the long-term well-being of humanity. The fifth chapter describes a conceptual framework for the research. The sixth chapter outlines the proposed research methodology. The following two chapters presents research findings. The ninth chapter analyzes the findings in-depth. The next chapter outlines the use of multiple perspectives in the dissertation and provides a review of the findings. The subsequent chapter offers findings and discussion of results as foresight is related to the context of work completed on complex problems. The last chapter concludes the document and offers a summary, limitations and further steps required to advance this area.

The link to foresight.

Since the 1960s, the study and practice of future studies and foresight significantly spread across the globe and the societal value of the field gained recognition from academia, business, government and non-profit groups worldwide (Öner & Beser, 2011; Rafael Popper, Georghiou, Keenan, & Miles, 2010; Varum & Melo, 2010). Future studies started to spread in the 1960s and in the 1990s foresight began to emerge as a more focused decision-making tool; especially in Europe (Keenan, Miles, & Kaivo-Oja, 2003). Today, foresight continues to expand.

Foresight appears as a contradiction in that it is relatively new and the practice has not yet been adopted in the mainstream, while the number of related organizations and publications suggest foresight is well-established. As such, foresight is referred to in this dissertation as both an emerging field and one that is established worldwide. In general, the practitioner community now refers to the field as foresight or strategic foresight more often, whereas the terms future studies or futurology are used typically by academia (G. Van Alstyne, personal communication, March 7, 2014). Foresight will be the term used throughout this document.

Foresight is a field with significant depth and breadth. Although these elements are strengths for this emerging and dynamic field, describing foresight and its activities globally can be difficult in consideration of diverse definitions and overlapping disciplines. Foresight has been defined in several ways (Amanatidou, 2014; Georghiou, 2008). For example, the foresight definition used by the European Foresight Monitoring Network, is "a process which combines three fundamental elements: prospective (long-term or forward-looking) approaches, planning (including policy-making and priority-setting) approaches, and participative approaches (engaging stakeholders and knowledge sources)" (Popper, R., & Directorate General for Research, 2009, p. 8). For the purposes of this dissertation, foresight is defined as the application "of a systematic, participatory, future-intelligence-gathering and medium-to long-term vision-building process aimed at enabling present-day decisions and mobilizing joint actions" (European Commission Research Directorate General, 2001, p. 13).

As can be seen from these definitions, foresight has the potential to be applied by many varied disciplines, such as engineering, health care and policy science and builds on knowledge

and methods from different disciplines, like planning. Also, there are a number of individuals from diverse disciplines practicing in the foresight field ("Foresight and Futures Studies Graduate Programs - Global List," n.d.). Thus, the number of organizations, academic programs offered and publications focused on foresight are numerous, but it is important to note that they can vary depending on whether foresight is treated as a direct or indirect subject. To elaborate, an academic program offering a degree in foresight is direct while foresight courses being offered as part of a business degree are indirect. Further, distinctions are not always clear or reflective of the importance or depth of the foresight activity. For example, a policy think tank may have a small but highly influential foresight department even if foresight is not the direct focus of the organization.

What is considered as foresight? Some key elements of what foresight practice includes and does not include helps to further explain the practice. First, foresight practitioners do not predict the future but rather systematically identify alternative forecasts or images of the future. This is critical as there has been a misconception that this practice's objective is to identify what is going to happen in the future. Second, foresight challenges the status quo and sometimes what seems realistic and builds on creativity and imagination. Next, working with the future is a dynamic ongoing process (Dator, 2007). Finally, the practice of the field is holistic and transdisciplinary; building on the knowledge and methods of other disciplines.

In the last few decades there has been a significant rise of interest in the field (Georghiou, 2008; Varum & Melo, 2010). Currently, over 18 countries have well-established foresight activities (Dreyer & Stang, 2013; Popper, R., & Directorate General for Research, 2009); at minimum 22 primarily foresight Masters and or PhD degrees are offered worldwide ("Foresight and Futures Studies Graduate Programs - Global List," n.d.); and over 100 institutes/research organizations have been identified as focused on foresight (Berze, 2014b). Further, 16 peer-reviewed foresight journals are being published ("Futures Publications - Journals," 2018). This rise of interest in the field is also found in other subject areas, especially as related to complex problems.

As evidenced by the resources expended in terms of money, activities, publications and growth of international civic organizations, mostly accessible through a basic Internet search, the effort to address complex global problems is immense and growing ("Union of International Associations," 2001; "Union of International Associations," 2010). A huge number of organizations, processes and tools exist to manage complex problems or their elements in complex adaptive systems in several ways to, for example: frame, shape, forecast, monitor and/or evaluate problems. They either tackle one element or all, and the strategy is to focus on one or a few approaches but a comprehensive approach to address all elements is rare. (This information is based on a personal search of the Internet for efforts used to address complex problems.) Foresight fundamentally can tackle complex problems holistically, in several ways, at various levels, linking to various tools and doing this effectively with the potential for broad citizen engagement.

The rapidly emerging field of foresight is especially significant in the current increasingly turbulent and complex social environment in which risk and uncertainty are prevalent (Chermack, 2005; Costanzo & MacKay, 2009; Eriksson & Weber, 2008; Wilkinson et al., 2013). One of the reasons for this is that foresight consists of a wide range of processes that examine alternate futures in order for the user to anticipate and prepare for events which may occur (Dator, 2007; Schwartz, 1991; Wells, 1932). Another reason foresight is especially pertinent to current society is that it is transdisciplinary and holistic while engaging values (Brown, Harris, & Russell, 2010; Da Costa, Warnke, Cagnin, & Scapolo, 2008; Dator, 2017; Habegger, 2010; Kopelman, 2010). These factors are important to addressing complex problems in complex adaptive systems (Jörg, 2011).

Several disciplines are also drawn upon for foresight, e.g., communication, policy studies, and foresight is equally applied to many different disciplines; e.g., business, technical fields, and the natural and social sciences (Chermack, 2005). Additionally, many of the methods used in foresight involve social processes; dynamic techniques that help to build social, cultural and human capital through flexibility and diversity. Dynamic techniques that are flexible and incorporate diversity are important to working within the current complex environment (Hassan, 2014; Kuah, 2018).

Another reason why foresight is appropriate to the current social milieu of complex problems is that it can be action-oriented; engaging multiple perspectives to challenge the status quo in order to achieve ongoing cognitive and deliberated social change (Bengston, 2013). Furthermore, the continual assessment of the changing societal context, such as drivers and trends, and specific external context surrounding the foresight exercise, like the broader group of stakeholders and institutional practices, are instrumental to the successful implementation of the foresight exercise (Amanatidou, 2014; Georghiou & Keenan, 2006; Saritas & Nugroho, 2012; Volkery & Ribeiro, 2009) and to addressing complex problems. Finally, embedded within foresight is a long-term orientation which can be critical to a sense of stability and human survival in an uncertain environment (Destatte, 2010; Hauptman & Sharan, 2013).

Many foresight scholars and practitioners naturally link the fundamental purpose of foresight as a lens and mechanism for advancing society and addressing issues related to humanity's sustainability (Riedy, 2009; Slaughter, 2009). As such, foresight is used in the literature to assist problem-solving indirectly in the multiple objectives it serves by, for instance, aiding decision-making and conduct technology road mapping. Foresight is applied directly to complex societal problems through mostly policy-oriented foresight or specific problem-oriented foresight. This is likely because foresight has emerged in different use and subject areas and tailoring has been to these use and subject areas, such as linked to environmental foresight, or the specific environmental issue that is being addressed, for instance, climate change and fresh water management.

Highly effective approaches to ameliorate urgent complex challenges are important and foresight may be one of the promising approaches that can assist in this process (Destatte, 2010; Raphael Popper, 2008). Indeed, there is a call for greater use of foresight for addressing these complex challenges (Jhirad, Juech, & Michelson, 2009; Kishita, Hara, Uwasu, & Umeda, 2012; Riedy, 2009) and a call for more evaluation of foresight (Georghiou & Keenan, 2006; R. Johnston, 2012). In general, foresight has been effective incrementally in a number of areas (Calof, Miller, & Jackson, 2012; Calof & Smith, 2010; March et al., 2012; Masum, Ranck, & Singer, 2010; Meissner, Gokhberg, & Sokolov, 2013) but the evidence and description of

effectiveness as well as value needs to be strengthened (Lundsgaarde, 2011). For instance, conditions and mechanisms for effectiveness need to be better ascertained. Work is ongoing by both foresight practitioners and related academics to determine and establish foresight's effectiveness and the extent of this effectiveness to advance foresight. Also, several scholars and practitioners believe the potential exists for increasing the impact of foresight through improved measurement and research (Giaoutzi & Sapio, 2013; R. Johnston, 2012; nik, 2014; Riedy, 2009; Rohrbeck & Bade, 2012; M. van der Steen & van Twist, 2012; Varum & Melo, 2010; Veliquette et al., 2012; Wilkinson, Kupers, & Mangalagiu, 2013).

However, foresight is commonly referred to as a craft or an art form. As such, foresight is a not a one-size-fits-all approach (Georghiou & Keenan, 2006). It is a highly customized concept and mechanism that requires in-depth appreciation. For instance, a foresight project can include many stages composed of numerous methods that can take years to complete. The manner in which a foresight project is viewed and delivered is dependent on specific variables, e.g., timing, objectives, the sponsor and the practitioner (Lindgren & Bandhold, 2009; Raphael Popper, 2008). As such, there is no one correct way to apply foresight. Although, lessons learned, guidelines and checklists are provided for foresight generally and for specific types or approaches to foresight they still need to be adapted to a specific foresight project (Hines & Bishop, 2015; Lindgren & Bandhold, 2009).

Calof and Smith (2010) provide a review of success factors for foresight programmes. Several suggestions for successful use of foresight for policy are made, for example, by UK Foresight's Horizon Scanning Centre (http://hsctoolkit.bis.gov.uk/index.htm). General suggestions for improving foresight and its impact are also prevalent in the literature (Calof & Smith, 2010; Johnston, 2012; Lindgren & Bandhold, 2009; Riedy, 2009; Wehnert & Wolfram, 2009). Ultimately, practitioner knowledge of and experience with foresight as well as user receptiveness to foresight information and processes are critical elements to the success of a foresight project but there are a multitude of other factors at play (Calof & Smith, 2010; M. van der Steen & van Twist, 2012; Volkery & Ribeiro, 2009).

Foresight effectiveness or impact is very difficult to measure and significant empirical and conceptual work is still required (Könnölä, Scapolo, Desruelle, & Mu, 2011; Volkery & Ribeiro, 2009). Yet, systematic measurement of foresight effectiveness appears justified in order to advance the field practically and theoretically, increase the credibility and trust in the discipline, share knowledge and strengthen the impact of foresight (Georghiou & Keenan, 2006; Georghiou, 2003; Miles, 2012; Piirainen, Gonzalez, & Bragge, 2012; Van der Steen & Van der Duin, 2012). Complications occur in conceptualizing foresight types and their impacts at different levels and methodically addressing all the relevant entangled factors while addressing other assessment issues and ambiguity in the emerging field. In other words, foresight is difficult to measure for a number of reasons; application of foresight varies across systems, objectives and actors; many intangibles and attribution problems (Amanatidou, 2014; Calof & Smith, 2010; Georghiou & Keenan, 2006; Schartinger, Wilhelmer, Holste, & Kubeczko, 2012; Volkery & Ribeiro, 2009); external context and actors have significant impact (Miles, 2012); and it can take years for full impact to be achieved and then attribution and other measurement errors can increase (Lundsgaarde, 2011; Volkery & Ribeiro, 2009). Georghiou (2003) and Van der Steen and Van der Duin (2012) elaborate upon the dilemmas in foresight evaluation, e.g. defining when scenarios begin and end, and timing of evaluation.

Although systematic measurement can be helpful in developing the field, the interest of this dissertation is to better understand and assess dialogue-based foresight for drawing insights, towards advancing alleviation of complex problems and their impacts through a comprehensive approach. This is where the greatest contribution of foresight lies in respect to addressing urgent and non-urgent complex societal problems. With refined assessments and improvements in dialogue-based foresight approaches the practice will advance. Further advances could be made in foresight impact with addressing system and other barriers extrinsic to foresight. Dialogue-based foresight has been used in an attempt to deal transformatively with urgent complex problems, but the practices have been limited in scope and number. A tailored foresight approach building on these attempts for transformatively addressing urgent complex social problems and sustainable development issues could be an important development. Some researchers have already taken steps in this regard by presenting innovative ways in which to address challenges

by tailoring foresight to its context while encouraging participatory practices (Da Costa et al., 2008; Saritas, 2013).

The researcher's role.

It is important to contextualize this research by explaining the perspective of the researcher, so the reader has insights into how and why this research is being conducted. The researcher has pragmatist views and does not think there is such a thing as a completely objective or value free research. Interested in real-world problem solving, the researcher believes values are inseparable from rationality, and theory and practice are integrated. Pragmatism places experience as paramount and dependent on the situation and the context (Snider, 2011).

The researcher is motivated by values and a diverse background to conduct the research outlined in this dissertation. The driving force behind completing this dissertation is to improve societal well-being or at least minimize potential suffering. By understanding and assessing promising ways in which complex problems are being addressed the researcher hopes to provide insights that may ultimately facilitate societal progress and well-being. The researcher brings to this research values of openness, diversity, freedom, integrity and well-being, as well as, professional work experience in the environmental and health sectors at policy, program and service levels within Canada. Since completing an undergraduate degree in Sociology and Anthropology and an MBA degree, the researcher has focused on results and ways to improve societal outcomes.

From a normative perspective, the field of foresight is well-suited to addressing the current complexities of society; however, the assessment and appreciation of foresight in addressing complex problems and societal transformations still needs further effort. Debates over the development of the field abound but there is no objectively clearly defined right or wrong ways in which certain fields evolve especially in the context of complexity. Thus, there is a significant subjective component to this evaluation. This dissertation is focused on both process and outcome as results. The values of openness, accountability, fairness and citizen engagement are increasingly reflected in different approaches to foresight but how and to what extent these values can practically translate to a desirable future society needs to be continually studied and

challenged. A pragmatic and inherently foresight approach is to present alternatives, view the system as a whole, maintain different perspectives and question the status quo. Thus, there is certainly more than one approach to foresight that can benefit society and an open mind is important to foresight approaches. The creativity of the field depends on the ability to use different approaches contingent on the foresight objective, the stakeholders involved and its context. However, clarity and quality of foresight are also important to the field. There is a need to address clarity. A discussion will now be conveyed in concepts and definitions in the next section.

Concepts and definitions.

Complex, wicked or urgent problems.

Climate change, poverty, peace and security are examples of some of the menacing complex problems, or alternatively referred to as wicked problems or grand challenges, that in some cases individual societies as well as in other cases the global society are attempting to address. Prior to the term wicked problems, Herbert Simon (1973) identified “ill-structured” problems in the context of a problem structure without definition. Grand challenges is another phrase that has been used for complex problems, but the term is used variably in different contexts. Even so, the term grand challenges tends to focus on challenges or obstacles being resolved by innovations in science and technology (Gould, 2010; Kuhlmann & Rip, 2014).

Many social problems policy makers regularly face fit the definition of wicked problems as outlined below (Head & Alford, 2008; Rittel & Webber, 1973; *Tackling wicked problems*, 2007). Rittel & Webber (1973) also expand on wicked problems being formulated within a complex contextual environment with a variety of stakeholder and values involved but do not list these as characteristics.

Rittel & Webber’s (1973) definition of wicked problems includes 10 characteristics (pp.161-166):

1. There is no definitive formulation of a wicked problem.
2. Wicked problems have no stopping rule. The planner terminates work on a wicked problem, not for reasons inherent in the "logic" of the problem. He [*sic*] stops for

considerations that are external to the problem: he runs out of time, or money, or patience.

3. Solutions to wicked problems are not true-or-false, but good-or-bad.
4. There is no immediate and no ultimate test of a solution to a wicked problem.
5. Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial-and-error, every attempt counts significantly.
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the [*sic]* plan.
7. Every wicked problem is essentially unique.
8. Every wicked problem can be considered to be a symptom of another problem.
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.
10. The planner has no right to be wrong (Rittel & Webber, 1973).

Although the term “wicked” problems have been widely used in the literature, there is no concrete definition and many problems are being identified as wicked on a general understanding of meeting some or most of its criteria outlined by Rittel & Webber (1973). The characteristics as well as the concept are not definitive and have been debated in the literature (Peters, 2017). Furthermore, the concept has evolved with authors expanding on the characteristics and the term, e.g., super wicked problems (Levin, Cashore, Bernstein, & Auld, 2012). The concept’s usefulness is in its general categorization of a very difficult type of problem that can have a few or many of the characteristics identified. The characteristics have been very useful in a discussion of examining the growing number of current complex issues society faces and highlighting the lack of traction on alleviating these problems. These characteristics have assisted practitioners and academics to more clearly understand the parameters of certain difficult problems and the ways in which they can be addressed or resolved. Due to the debate around the term, the moral connotation of the term, and its faddish use, another term has been used to describe these problems in this dissertation. The context of complexity and complex systems have partially given birth to this concept and as such these “type” of problems have been

termed as complex problems which can be noted as urgent or not urgent. There is a literature on both complexity and complex systems. These will be discussed along with evolution of the term wicked problems in Chapter 2.

For a further explanation of specific terms used in this document there is a review in the glossary at the front. Although this is not an exhaustive list, it attempts to review those terms that may be confusing or that are of particular focus for this dissertation. These terms will be important to appreciate the research question for this dissertation.

The research question.

The research question for this dissertation is: How are foresight practices used to address complex problems and how can dialogue-based foresight assist society to alleviate complex problems and their effects in the Canadian context? How foresight is performed, how the practice attempts to address complex problems and how foresight can provide value has been addressed to some extent in the literature. However, publicly available studies as to how foresight has been generally used for Canadian complex problems, and comparative assessments of dialogue-based foresight projects applied in Canada and contextualized within the progress of addressing specific complex problems are limited. The dissertation research question fills this gap in the literature. Furthermore, the purpose of this study builds on the identified gap by addressing how dialogue-based foresight can help societies beyond Canada to alleviate complex problems and their effects. This research question thus benefits both foresight and complex problem communities in Canada and outside of Canada.

A PhD dissertation by Soroka (2016) and a review by Calof and Smith (2012) address these topics to some extent. In demonstrating foresight impacts policy, Calof and Smith (2012) provide a table summarizing 14 case studies explored in a special issue, four of these are Canadian. The case studies, from across four continents, are drawn from a rigorous review of submissions based on the experience of foresight professionals. The issue concludes with a delineation of helpful factors that may lead to future oriented technology assessment activities having an impact on decision-making (Calof et al., 2012). Soroka (2016) conducts a comparative case analysis of two Canadian foresight projects which were completed approximately five years

prior to the dissertation, developing a sustainable Canadian health system and adapting agriculture to climate change. The research question focuses on the impact of the projects on decision-making and sustainability. Findings include: achieving action and change are difficult, crisis and strategic endeavors help drive change, people need to desire change, foresight enables social learning and adaptive capacity, diverse participants add significant value to the process, strategy development and action are important, findings need to be meaningful for decision-makers, and a transformational leader facilitates implementation.

Work related to this dissertation includes seeking perspectives of members of the foresight community, addressing the importance of dialogue in foresight, advocating for/identifying the use of foresight for complex problems and humanity's crisis, conducting a comparative assessment of foresight case studies, and documenting the status or history of national foresight practices/programmes (Karuri-Sebina & Rosenzweig, 2012; Kuah, 2013; Li, Chen, & Kou, 2017; Lohr, Hallensleben, & Beyer-Kutzner, 2013; Miller, 2017; Raphael Popper, Georghiou, Keenan, & Miles, 2010; M. Ramos, 2004; van der Meulen, de Wilt, & Rutten, 2003; Yoda, 2011). The interplay of these various areas is highlighted in this dissertation to provide a contextualized multi-perspective analysis of practice and theory. Typically, a few of the above are included in a particular publication but an in-depth study of their broad relationships has not been completed. The only in-depth examination of the foresight field and practice in Canada is the work completed by Thompson (1992) on the development of foresight from 1960s to 1990s.

Literature on foresight perspectives (R. Johnston, 2011; Rijkens Klomp & Van Der Duin, 2014; Yoda, 2011) and dialogue processes (Borch, Dingli, & Jorgensen, 2013; Lohr et al., 2013; Sharpe, Hodgson, Leicester, Lyon, & Fazey, 2016) are not common. There is, however, increasing attention to the use of foresight for complex problems in a variety of disciplines and within foresight (Bengston, 2013; Bezold, 2017; Boston, 2017; Conteh, 2014; Destatte, 2010; Könnölä et al., 2011; Slaughter, 2010; van Dorsser, Walker, Taneja, & Marchau, 2018; Wiebe et al., 2018; Young, 2017). In addition, a variety of comparative foresight cases studies have been completed, such as in examining the value of foresight for innovation management or for the food industry (Adegbile, Sarpong, & Meissner, 2017; Bourgeois, 2014; Inayatullah, 2015b;

Oteros-Rozas et al., 2015; Rohrbeck, 2012) Due to the diversity in the literature, more comparative case studies would strengthen findings.

There are several ways in which to assess foresight, e.g., as a craft, art and/or science and per activity. Further criteria for assessment can include effectiveness, efficiency and collaboration. Foresight can be considered *effective* if benefits are achieved, goals are realized, and/or overall outcome is improved; *efficient*, if the resources are used wisely to obtain the best results; and *collaboration*, if cooperation is prominent while inclusive stakeholder participation and engagement are attained. Ultimately, the dissertation addresses the research question by scrutinizing the appreciation of the foresight community, the practice, the use of dialogue-based foresight to address real-world complex problems and placing the assessment of foresight and dialogue-based foresight in the context of efforts underway to work with complex problems. It is important to strengthen the finding in the existing literature that foresight has incremental wide-ranging benefits and that this also applies to the Canadian context and with society's complex problems. However, it is more important to identify whether dialogue-based foresight can contribute specifically to alleviating society's complex problems, how it can do so, whether this contribution can be increased, and if so, in what ways. It is to the latter questions that this dissertation is particularly engaged.

This dissertation research develops insights into how dialogue-based foresight can contribute to society's efforts in alleviating complex problems and the problem's consequences through the following:

- transdisciplinary practice and information;
- multiple perspectives;
- understanding of the Canadian foresight community and foresight practices directed at complex problems;
- understanding of communities addressing specific complex problems and the communities' associated activities;

- knowledge and assessment of dialogue-based foresight applied to addressing specific complex problems;
- literature and perspectives on various approaches and efforts utilized in working with complex problems;
- literature on current transformative foresight approaches, improving foresight in general and related information and technologies; and
- stakeholder and expert input.

This unique contextualized approach to answering the research question allows for breadth and depth in the findings as well as a rigorous and robust dissertation. Furthermore, the dissertation is able to provide descriptive and exploratory information.

As this dissertation is comprehensive and the subject matter at times complicated, it is deliberately written so the reader can read sections or chapters independently of each other rather than the entire document at once. Furthermore, notes are added on occasion to recognize alternatives in approaching elements of this dissertation. For example, other ways in which to describe context within the literature review are offered.

Sub-research questions answered through research process.

In order to answer the research question a number of studies are performed in conducting research and a range of sub-questions are touched upon or answered. These sub-questions include:

- How can the foresight and complex problem communities be described?
- What is being done to address specific complex problems? What are the broad issues impeding/advancing management of specific complex problems?
- How can dialogue-based foresight for complex problems be assessed at an aggregate level in the context of specific cases of managing complex problems in Canada? What role has foresight played? What insights can this research provide?
- How and to what extent are policy actors and other stakeholders impacted by foresight projects? How do these impacts affect complex problems? Can more be done to maximize outputs and/or translate these impacts into improved outcomes?

- Can dialogue-based foresight approaches create more effective, efficient and/or collaborative ways to address complex and/or urgent complex problems than traditional problem-solving approaches? How? In which contexts? Under which conditions? To what extent?
- Is there a difference in the way urgent complex problems and non-urgent complex problems are addressed? Is a difference warranted?
- Can lessons from the practice and application of current transdisciplinary literature and supporting tools be used to strengthen elements of foresight? How?
    - In-depth review for above questions includes, where appropriate and possible: *How? In what ways? To what extent? Is one change more significant than another? Does it matter? Through what type of mechanisms?*

It is important to keep these sub-questions in mind as they are raised again in the context of the dissertation findings and conclusions. While not the primary direct focus of the research they point to important themes and trends demanding attention and future action. The next section in this introductory chapter identifies assumptions and parameters for the dissertation.

Project assumptions and parameters.

This portion of the chapter is broken into the scope of the study, guiding principles, what is not covered in this study and assumptions about complex problems. Neither these portions nor the numbered items within them are placed in any particular order of importance.

Scope of study.

- *Foresight is used because of general reference to range of foresight methods - not only scenario planning or futures*

Futures and scenario planning are two of the terms similar to foresight that have been used to describe this area of study. Although different definitions are used for foresight, it is the most accurate word describing the area under investigation in this dissertation and provides for reference to a broader range of methods than scenario planning. The term foresight also seems to be more widely accepted by the community of practitioners.

- *Focus on dialogue-based foresight approach*

Foresight is a promising practice that fits well with addressing complex problems. For instance, the practice involves a range of approaches and methods adaptable to the uniqueness of complex problems. Approaches can be strengthened by their ability to engage various mixed methods. This is especially important in facilitating a collaborative people-centred approach. Due to the scope of this dissertation focus is on one general type of approach.

A type has been chosen because foresight has many different types and dialogue is both essential in addressing complex problems and in reflecting a democratic process. However, there is likely to be some ambiguity around referral to dialogue-based foresight as it is not a widely referred to type of foresight and is very closely related to foresight in general. Some individuals may appreciate the term as identical to foresight because dialogue can be considered as a natural part of foresight (Borch, 2013). In addition, the literature rarely distinguishes foresight from dialogue-based foresight. When it does it reveals the positive contribution of dialogue (De Smedt, 2013; Groff, 2013; Kristóf, 2013; Lohr et al., 2013; Meredith, Rosell, & Davis, 2016; Saritas, Pace, & Stalpers, 2013; Sharpe et al., 2016; Wiebe et al., 2018).

However, this dissertation argues several foresight projects have not necessarily focused on a truly dialogue-based process or process outputs in general. For instance, other tools, such as computer-based modelling, one-on-one structured interviews, and individual-based intelligence gathering or scenario development have been used to implement foresight process elements. Participation may exist but has in some cases been limited to a select few individuals who may be only internal staff and experts. This may be appropriate for a few projects, for example with limited resources or confidential material. Yet, a truly dialogue-based foresight that enables honest and open engagement of a broader group of diverse stakeholders is a very important type of foresight. Although it involves additional resources, skill and effort, it provides significant benefits for working with complex problems, as will be apparent in the findings of this dissertation. Thus, it is critical that the importance of dialogue is emphasized and delineated as a significant element of a foresight process. Furthermore, with the rapid development of various information and communication

technologies a true dialogue-based foresight process will need to be distinguished and compared to evolving forms of participation.

- *Focus on foresight for the long-term well-being of humanity*

Foresight has been applied to many topics and areas, such as business and organizations. It is resource intensive and most appropriately used for complex problems rather than simple problems. This dissertation focuses on the application of foresight to complex problems as they relate at minimum to directly sustaining and preferably directly increasing the long-term well-being of humanity. This understandably does not provide a definitive list of problems, since second or third order consequences are not often known and complex problems, as well as complex systems, are interrelated. However, it does offer a general type of complex problem that is being addressed. With this context, these types of complex problems can also be referred to as public sector, societal or society's problems. In this dissertation the term complex problem will continue to be mostly used for simplicity.

- *Elements of this document are a work in progress.*

Following the last principle, the work in this dissertation is continual in a sense that this is the beginning of a learning and evolving dissertation process based on a dynamic living system. The paradigm and conceptual frameworks continue to evolve as the dissertation proceeds and beyond the dissertation, even if the document itself is considered finished. Furthermore, society worldwide continues to address wicked problems and engage in a dynamic process of transformation indefinitely. Canada has relevance not only to complex problems and foresight in that country but also to global complex problems and global foresight mechanisms and practices. This dissertation addresses Canadian complex problems which are also challenges on a global and local scale. The national, global and local scales interrelate on an ongoing basis. Thus, insights at one level translate to other levels to some degree and work to address complex problems needs to consider this relationship. The snapshot approach of the dissertation is valuable because it can point to key "in-time" lessons, but the backdrop of research emergence should not be forgotten or dismissed.

Several guiding principles form the basis for the development of this dissertation.

- *People, their relationships and interactions*

People are the focal point for addressing complex problems as well as for foresight projects. Their engagement in dealing with complex problems is critical. Their relationships and interactions are also essential components of global transformation and understanding human behaviour. They are also significant factors in complex adaptive systems and critical to a successful process within these systems (Gunderson & Holling, 2002). The primacy of people is conveyed through/in the dissertation by: formulating the research question to ask how dialogue-based foresight can assist society, concentrating on people in the literature review, and selecting research methods that collect data directly from people on their views.

- *A multi-perspective study to establish rigour and for working with complex problems*

There are many different "lenses" from which to view global society and difficult issues and how to address these issues; there is no one best way. Openness, acceptance and innovation are critical to understanding and addressing difficult issues as well as transforming a diverse global society in a peaceful and collective manner. Moreover, using different lenses respects the basic values and dignity of individuals; such as freedom, ethics and trust. Rigour can be enhanced by triangulation of data and methods and multiple perspectives in addressing the research question. The dissertation has thus deliberately pursued a multi-methods approach to answering the research question.

- *An integrated, holistic, transdisciplinary study*

Transdisciplinarity is an important strategy for dealing with complex problems (Brown et al., 2010). A range of basic concepts and knowledge found in various disciplines is used in this dissertation, such as: social theory, transformation theory, change theories, social transformation theories, complex systems theory, risk theory, transdisciplinarity strategies, and natural laws. In addition, information from a wide-ranging literature is utilized related to: e.g., health and well-being, public policy, organizational studies, business, ecological sustainability and international development. A literature review or detailed outline of all the underlying materials drawn upon is not within the scope of this dissertation. Needless to say, key concepts and assumptions are highlighted below and relevant materials are reflected upon in different ways throughout the dissertation.

Comprehensive and integrated approaches are necessary to understand and address complex problems. Although difficult to utilize and not as well developed as reductionist methods,

these approaches are becoming necessary in understanding complex phenomena. For example, transdisciplinary research, ecology and complexity theory examine the comprehensive nature of issues and interactions more so than focusing in-depth on single elements. The sacrifice needs to be depth for breadth; while not attempting to cover everything and as such saying nothing.

- *Context, and thus complexity*

Context is very important as an explanatory variable (Pollitt, 2013; Trist & Bamforth, 1951). Its importance has been recognized in a range of disciplines and domains, for instance, sciences, humanities, action research and organizational studies. An example is general systems theory; cofounded by Ludwig von Bertalanffy, Kenneth Boulding and others. The theory ushered in a new way of thinking related to systems and this led to, for example, theories on organizations needing to consider the contextual environment in which they operate in order to survive (Kast & Rosenzweig, 1970; Miles, 1980; Thompson, 1967). Context has also been praised in other scientific endeavours as Gary Johns (2001) illustrates in his argument for more context to be provided in scientific publications (Johns, 2001). As such, context and complexity are given significant attention in this dissertation. For instance, the literature review, the research design, case study descriptions, and examination of efforts directed at complex problems, provide context in this research.

What is not covered in this dissertation.

There are several limits to what this dissertation can examine within its scope of study.

- *Not all tools/supporting tools for complex problems and foresight will be examined*

For example, there are a large number of tools/supporting tools that are being used to address complex problems and for foresight. It is not within the scope of this dissertation to examine all of them. During the research process, tools and supporting tools are identified and, as appropriate, examined.

- *Not detailed cost/benefit analysis*

Providing a detailed cost/benefit analysis for foresight projects is not within the scope of this dissertation and will not be provided. General insights into this area will be provided as data is available.

- *Not detailed rigorous evaluation but general concepts from evaluation and impact assessment still valuable*

A detailed and rigorous evaluation may be a valuable endeavour in assessing the effectiveness of foresight practices, however, it is not the purpose of this dissertation to provide such an evaluation. However, insights from the literature on program evaluation and impact assessment will be utilized for this study. These are emerging fields that are important in identifying and improving the value of actions taken in the policy process and in addressing complex problems.

Assumptions regarding complex problems.

Complex problems are a very broad global topic with some ambiguity around the term, as discussed previously. Thus, the dissertation builds on several assumptions regarding complex problems as outlined in this section.

- *Alleviating complex problems and their negative impacts is fundamental to minimize human suffering, increasing well-being in societies, and ultimately ensuring the survival of humanity as a whole. Thus, improving societal wellness or well-being are key goals for anticipating and working with complex problems.*

Wellness or well-being has been defined in several ways, e.g., a dictionary defines well-being as "the state of being healthy, happy, or prosperous" ("Definitions of Health," n.d.). Health and societal health needs are defined by the Royal College of Physicians and Surgeons in Canada, which is similar to the definition used by the World Health Organization, as "a state of complete physical, cognitive, emotional, social and spiritual wellbeing" (Royal College of Physicians and Surgeons of Canada, 2012, p. 3). Wellness, as defined by the World Health Organization, uses almost identical components (B. J. Smith, Tang, & Nutbeam, 2006). Furthermore, greater recognition is being placed on the importance of natural systems to human well-being, for instance, "planetary health is the health of human civilisation and the state of the natural systems on which it depends" (Buse et al., 2018; Whitmee et al., 2015, p. 1978). Although specific definitions vary and different dimensions are used, it can be noted that well-being or wellness is associated with values of health, happiness and the attainment of a high quality of life which depend on a number of factors

including the overall health of the planet. Both well-being and wellness will be used interchangeably in this document.

Well-being is of primary importance for various levels of society. Conducting a basic keyword search of an academic database such as Academic Search Complete reveals that over one million materials have been published using the terms wellness, well-being or wellbeing, and of this amount over 90% were published in the last 20 years. A search for similar keywords such as health would likely yield much higher results over the past centuries. The importance of wellness in society spans cultures, time periods, and definitions of basic human needs, such as identified by Maslow's hierarchy. Progress in society is also becoming more directly associated with well-being. However, similar to the varying definitions, the path to achieve progress and well-being is still being debated (Brinkman & Brinkman, 2011; D'Acci, 2011; Dervis & Klugman, 2011). The dissertation highlights the importance of interim and ultimate well-being in the goals of applying foresight to complex problems.

- *Complex problems can be improved upon or potentially solved and foresight can assist in this process.*

There is some disagreement in the literature as to whether complex problems can be potentially solved, alleviated or only coped with. It is the premise of this dissertation that complex problems can be broadly defined, measured and thus alleviated, as has been the target of the United Nation's Millennium Development Goals. The problems can also be potentially solved, however, this is a monumental task and not necessarily the best strategy for all complex problems, especially if the cost is too high. For instance, regulations and other punitive instruments could be taken to enforce environmental protection but consequences of this may result in significant damage to an economy, by affecting the performance of business sectors, and enraging or at least alienating citizens. Alternatively, a significant amount of funds and attention could be directed towards eliminating a problem, such as homelessness, but this narrow focus would draw substantial funds and attention away from other equally important complex problems potentially resulting in an overall loss for the society. Furthermore, governments taking on the political motive to "solve" a complex problem can form an obsession that is not worth the tremendous effort as it often results in

incomplete attempts due to limits in the capacity of policy and administration (APSC, 2018; Daviter, 2017).

- *Complex problems exist at different levels of severity and need different approaches to address them, depending on their level*

Rittel & Webber (Rittel & Webber, 1973) identified complex problems and their characteristics as different compared to tame problems. Levin et al. (2012) have identified urgency of addressing the problem as a characteristic. This dissertation examines both urgent and non-urgent complex problems. These authors as well as many others have suggested there are different ways in which these types of problems need to be addressed based on their characteristics. Also, the next chapter "Complex Situations and Complex Problems: A Literature Review" elaborates on this topic.

- *Collaboration and engagement are important to addressing complex problems within democratic societies*

Democracy is briefly defined as "government by the people" ("democracy," n.d.). Engagement and collaboration in governance, such as informed voting within the electoral process and being active in the political process, are important elements in maintaining a democracy. Elinor Ostrom, the Nobel prize winner and economist, is only one of the many proponents of collaboration (Ostrom, 2000). Her work has provided scientific evidence of the general benefits of collaboration and advantages in specifically addressing complex problems such as the "tragedy of the commons" through collaboration. Further, complex problems require the involvement of a diverse group of individuals in order to foster innovation and understanding of various viewpoints.

- *Some degree of planning, assessment, collaboration, and management of activities directed at complex problems is required*

Within a short time period and a complex environment, some degree of planning, assessment, collaboration and management of activities towards global progress is important in order to achieve a desired transformation while maintaining a relatively high quality of life. Although complex adaptive systems involve emergence, ambiguity and unpredictable outcomes, guidelines, assessments and actions are still important. For example, the ongoing operation of large countries, multinational corporations, and mega projects is also occurring within a

complex environment. Success occurs due to the use of assessments, plans and guided actions to maintain the organization on the verge of chaos rather than succumb to it. Meanwhile, collaboration is essential to work in a limited physical conflict environment and to build on the much needed resources of all parties involved. In fact, understanding the views of others, engaging members of society, using different lenses for analysis, and examining the multiple influences affecting issues are all critical to finding new and appropriate solutions (Cabrera, D., Colosi, L., & Lobdell, C., 2008; Gunderson, Holling, & Light, 1995; Romme & Van Witteloostuijn, 1999).

- *Understanding and description of the "complex problem community" and the "foresight community" is important to advancing these areas of study.*

The study of complex problems and foresight are still emerging and, thus, understanding the communities engaged in these areas and describing these communities provides insights into their practices and development. For example, limitations in human professional capacity may identify weaknesses in foresight education. There may be shortages in supply of or lack of demand for foresight professionals.

- *Assessing the current state of complex problems and foresight's role, as well as the overall results of activities directed towards them are important. Mutual and continued awareness among interested stakeholders of this status is important.*

Assessing status and overall results of activities in complex problems and foresight provides information on whether or how these areas may be advanced. Status includes the perception of stakeholders, impact on the communities affected, future risks to society due to the problem, definition of the problem and related activity and how as well as why the problem is changing over time. If stakeholders are aware of status they are better able to strengthen the practice as appropriate and desired, while anticipating the future.

- *Dissertations need to be rigorous to be of high quality and acceptable to a diverse array of individuals working in relation to complex problems and/or foresight.*

Finally, this dissertation process needs to be rigorous, and as such checkpoints and triangulation are two of the factors included throughout the work (Campbell, Cook, & Shadish, 2002; Greene, 1990). Rigour is important to the foresight academic and practice communities, as over time there have been a significant number of individuals involved in

both areas who do not comprehend the complexities involved in either foresight or the addressing of complex problems or both. These individuals may have negatively impacted both the public and past foresight client's impressions to the detriment of advancing these fields.

Overall, these areas all contribute important dimensions pertaining to foresight and its ability to address complex problems but they are not covered in the dissertation per se because of the need to proscribe limits to any given research task.

Overview of research approach.

Within a qualitative empirical research paradigm, this study uses a comparative case study approach for an emergent research design. The following methods are used to collect data on the Canadian foresight community and foresight practices: survey, semi-structured interviews and document analysis. The independent variable under study is dialogue-based foresight within the Canadian context. The dependent variables are people, change factors, complex problems and the context in which the foresight projects being assessed take place. Research begins with a scan of the foresight community and then delves into exploring the case studies. Four problem areas and one foresight project per area of which three projects have been delivered within approximately the last ten years, are defined once the foresight community scan is complete and then confirmed as the study progresses. Data is collected in aggregate sets. A multi-perspective assessment of the cases is conducted as well as thematic, pattern-matching, time series and contribution analysis. Next, initial insights are prepared and vetted with experts. The advice of a transdisciplinary supervisory committee, foresight experts and problem area experts inform the entire research process.

Significance of dissertation and unique contributions.

There are several novel aspects to this research. This dissertation is relatively unique, with the exception of a couple of studies, in that it focuses on complex societal problems and foresight's potential role in alleviating them as well as their negative effects. Furthermore, dialogue-based foresight has been delineated and studied as a type of foresight. This is a novel approach. Finally, using a holistic contextualized approach and a multi-case comparative

analysis on Canadian cases are all relatively unique factors. Together these novel aspects point to innovative research; a combination of transdisciplinary, integrated, multi-perspective and context rich cases to understand dialogue-based foresight for complex problems and derive specific targeted insights.

To present the significance of this study, it is helpful to further elaborate upon the objectives of this dissertation based on the research question outlined earlier in this chapter. The first part of the research question refers to how foresight is being used in Canada to address complex problems. To respond to this question this dissertation takes a close look at the foresight community and foresight projects. This is significant because there is limited available information on this topic and more so because it provides a context to appreciating the practice of foresight within Canada. This also allows for identifying current and historical barriers to the practice as well as successes in terms of efforts expended on research, advancing the field and projects completed.

Another point of significance is the way in which this dissertation has been carried out. To provide a fuller understanding of foresight, building on the first objective, and deliver a rigorous and robust dissertation a unique approach examining the interplay of foresight with various elements has been used to understand foresight in Canada. Multiple perspectives and transdisciplinary views as well as mixed methods have been used to consult documents and professionals', experts', and participants' views. The empirical data has been aggregated to provide a stronger appreciation of foresight and specifically how it addresses complex problems. In addition, through these methods this dissertation is able to advance foresight literacy and solidly determine if dialogue-based foresight, as well as foresight more generally, are tools to use to alleviate complex problems and in what manner they should be applied.

The third point of research significance concerns the objective to assess and determine the value of dialogue-based foresight and whether it has the capacity to contribute to society's efforts in alleviating complex problems and their effects. Alleviating complex problems and their effects are critical. Dialogue-based foresight is also an important practice and examining the application of dialogue-based foresight to complex problems could be very important to make

progress in this area, as indicated by several authors. Foresight has been explored in the literature in terms of its value and inherent role in working with societal issues and long-term societal well-being. Specific cases have been also reviewed (Destatte, 2010; Hebinck, Vervoort, Hebinck, Rutting, & Galli, 2018; Kahane, 2002; Jose Ramos, 2011; Riedy, 2009; Slaughter, 2010, 2013). However, significant work remains in empirically assessing and delineating specific foresight elements and strengths in working with complex challenges. In addition, conducting this empirical work while understanding foresight in the context of working with complexity, to some extent, and appreciating foresight through a holistic and contextual view are vital in determining its potential contribution to a complex systems application. A systematic and comprehensive approach is taken in this dissertation to provide a unique and valuable contribution by empirically analyzing dialogue-based foresight as a contribution to alleviating complex problems and their impacts.

Expanding upon the third point, clarifying dialogue-based foresight's role in terms of alleviating complex problems in terms of the context of efforts underway in this area is in itself considered a fourth consequential endeavor. The appreciation of the milieu of activities undertaken is important to place dialogue-based foresight in a role(s) that complements or strengthens current work on complex problems, while taking into consideration barriers. This focus on analyzing foresight's significance and potential contribution by way of placing foresight among the literature and activities related to addressing complex problems is uncommon. Yet, if the findings on the value and potential capacity of dialogue-based foresight to assist society in the current context of efforts being undertaken towards ameliorating complex problems are delineated, the implication becomes how to advance the practice and its acceptance into the mainstream as well as advance its application to complex problems. If, however the findings do not support the use of dialogue-based foresight for complex problems, for example, barriers are insurmountable and other fields provide similar benefits, it is important to note this and spend resources elsewhere.

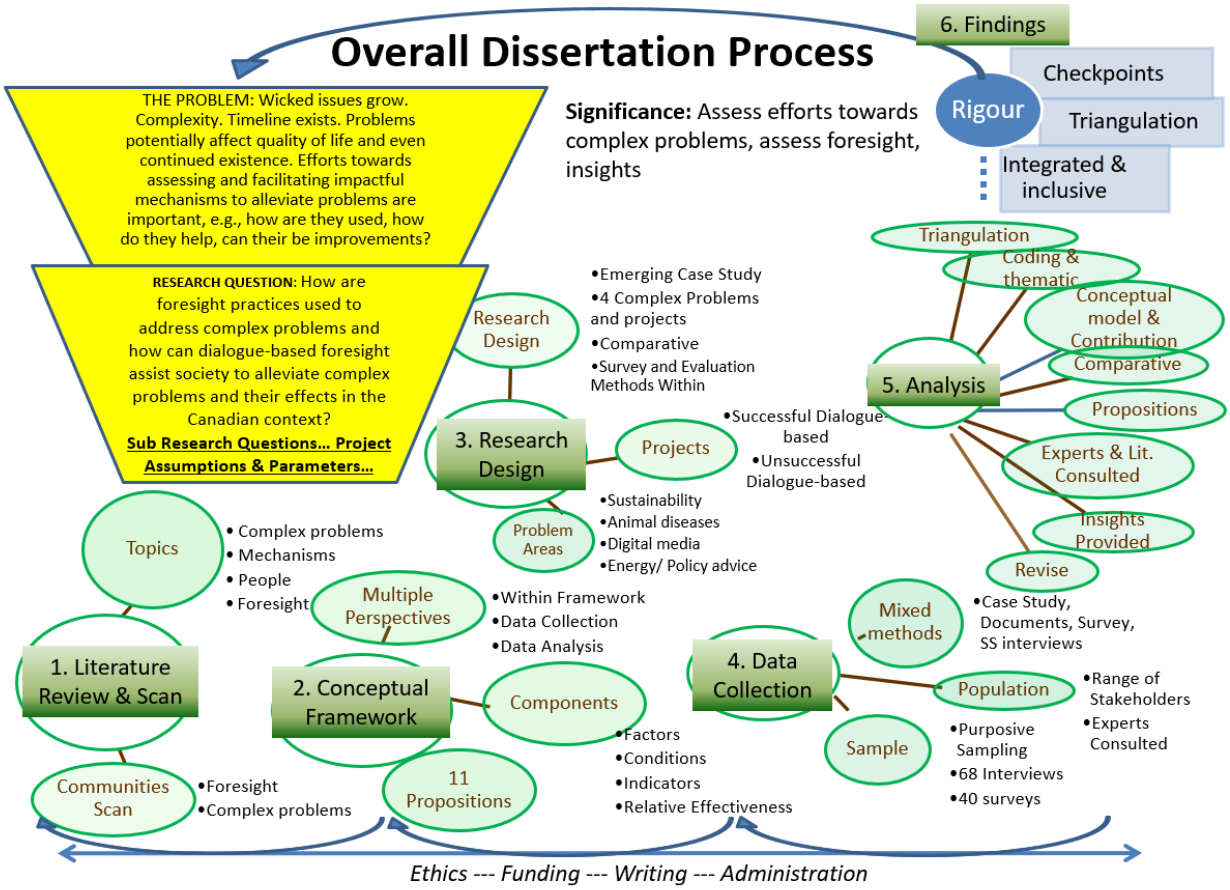
Such a highly contextualized dissertation has only partial generalizability to other countries because case studies have limited generalizability and countries vary in terms of their context and application of foresight (Meissner, 2013). Since this research is examining aggregate

factors there may be increased generalizability. Furthermore, the evolution of foresight, the practice and status of foresight, motivation of foresight use, and language around foresight in many countries are similar. This is evidenced by general literature on foresight and its use in different countries and regions (Dreyer & Stang, 2013; Georghiou, Keenan, Miles, Popper, & Cassingena Harper, 2008; Habegger, 2010; R. Johnston, 2012; Kuosa, 2012; Meissner et al., 2013; Rafael Popper & Directorate General for Research, 2009). Additional evidence can be drawn from multiple case studies completed by several authors (Borch, 2013; Bourgeois, 2014; Georghiou, 2003; R. Johnston, 2012). This dissertation is likely to be more applicable to liberal democratic nations because of the similarity in system and emphasis on democratic processes and benefits.

Summary.

A conceptual diagram is presented to summarize the major steps and key points of this work (Figure 1). The purpose of this visual is to aid the understanding of a complex process by depicting it in one picture. The problem and research question begin the process. The dissertation proceeds through an emergent design in which the first step partially informs the following steps, especially the next step, and the second step then provides enough further information to move forward to the third step and so on. The information builds on each other throughout the process. These steps, however, are not entirely linear as some reiteration can occur.

Figure 1. Overall dissertation process



Chapter 2: Complex Situations and Complex Problems: A Literature Review

This chapter provides a literature review for this dissertation. The review provides information related to the broader factors in this study, i.e., complex problems, their contextual parameters, and understanding people. Inherently these topics are general and extensive in scope. The purpose of this review is to present information on these topics that is relevant to the research and extract information that will be useful in the development of a conceptual framework for the research and in the research design. Types of complex problems are presented, the overall Canadian context of complex problems is reviewed, ways in which complex problems are being addressed is offered, and the understanding people section closes out the chapter.

Information is presented on types of complex problems, their context and what is being done to address these problems. Complex problems can be grouped under various categories, e.g., type and size of system effected. The context of complex problems is important in grouping, understanding and managing these problems. As such, the Canadian context is examined below through a STEEP format (Social, Technology, Ecology, Economy and Politics) that includes a brief overview of the current state of key societal dimensions in Canada.

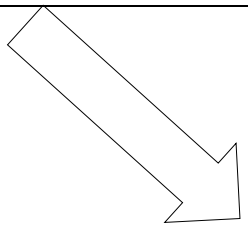
There are other ways in which context can be presented but STEEP has been chosen as a commonly used tool in foresight practice, marketing and strategic planning. STEEP has various formats depending on which groups of external factors are included; one of the more common ones is PEST. STEEP is a structure used to organize developments in the macro external environment and analyze their future impact on a product, initiative or organization. SWOT analysis is a tool that is often used to build on the work completed in STEEP or PEST. In this document the STEEP format is used but the additional detail from the analysis that assesses the dimensions according to the topic is beyond what is needed for the purposes of presenting key trends and issues in the Canadian environment. Finally, following STEEP, this section addresses how Canada is and theoretically should be, based on literature, addressing these problems.

Complex problems.

Head and Alford (2008) adapt a typology of wicked problems according to complexity levels and degrees of stakeholder diversity. This work, based on Heifetz's situational types of

problems (Heifetz, 1994), helps to differentiate the wicked, many of the "typical" policy problems, from very wicked problems (Table 1). Heifetz identifies Type 1 problems as tame and most of Type 2 and all of Type 3 as wicked. These very wicked problems, especially, are nearly impossible to solve, yet they exact a high toll on humanity and in some situations they threaten the very existence of human life or at least the life to which many individuals are accustomed. Thus, due to the problems' potential effects and specific characteristics, as outlined below, they require special consideration. Very wicked problems have also been referred to as super wicked problems reflecting the intensity and scope of the problems (Head & Alford, 2008).

Table 1. Typology of problems

Diversity → **Complexity ↓**	**Single party**	**Multiple parties, each having only some of the relevant knowledge**	**Multiple parties, conflicting in values/interests**
Both problems and solutions known (Heifetz Type 1)	Tame problem		
Problem known, solutions not known (relationship between cause and effect unclear) (Heifetz Type 2)			Wicked problem
Neither problem nor solution known (Heifetz Type 3)		Wicked problem	Very wicked problem

(Head & Alford, 2008, p. 10)

Other authors also describe types of wicked problems. Levin et al. (2012) define super wicked problems using four main features (p. 1):

- time is running out;
- those who cause the problem also seek to provide a solution;
- the central authority needed to address it is weak or non-existent; and,
- partly as a result, policy responses discount the future irrationally.

These four features combine to create a policy-making ‘‘tragedy’’ where traditional analytical techniques are ill equipped to identify solutions, even when it is well recognized that

actions must take place soon to avoid catastrophic future impacts (Levin et al., 2012, p. 1). Horn and Weber (2007) who further delineate wickedness as per defining characteristics of "social messes" provide another perspective (pp. 6-7). The defining characteristics of a social mess are:

1. No unique "correct" view of the problem;
2. Different views of the problem and contradictory solutions;
3. Most problems are connected to other problems;
4. Data are often uncertain or missing;
5. Multiple value conflicts;
6. Ideological and cultural constraints;
7. Political constraints;
8. Economic constraints;
9. Often a-logical or illogical or multi-valued thinking;
10. Numerous possible intervention points;
11. Consequences difficult to imagine;
12. Considerable uncertainty, ambiguity;
13. Great resistance to change; and,
14. Problem solver(s) out of contact with the problems and potential solutions.

The definition used in this dissertation for urgent complex problems is formulated by the researcher to be problems which meet the conditions of both Horn and Weber's definition of social messes and Levin et al's definition of super wicked problems as per having a strong urgency to be addressed due to the potentially devastating consequences for human well-being. They are not mutually exclusive, and both place the focus on urgency and potential consequences of the problem for well-being. Literature on how to address complex problems is mostly diverse and siloed, e.g., per problem area, elements of problems, tools, and approaches and usually not distinguished between types of wicked problems.

Context of Canadian society through STEEP format.

This Social, Technology, Ecology, Economy and Politics (STEEP) analysis explores five dimensions of Canadian society. Within the social category the concepts of globalization, societal progress and complexity are also described. As a general overview, a short description of

issues and trends will be provided in each area as well as a list with a few statistics. The information provided in all areas will then be related to this study.

Social.

The social dimension includes factors such as demographics, education, health, security and connectivity as well as more general concepts including globalization, societal progress and complexity. Each of the general concepts will be addressed separately as global concepts that are important to present on their own. Overall, some of the key social trends and potential concerns in Canadian society include aging of the population, increasing obesity rates, increased concerns for personal security, longer wait times for health procedures, state of Canadian children, the opioid crisis, loneliness, poverty and inequality levels, and personal/leisure time.

Seniors (above 65 years) will likely increase in number from 15.3% to 23.8-27.8% of the Canadian population in 2063 (Bohnert, Chagnon, & Dion, 2014). Nearly one in four individuals in the labour force is predicted to be over 55 years old by 2021. The labour force will potentially be 22.5 million people by 2031 (Statistics Canada, 2011). The mandatory retirement age is 67 and life expectancy at birth is 81.67. The Canadian population, which is 36,708,083 as of July 2017, is growing with the help of immigration, e.g., ~273,000 immigrants came to Canada in 2016/2017 (S. C. Government of Canada, 2018). “Nearly half of Canadians say they feel less safe from terrorism than they did two years ago” (Hembrey, 2015). Wait times for priority health procedures are not improving (from approximately 2011 to 2014) regardless of significant effort to use performance measures to change these statistics (CIHI, 2014, 2015). Seeing a specialist or doctor takes the longest for Canadians over 55 years of age among 11 commonwealth countries. Canadians employed full time have less personal/leisure time than 31 other countries measured in the OECD Better Life Index (OECD, 2014). Canadian children are suffering from many health related concerns, for instance, high rates of child abuse, suicide and poverty (O’Brien Institute for Public Health, 2018).

The following list outlines a range of other statistics to help frame the social context in Canada:

- More than 8,000 deaths between January 2016 and March 2018 are attributable to opioid-related causes (Canada, 2018).

- Canada's homicide rate is 1.4 per 100,000 residents or ranked 28th place out of 36 OECD countries ("OECD Better Life Index," 2016).
- Obesity and overweight rate: 53.6% of adults in 2013 (Statistics Canada, 2014).
- "In 2010, 9% of Canadian people living in households with at least one worker experienced in-work poverty (e.g. low working hours and hourly pay among full-time workers, frequent moves between low-paid work and joblessness, etc.), while 7% of those living in households with all adult members employed were in poverty" (OECD, 2014).
- The fertility rate in 2017 is ~1.6 individuals. This places Canada 183rd among 224 countries in demographic ranking globally for population replacements (CIA, 2017).
- "In 2010, about 27% of working adults identified most days of their lives as 'quite a bit' or 'extremely' stressful. Approximately 62% of those workers indicated that work is the reason for their stress" (Statistics Canada, 2010).
- "One in five people in Canada experiences a mental health problem or illness, with a cost to the economy of well in excess of $50 billion" (Mental Health Commission of Canada, 2012).
- "In 2013, about 1 in 6 full-time Regular Force members of the Canadian Armed Forces reported symptoms of at least one of the following disorders: major depressive episode, panic disorder, post-traumatic stress disorder, generalized anxiety disorder, and alcohol abuse or dependence" (Pearson, Zamorski, & Janz, 2014).
- Loneliness is a growing public health issue with dramatic consequences for the population such as premature mortality and depression (Cacioppo & Cacioppo, 2018; "U.K. offers prescription for loneliness, no drugs involved | CTV News," n.d.).
- Canadians spent $22.3 billion on e-commerce in 2012, a rise of 10 per cent (ComScore, 2014).
- "The Canadian lifestyle requires nearly 7 global hectares of resources per person, but the planet can only support 1.7 global hectares per person" (Phillips & McKessock, 2014).

Globalization

Globalization refers to the unification and interconnection of separate nations intensified within the last few decades through significant technological advances. This force has had a huge positive and negative impact on people's lives and the societal trends prominent today, like the

financial crisis. Due to the negative effects of globalization and the anti-globalization movement there is the possibility that globalization is losing momentum. An opposing movement is attempting to strengthen and refocus societies on the local community – localization (Moore, 2014). In addition, a somewhat comparable movement is a rise in populism and nationalism. Finally, glocalization, a concept somewhat between globalization and localization, refers to adapting the global to the local context, such as McDonald's fast food outlets worldwide (Allen & Wilson, 2008; Pitchton, 2005; Robertson, 1995). This final concept may present a way in which both globalization and localization concepts can present a more favourable outcome (Jose Ramos, 2011).

Societal progress

Societal progress has been addressed in-depth by Berze (2012) and relevant material is offered below:

Several papers have delved into a conceptual discussion and definitions of various notions in relation to well-being (Giovannini, Hall, Morrone, & Ranuzzi, 2011). For example, in assessing well-being are we measuring the wealth, progress, flourishing, happiness, quality of life, life satisfaction or prosperity of the society? Each of these notions has a different origin and possibly different connotations. Furthermore, the specificity of what is being measured is substantial to the instrument of measurement. What is important to society? Is an aggregate measure more advantageous than a multiple measure?

The Genuine Progress Indicator (GPI) has been referred to as a corrected GDP, "greening the GDP" (Jackson & McBride, 2005), an alternative to GDP and another national income measure. For example, it accounts for the benefits of housework and for costs for pollution (Posner & Costanza, 2011). It has become well-known and has been measured in over 20 countries; used by scholars and non-profit groups. The Human Development Index (HDI) is an aggregate measure that combines three dimensions into a composite index: Health, measured by life expectancy; income, measured by Gross National Income; and education, measured by mean years of schooling and expected years of schooling. The basis of this index is a capabilities perspective that reflects the

opportunities that individuals can select in living their lives. Several studies have proven the importance of happiness as an indicator for well-being (Blanchflower & Oswald, 2008; Giovannini et al., 2011; Huang, 2010; Kusago, 2007; Layard, 2010; Oswald & Wu, 2010; Schimmel, 2009). For example, the Gallup World Poll has been one of the many surveys used internationally (in 122 countries worldwide) to capture information on happiness. In addition to findings that increases in income and national growth do not necessarily translate to improvements in overall welfare, there has likely been an even stronger push for welfare and overall progress indicators due to the current economic crisis, increasing drive for governmental accountability and sustainability and climate change issues. The use of macroeconomics for policy as defined around GDP measures that promote *unconditional growth* has negatively impacted the sustainability of society (Bergh, 2009; Jackson, 2009). Quality of life, inequity and sustainability concerns need to be given more consideration (OECD Publishing, 2008).

Governments have supported social welfare initiatives in the past. How might this change? Generally, trade-offs and value judgements become much more important. Better information is also available to make these decisions (De Prycker, 2010; Diener, Lucas, Schimmack, & Helliwell, 2009). For example, there are at least five areas of policy that could be affected by the use of alternative indicators: broader definition of public goods, application of instruments, consideration of externalities, cost-benefit analysis in policy design, and implementation. Public goods for example could include sustainability and thus encouraging sustainable land use becomes a public concern (Clarke & Lawn, 2008). A greater priority would be the use of policy instruments, such as taxation, to create greater income equality (Clarke & Lawn, 2008) and reduce the impact poverty has as a health determinant. How policy supports positive externalities such as those gained from volunteerism and education would now be a consideration. Evaluating how the benefits of a policy decision impact the well-being of those interacting with the groups that receive the benefit (Layard, 2006) enters the cost-benefit equation. Full cost accounting becomes critical in examining transaction costs for non-market functions (Posner & Costanza, 2011).

In addition to the numerous initiatives taken by non-profit organizations, several steps have been taken by governments towards the establishment of well-being indicators and their use for policy. One of the commonly cited efforts is the recent release of the report, initiated by Nicolas Sarkozy ([former] President of France), which has several recommendations for the further development of well-being indicators as well as useful recommendations for nations to pursue in the context of improving the well-being of their population (Stiglitz et al., 2010). In 2010, the United States government funded the development of a new Key National Indicators System (Dickinson, 2011). The Office of National Statistics in the U.K. had already addressed several of the recommendations made in the Stiglitz Commission Report before the report was released and has since developed an action plan based on the Report (Thomas & Evans, 2010). Canada also measures and reports indicators of well-being (https://open.canada.ca/data/en/dataset?q=well-being+indicators). Recent growing societal concerns, such as sustainability and well-being, need to be measured in order to be addressed (Berze, 2012, pp. 8–13).

Complexity

In lay person terms complexity is defined as "the state of having many parts and being difficult to understand or find an answer to" ("complexity definition," n.d.). Complexity has more technically been defined as "a setting wherein the behaviours of those systems are described by interacting 'loops' of positive and negative feedback relationships" (Gray & Gill, 2009, p. 87). There is no one definition for complexity. Complexity science can be described as the study of a non-equilibrium state which has the following traits: interactivity, non-linearity, at the edge of chaos, with "sticky" behaviour along path dependant trajectories leading to tipping points, at which point self-organization and emergence through attractors generate global order and patterns (Gray & Gill, 2009; Johnson, 2009; Levin et al., 2012; Rogers et al., 2013; Sanderson, 2009; Stenvall & Kaivo-Oja, 2013; Westley et al., 2011). People are having to adapt to complexity as an uncertain, turbulent and rapidly changing environment. It has been increasingly difficult for organizations, people and institutions to adapt to complexity with traditional modes of functioning (Allen, 2013; Game, Meijaard, Sheil, & McDonald-Madden, 2013; Hannigan & Coffey, 2011).

Complexity has been associated with chaos theory and systems theory (Stenvall & Kaivo-Oja, 2013). Chaos theory is a mathematical theory that refers to dynamic systems with very small initial differences that lead to large differences in outcomes (also referred to as the butterfly effect) (Farazmand, 2003). General systems theory, originating with Ludwig von Bertalanffy and others, provides a basic introduction to complex adaptive systems.

The theory can be described using Ludwig von Bertalanffy's (1968) own words:

> there exist models, principles, and laws that apply to generalized systems or their subclasses, irrespective of their particular kind, the nature of their component elements, and the relations or "forces" between them. It seems legitimate to ask for a theory, not of systems of a more or less special kind, but of universal principles applying to systems in general. (p. 32)

In the 1950s Kenneth Boulding directed attention towards finding commonalities among disciplines and built on general systems theory by creating nine levels of hierarchical discourse for all sciences (Boulding, 1956). Different descriptions of systems include, for example, rational, closed, and open (W. R. Scott & Davis, 2007). Different systems have different characteristics. An open system can self-organize into a non-uniform structure through its interaction with the environment, such as an organization (Pondy & Mitroff, 1979). Since the development of general systems theory, the theory has blossomed into several areas of study, such as contingency theory, sociotechnical systems and cybernetic systems, including a scientific approach to modelling and mathematical studies in a variety of fields (W. R. Scott & Davis, 2007).

A complex adaptive system is a type of complex system and is defined as an "entity consisting of many diverse and autonomous components or parts (called agents) which are interrelated, interdependent, linked through many (dense) interconnections, and behave as a unified whole in learning from experience and in adjusting (not just reacting) to changes in the environment" ("complex adaptive system (CAS)," n.d.; Lansing, 2003). Human beings, ecosystems and artificial intelligence are all complex adaptive systems that are nested in a larger complex system, i.e., earth. Like complex systems, complex adaptive systems, for example,

experience agent change due to responding to feedback, may be emergent, are highly connected, are non-linear and benefit from high levels of variety (Kaisler & Madey, 2009). Significant work on complex adaptive systems is completed by the Santa Fe Institute (Gell-Mann, 1994).

Complexity is increasing and its increase is facilitating the challenges in working with complex problems (Kaisler & Madey, 2009). Partially so, the literature on complexity identifies several ways in which to think and act within this background: holistic non-linear thinking, practical rationality, openness, learning, communication/dialogue, values, connectivity and contextual awareness (Gray & Gill, 2009; Meek & Newell, 2005; Plant, 2009; Rogers et al., 2013; Stenvall & Kaivo-Oja, 2013). Primarily, complexity should be addressed as a new post-rationalist form of thinking. Holistic, non-linear and non-reductionist approaches are very different than the paradigm to which modern Western society has been accustomed, but are synonymous with an unpredictable emergent environment (Kuah, 2017b). As such, working within complexity is different than the traditional approaches to training, education and working with society's complex problems. The positivist or scientific paradigm is the foundation of the dominating paradigm in Western society. The desire for and importance placed on the concrete and the use of quantitative methods with clear and solvable problems takes precedence. There is little room for serendipity or emergence. Yet, it may be the consideration of, allowance and perhaps even design for open spaces and unexpected consequences that becomes critical.

John Dewey indicates practical rationality can be a useful way in the form of "experimentation in practice" under the conditions in which there is no room for trial and error (Sanderson, 2009, p. 700). Taking careful risks while respecting action and restraint are important (Rogers et al., 2013). Monitoring and both rigorous as well as flexible evaluation also need to take place to inform which actions should be pursued.

Openness in general and specifically to different ways of knowing, multiple worldviews, diversity and boundary spanning are identified as essential for a holistic approach that values the nature of such an environmental contribution to its adaptive system. Many scholars have reported that ongoing learning assists in adapting to a rapidly evolving complex environment (Mitleton-Kelly, 2011; Rogers et al., 2013). Communication and dialogue are proposed to be factors which

both enhance learning, connectivity, openness, understanding of values and innovative problem solving. Values are an important component of society and a post-rational world. Understanding the connectivity or the relationships of a system enables an improved understanding of how it functions. Finally, situational or contextual awareness provides a stronger ability to appreciate, transition and address the systems in which people live. Complexity has been the subject of many academic and professional disciplines and continues to be weighed for its practical implications.

Technology.

Trends in the technology area include digitization, new ways of communicating, robots, genetics, electric cars, green technology and information overload. Although these technological trends are present globally, Canada is a leader in at least one of these areas: in 2013 the number of web pages visited in a month (3,731) and the time each user has spent online per month (41.3 hours) (ComScore, 2014). Furthermore, two thirds of the Canadian population use social media (Faber, 2013). Digitization and information management has brought about several changes as well as issues, for instance, in how business is conducted, information stored and governments are run. Social media and digital technology have altered patterns of work, connectivity, leisure and mobility. Artificial intelligence, automation and robots all describe a significant movement towards the replacement of human activity in industrial, and increasingly service and home settings. Improvements in electric cars are just one of the advances in green technology. Gene mapping for humans and genetic modification of food and organisms have seen a momentous advancement that affects all parts of life.

Ecology.

In the 21st century ecology has received significant attention worldwide. Indicative of this consideration is the term Anthropocene has been increasingly used since 2000 to refer to the proposed current geological epoch to reflect the impact humanity has had on the planet. The term was coined by Paul Crutzen in 2000 and used a few years earlier, independently, by Eugene Stoermer. Both scientists co-authored a paper on the proposed use of this term (Zalasiewicz, Waters, Summerhayes, & Williams, 2018).

The Anthropocene reflects the environmental challenges humanity has been facing in terms of, e.g., climate change, sustainability and mass extinction. Debate has surrounded the proposal of this new epoch (Corlett, 2015; Owen, 2010). Some of these debates are on the scientific aspects of defining this epoch, while other issues surround political and philosophical factors. For example, one contentious issue has been defining the start date of this geological period which has been proposed by Crutzen as the start of the industrial revolution (Hamilton, 2015; Lewis & Maslin, 2015). Political and governance ramifications regarding to what extent and how societies need to respond to *societal progress* and the impacts humans are having on their natural environment are also being deliberated (Dryzek & Pickering, 2018; Olsson, Moore, Westley, & McCarthy, 2017; Young, 2017). Regardless, there has been increasing informal use of the term in the diverse academic and grey literature (Dryzek & Pickering, 2018; W. Steffen, Grinevald, Crutzen, & McNeill, 2011).

A formal Anthropocene working group has been set up by the International Commission on Stratigraphy to study the potential for defining a new geological period. Most of the Anthropocene Working Group find in favor of formalizing the term. As such, a proposal in this regard is being developed with the necessary scientific circumspection (Zalasiewicz et al., 2017, 2018). This takes significant effort and time, but in the meantime the use of the term is instrumental for many reasons, such as documenting scientifically the substantial influence humanity is having on the earth and attracting the attention of popular media to this realization. In addition, many scholars from a range of disciplines like health, biology, art and philosophy are placing importance on this topic (AGO, 2018; Buse et al., 2018; Corlett, 2015; Dryzek & Pickering, 2018; Reyers, Folke, Moore, Biggs, & Galaz, 2018; Will Steffen et al., 2018; Whitmee et al., 2015; Young, 2017).

Particularly in the last decade in Canada concern has especially grown in the area of climate change, freshwater management and sustainable development (Policy Horizons Canada, 2013). This concern reflects the dramatic changes underway in the current global ecology and the dire warnings of many experts. Yet, in 2014 Canada was the 37th country in terms of population size, while ranking the 11th highest in terms of leaving an ecological footprint. In addition, as of 2010 Canada is the third highest out of 17 countries in releasing greenhouse gas

emissions (Phillips & McKessock, 2014). Canada is the second largest energy, resource and carbon-intensive country in the OECD (OECD Publishing, 2017). Also, 50% of wildlife species in Canada has declined between 1970 and 2014 ("Living Planet Report Canada | WWF-Canada," 2017). However, it is interesting and disappointing to note that Canadians do not place ecology concerns at the forefront of their issues. Awareness exists of ecological problems and Canadians acknowledge their role in the system, but their actions are not necessarily reflecting that of an upcoming crisis in this area. According to the 2014 Greendex survey, out of all 18 countries surveyed, Canada has had the greatest number of the population practicing less sustainable behaviour since 2012. Furthermore, Canadians are in the top five countries to feel the least anxiety over the environment (National Geographic, 2014).

Economy.

Economics, the primary concern of Canadians today, has gone through a global crisis in 2008. The international community has not fully recovered from this crisis. Furthermore, some experts point to inherit problems with the economic system, definitions of progress, and global inequality as continuing barriers to economic advances (Jackson, 2009; Knoop, 2008; *Making globalization good*, 2003). The unemployment rate in Canada in September 2018 was approximately 6%, however, for youth ages 15-24 the rate was almost double this amount ("Canada Unemployment Rate | 1966-2018 | Data | Chart | Calendar | Forecast," 2018; "Canada Youth Unemployment Rate | 1976-2018 | Data | Chart | Calendar," 2018). Household debt is another indicator of the current economic situation with a very high credit market debt to disposable income ratio, jumping from ~111% in 2003 to ~169% September 2018 (2018). The value of the Canadian dollar has also decreased dramatically, from being on par with the US dollar in 2013 and now worth approximately 70 to 80 cents. Some of the highlights from the OECD survey for 2018 include Canada has a strong economy but concerns exist around affordable housing and homelessness, rising health care costs, and issues around supporting women, youth, immigrants and seniors (OECD Publishing, 2018), Finally, in 2015 approximately, 12% of Canadians lived with low income that can be considered as below the poverty line (Corak, 2018).

Politics.

A review of Canadian politics completes the STEEP presentation. Canada is a bilingual country (English and French) and has three levels of government: national, provincial/territorial and municipal. From 2006 to 2015 the country had been led by a conservative government which was then replaced by a liberal government. Among all OECD member countries satisfaction with the political government is high. In Canada only 68% of Canadians voted during recent elections (slightly lower than the average within 36 OECD countries) (OECD, 2017; "OECD Better Life Index," 2016). Satisfaction with the way democracy has been working has dropped among Canadians from 75% in 2004 to 71% in 2017 ("Samara's 2017 Democracy 360: The Numbers," 2018). Efforts towards democratic reform and new governance have been evolving particularly since the 1980s.

STEEP Summary.

Canada is part of a complex fast-paced global society that is also attempting to better define progress and well-being. As an affluent country it has been identified as one of the best places to live in the world. Yet, issues exist. Ecology deserves special attention because of the size of Canada's footprint and its affluent position in comparison to several other countries. Also noteworthy is surprisingly low satisfaction with governance in comparison to other OECD countries. Even though a local approach to Canadian problems is important, priorities of Canadians are issues intricately linked to the functioning of the global system. This STEEP presentation has demonstrated how systems are complex and interrelated and how context plays an important role in understanding and addressing problems within these systems. It is clearer from the review of trends and issues that several complex problems exist and Canadians perceive these problems in a certain way. Although, this is not an exhaustive review, the question is how to move forward to address these problems with the current information at hand. The next section takes a closer examination of complex problems.

Ways in which complex problems are addressed.

Ways in which complex problems are addressed depends on several factors, such as their urgency, scope, system type, and context. Urgency has been discussed at the beginning of this chapter and scope has been alluded to in terms of global complex problems and similar complex

problems in the national Canadian context in the introduction. Complex problems can also be grouped according to type of complex system in which they exist, for example, fresh water management as socio-ecological systems versus public health problems as primarily occurring in a sociological system. Furthermore, complex problems can be classified by subject, like sustainable development. Sustainability science is a new area of study that specifically attempts to address the complex problems of sustainable development in a transformative manner. Further information on this area of study is available in *Sustainability Science: A Multidisciplinary Approach* (Komiyama, 2011).

Regardless of the factors defining the complex problem the problem requires a holistic review (Kuah, 2016). It is therefore important to note that communities, provinces, organizations and groups of people can all have an important role in creating and attending to some form of a larger complex problem or a more local problem. For example, freshwater management is one urgent complex problem for all levels of society and different levels may be attending as well as contributing to different parts of the problem. Alternatively, freshwater management can be seen as a cluster of complex problems. Even if the details of the parts or clusters of the overall problem are usually unique because of their context, such as Ontario's Great Lakes, it is helpful to appreciate the holistic picture with the interrelations of the systems involved. In consideration of the importance of a holistic review, a description of context in general as it applies to Canada has been provided in the STEEP analysis above.

Complex problems are not necessarily treated differently than how difficult problems have been addressed in the past. This is one reason why it is important to distinguish between simple problems, difficult and complex problems (Patton, 2015). The simple problem can be easily worked out through traditional methods, including prioritizing, using a template, and assessing options. The difficult problem is not necessarily complex because a solution is available to the problem even if significant effort is required. Yet, traditional methods to solving difficult problems are not adequate to address complex problems (J. H. Allen, 2013; Game et al., 2013; Gray & Gill, 2009; Marien, 2011; K. H. Rogers et al., 2013; Waddock, 2012). This is apparent in the literature calling for recognition of complexity and complex problems as an important step to addressing them (Head & Alford, 2008; Rittel & Webber, 1973). Further,

methods to address complex problems are not seemingly sufficient in dealing with urgent complex problems (Kanninen, 2013; Levin et al., 2012; Jose Ramos, 2011).

Of course, complex problems are being addressed regardless. It has been the domain of the public sector to address problems of the polity. In an overly simplified and high-level explanation, there is a policy process that begins with elected officials choosing and defining the problem to work on and designing a policy to meet a goal. The bureaucrats support the officials and apply the specifically assigned instruments to implement the policy. An evaluation of the policy completes the process. In combination of the work of the politicians and bureaucrats, a complex web or networks of various members from different stakeholder groups exist in several policy areas. These policy networks are part of policy communities and have an increasing role in the governance of Canadian society (Althaus, 2013; Pal, 2013; Smith, 2003).

Most of the stakeholders or actors in any given policy process belong to five groups. In addition to the public or government sector discussed above, the non-profit and non-government sector or, as it sometimes referred to, the volunteer/civil/social sector (e.g., interest groups, charities), has played a direct on-the-ground role in addressing complex problems. Recently, as the government has required assistance in managing complex problems the role of this sector has grown. The business or private sector has been under pressure from several of its broader group of stakeholders to take an active role in helping with these problems through corporate social responsibility (not purely profit driven). Recently a fourth sector has been identified; social enterprises. This sector has a mixed social and for-profit purpose.

The fifth stakeholder group in the list is the citizens of a community. Their form, level, composition and size of engagement have changed since the presence of digital technologies and social media. Community member involvement is seen as critical for complex problem management through a democratic process. Literature is expansive on co-design and co-production. There has been a significant change over the last decade as to who, how and why stakeholders are involved (Dutil, 2010; Lindquist & Wanna, 2011; Tapscott, 2006). In addition, the need for improved governance of Canadian society and complex problems are one of the political issues that have been identified in the previous section. Building on the literature on

how problems are being addressed theoretically, it would be helpful to confirm actual practices for particular problems. This could be pursued through a community scan.

Literature exists on how to address complex problems in general as well as per specific type, but it could benefit from further work and especially more integration. Overall, complex problems are indicative of complexity and the literature seems to offer similar suggestions to address complex problems as is offered to address complexity. In other words, many suggestions on how to address both complexity and complex problems are similar and include, for instance, openness, learning, communicating, contextual awareness and thinking holistically. This is not surprising as in the introduction of this dissertation level of complexity, diversity, ambiguity and time constraints are identified as some of the traits that define complex problems.

There are some additional points offered for managing complex problems: use foresight, embrace the circumstances rather than resist them, collaborate, use more visuals, innovate, take action, have a long-term focus, create sustained behaviour change, build on democracy, and shift mindsets to work toward the common good (Game et al., 2013; Gray & Gill, 2009; Head & Alford, 2008; Horn & Weber, 2007; Kim & Senge, 1994; Levin et al., 2012; Rogers et al., 2013). These suggestions emphasize the importance of accepting the need to look at the world differently, use new tools and engage all individuals towards a commitment to change and collaboratively address complex problems for the long-term good of society. Writings on specific types of complex problems can be found within subject areas and tools used (Allen, 2013; Game et al., 2013; Hannigan & Coffey, 2011).

An understanding of people.

Certain information is important for society to know about people to help them address complex problems and transition to a different type of society. People need support and tools to understand, address and transition through complex problems and their implications. More so, complex problems exist because they are defined as such by groups of individuals. Understanding individuals is critical to assisting them in dealing with these problems. By understanding people there is a greater likelihood appropriate tools can be formulated,

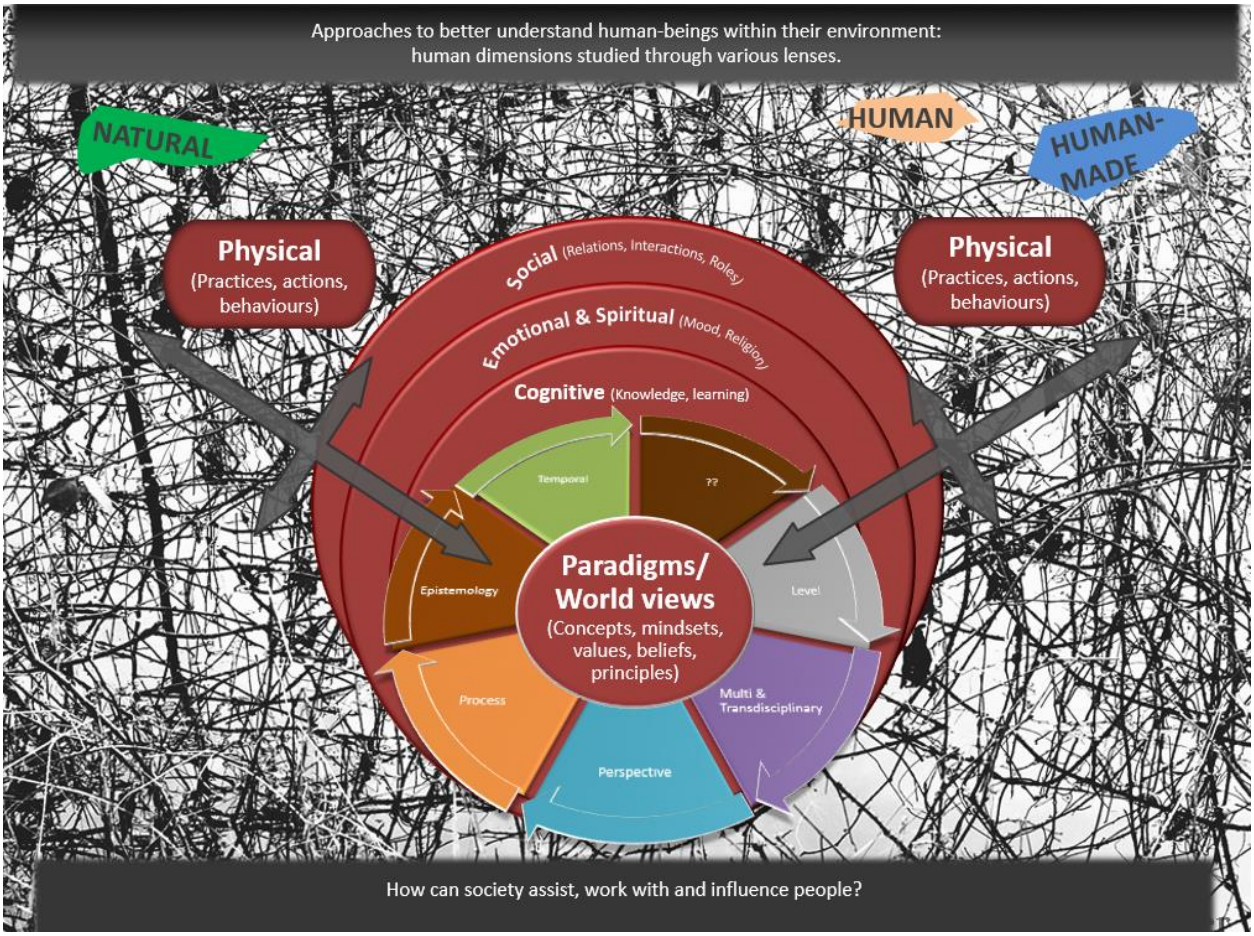
information and options can be provided and accepted, guidance and support can be utilized for benefit, and advocates for the long-term well-being of society succeed.

Specifically, foresight is a tool and lens that can be used to prepare human beings to better anticipate, adapt to and address what the future may hold and can be used to help societies address complex problems. How foresight can and does impact upon individuals is affected by the interaction with components that form individuals into their selves. The following is a general description of people and some key aspects of individuals and groups that are helpful to understand and work with them. Undoubtedly, extensive volumes can be written on human beings, but this section is only a broad overview to provide a perspective on this area within the scope of this dissertation and assist in the development of a research design.

There are various approaches that can be taken to study and explain human beings at a broad level. Figure 2 is a visual representation of different approaches. This is neither an exhaustive diagram nor the only way to conceptualize this subject. As presented in Figure 2, people can be studied in terms of one or more of the following dimensions: paradigm shift, cognition, emotion, spiritual, social and behavioural. Each general area can be examined through various lenses: individual perspective, disciplinary, temporal, process, level/scale, epistemological view and others (as can be identified). In addition, people are continuously changing according to many ongoing internal and external stimuli affecting them on a continual basis. This external stimuli currently defined by complexity can be categorized as human, human-made and natural: components of a human environment ("human environment," 2008). The human component refers to the social systems of people including their behaviour, relationships and interactions, e.g., cultural and economic. The human-made component consists of the built or artificial environment produced by people, e.g., stock market and buildings. The natural component encompasses those elements that have originated on their own without significant and deliberate human development, e.g., plants and minerals.

As such, many variables are at play and exist in different combinations at any given time; people are highly complex and can be very difficult to understand. The question at the bottom of the diagram asks about the types of tools, lenses, approaches and methods that can be used by

Figure 2. Approaches to study and explain human beings



society to influence, work with and assist people. This question further demonstrates the complexity of alleviating complex problems from the viewpoint of people and the difficulties in identifying which tool, directly or indirectly addressing complex problems and their effects, is effective, to what extent, and how. Yet, the target of most interventions related to complex problems is in some way to transform global society so it can transition through these complex problems in at least a partially controlled and humane fashion.

One of the lenses identified in Figure 2 is disciplinary. Researchers from several different disciplines like psychology, anthropology, history and sociology have studied human beings to better understand them. The focus of some of these fields is on the internal factors that affect human beings, for example, biological, and within other fields the focus is on external factors,

such as environmental and cultural. Within these areas are several subareas of study and description, e.g., motivation, learning, perception, and culture. There are some theories within and across disciplinary fields and subfields that have become tested and accepted over time, such as people are driven by a basic need to survive and basic emotions are felt worldwide. Other theories continue to evolve and undergo testing and evaluation. Furthermore, people can be studied at different levels, such as: individuals, small groups, large groups, within organizations and systems.

Individual perspectives of researchers formed through unique life experiences and education provides a distinct view. Epistemological viewpoints of researchers, such as the view that people are dominated by those in power versus people can be studied objectively, also affect the study and description of human beings. The study of humans in the past, present or future and over different periods of time provides different temporal views. Finally, the process or method used to study people affects the way in which they are explained, similar to understanding people through experiments or study of their narrative. Attempts to understand, influence, assist and work with people are common in every part of society. An ultimate goal of foresight or other initiatives working with complex problems may be to shift the worldview/paradigm and values in which individuals are functioning.

Dialogue-based foresight can affect all the dimensions listed in Figure 2: paradigm shift, cognition, emotion, spiritual, social and behaviour. Learning, social interactions, stimulation of emotions and the spirit, and action have all been cited as impacts from this foresight approach (Amanatidou, 2014; Veliquette et al., 2012). Many organizations and initiatives addressing complex problems attempt to influence by one or more of these dimensions, including advertising, disseminating information and organizing projects. Furthermore, foresight practitioners utilize several tools from various subjects, like communication, visual design, knowledge management, to achieve their objectives. This dissertation explores dialogue-based foresight but does not explore specific foresight mechanisms, such as how mental models are changed. Rather, the research identifies the potential affects of dialogue-based foresight and whether there may be correlation to outcomes as also evidenced by findings in the literature.

Using Figure 2 as the foundation, this study examines the areas outlined in Tables 2 and 3. The first table (Table 2) outlines how the lenses are applied to the research study to allow for multiple viewpoints. A second table (Table 3) identifies indicators that can be used to assess change in people. A detailed assessment of change using any one of these indicators is possible. The general concepts have been studied elsewhere in the broad academic literature, like psychology. However, as this dissertation aims to capture a wider range of data significant depth of study for any variable is not feasible. The indicators in the tables can provide a basic guide to collect data to describe the overall changes occurring in individuals and in the efforts individuals undertake to address complex problems.

Summary.

To summarize, this chapter reviewed complex problems and their Canadian context using a STEEP analysis, ways in which complex problems are addressed and approaches to

Table 2. Multiple lenses as applied to this dissertation

Lens	**Application to Study**
Epistemology	Pragmatist
Disciplinary	Subject areas are offered below to assess change in people
Perspective	Multi-perspective-different ways to collect and analyze data
Temporal	~5 to 10 years ago to situate most cases within a time period
Level	Multi-level
Process/method	Mixed methods to collect data and triangulate, process helpful to society's efforts

Table 3. Indicators of change

Dimension	**Descriptors**
Cognitive	Increase learning, understanding, openness, awareness, long-term focus
Emotional	Positive, empowered, stress, coping
Spiritual	Purpose, hope, vision, aspiration
Social	Connective capacity, networks, dialogue, co-production, conflict management, collaboration, belonging, handle diversity
Physical/Behaviour	Actions taken, physical effects of foresight & other resulting

	outputs, sustained change, practical rationality
Paradigm Shift	Holistic, non-linear, changed views and mental models
Subject Area	
Personality	Attitudes
Perception	Openness, framing of problem, seeing different possibilities & visions
Self-awareness	More aware
Motivation	Critical, what motivates, more motivated, engaged
Leadership	Views on, changed conduct
Creativity/innovation	More innovative/creative
Decision-making	Different models, How does it occur? Better?
Problem-solving	How does it occur? Better?
Culture	Changes norms, values, social structures, common-good view

understanding people. Chapter 2 began with adopting a definition for urgent complex problems for this dissertation. Within the STEEP analysis the concepts of globalization, societal progress and complexity have also been described. Within the approaches reviewed to understand people, human dimensions and lenses have been identified as ways in which to assess change in people and their efforts.

Key findings have been extracted from the literature reviewed. For instance, a variety of complex problems exist in Canada including: an aging population, obesity, sustainability, poverty, addiction, housing affordability and homelessness. These complex problems need to be treated differently than simple or complicated problems, e.g., reviewed holistically. The problems are linked to each other and globally. On another note, complexity is increasing. Openness, communication, continual learning, understanding, values and contextual awareness are examples of important ways in which to work in an environment of complexity. Also, traditional definitions of societal progress and its relationship to well-being are being challenged; thus, reframing the goals of addressing complex problems. Finally, the stakeholders involved in addressing complex challenges are changing. New sectors are forming, i.e., social enterprises, the public and non-profit sectors are asking for assistance, the private sector is being pressured to take on a more socially responsible role and citizens are becoming increasingly involved.

Chapter 3: Foresight Literature Review

This section is a detailed literature review of change, assistance and support mechanisms in society and as a part of these mechanisms as well as the focus of this research foresight is reviewed as a concept and tool. Several portions of this review take literature from working documents the researcher has completed in this area and as published by OCAD University (Berze, 2014a, 2014b). The chapter begins with reviewing the broad concept and practicalities of change, assistance and support mechanisms in terms of the following.

- Mechanisms for change.
- Influencing people to change.
- Theories of change directed at different levels of society.
- Designing change.
- Governing and managing change.
- Mechanisms for support and assistance.

Foresight is then reviewed as per the basics of foresight, i.e., tracking its history and the current state of play in the field with respect to theory and practice; a description of activities worldwide and in Canada; and an explanation of key elements of the practice.

Change, assistance and support mechanisms for people.

For society and the individuals within society to alleviate complex problems and their effects they require tools, conceptual frameworks and mechanisms. These tools, frames and mechanisms have two vital roles: changing the predicament of this complex situation while mitigating impacts of the situation. Different functions under these two roles include changing different complex systems, for example, individuals, institutions, and communities, assisting people to perform activities related to alleviating complex problems and their consequences, and supporting individuals and communities in various ways while they perform activities. These functions are not exclusive as, for example, supporting and assisting, can also be change mechanisms. This segment presents broad information on mechanisms for these three different functions. Like the other reviews, it provides a general introduction to a very large topic area.

Mechanisms for change.

Why is understanding change and how it can be achieved, designed, governed/managed at different levels important to this dissertation? Change is instrumental to the context, crises and complex problems society faces. It can be facilitated in various ways. For instance, understanding, influencing, supporting, guiding, informing, and engaging are critical to the outcomes of the current complex situation. This dissertation focuses on identifying and assessing changes occurring in people and in ultimate outcomes of foresight projects. Furthermore, the context of the variables being researched is in a constant flux.

To appropriately and rigorously assess change a basic description of the concept of change and identification of its key aspects for this research is necessary. Key aspects include (i) what is important about change regarding assessing it in people and outcomes and (ii) which change factors can impact upon or are being impacted by the current complex situation and challenges. This section examines the concept of change, causes of transformative change, influencing people, theories on social change, how change is designed, and governing or managing change.

Change is ubiquitous. It occurs in different contexts, regarding different subject matters and at various scales, such as a small rural Canadian community has an increasing suicide rate. Furthermore, different facets of change have undergone significant study, like time of occurrence, pace, duration, size, and location. Change can also be differentiated by being planned and/or unplanned. It is brought about by the interaction of the entity being changed with external as well as internal forces. For instance, planned change can be achieved through one of more of the following processes: guiding, informing, facilitating, influencing and engaging.

Change occurs at various levels, including: systems, institutions, organizations, communities, groups and individuals. Another way to describe levels of change is micro, meso and macro. Each level of change has different characteristics and barriers that affect the way in which change is designed and/or managed. An example is institutional inertia. This concept defines barriers to change as a result of institutional structures and processes ingrained over time (Greenwood & Hinings, 1996). Another example is groups of individuals are easier to change

than individuals because groups provide social pressures that can engender easier acceptance of a change (Lewin, 1947).

An unplanned societal transformation, as the world is currently experiencing, can be brought on by many different drivers within the society, such as, technology and social events, in different ways, like social movements and collaboration of various partners. Historically, society has gone through major periods of change that have sometimes been defined by technological advancement including industrialization and the information age. Underlying forces of change are power and control, for example who benefits, drives/resists the change or attempts to control it. For instance, some environmental regulations, as external drivers, are resisted because the necessary alterations needed to these laws would cost certain parties significant resources. Other examples of power struggles are revolutions and movements, which can be driven by both external and internal forces, comparable to the Arab Spring. All these drivers of transformative change, especially power and control, play a prominent role in humanity's current situation and its complex problems.

Influencing people to change.

Mechanisms for influencing people can be described by the six dimensions used earlier with respect to understanding people: paradigm shift, cognitive, spiritual, emotional, social and physical changes. Many change efforts are directed at one or more of the six dimensions, e.g., the Arab Spring targeted emotional and social, at the least. Marketing campaigns or gatherings of groups of people for conferences are other examples of multi-targeted change efforts. Depending on the goal for the change, one can assume that the more dimensions targeted the higher the improved chance of a paradigm shift occurring. In the organizational change literature steps are laid out as to how major change should be achieved and cultural changes associated with values, myths and beliefs have been end goals (Argyris, 1977; Kim & Senge, 1994; Nadler, 1990; Robinson, 1996; Schein, 1996).

There is evidence that behaviour change, as a mechanism, can be an important step to cultural and cognitive changes in people. Sensemaking literature, initially presented by Karl Weick, describes the ways in which individuals change or build their perspectives after an event

has occurred in order to make sense of it (Weick, 1993). This is a very important finding because, for example, change can be directed at behavior rather than cognition. Individual reasoning then makes sense of the change in retrospect. For instance, cognitive behavioural therapy focuses on providing tools for an individual to improve their well-being, e.g., performing an activity such as exercise that then results in emotional change, i.e., feeling better. The individual makes sense of this as having more control over their emotions by engaging in certain activities, cognitive change.

One reason for behaviour change being easier than cultural change is because basic values are established in the first 20 to 30 years of a person's life. Initially, values are formed through parents and schools and then through occupational settings (Schein, 1990). National cultures, which vary throughout the world, are very strong in forming their populations' values (Hofstede, 1988). Values are very difficult to change after this point (Vakil, Lindquist, Administration, & (B.C.), 2009). People tend to resist change in general because what is known, stable and routine is secure to a person. This is evidenced further by diffusions in innovation theory and in Kirton's work in which there is a small population of individuals who are willing to try something new, "innovators", but the majority of the population are "adaptors" (Kirton, 1976; Rogers, 2003).

Theories of change directed at different levels of society.

Several additional theories to the ones listed above have developed across various disciplines around change and its numerous facets. These are all pertinent in how efforts towards complex problems can be directed at different levels of society. This includes grand theories such as evolutionary and revolutionary as well as theories regarding specific areas, like the role of technology in change (Gersick, 1991; Poole & Van de Ven, 2004). An example of one theory is institutional theory; it refers to institutions with a public interest and a need for legitimacy among the community. Other organizations that are focused more on results and tasks have been referred to as technical organizations. The difference between the two is that rules, norms, processes have created a strong setting for institutions that is very difficult to change. Efforts are spent more on securing and maintaining legitimacy than developing new ways to innovate (Meyer, Scott, & Deal, 1981; Powell & DiMaggio, 1991).

Earlier theories on facilitating group change and managing conflict are Lewin's action theory, field theory and group dynamics (Lewin, 1947). Newer theories include how Porras (1991) describes the importance of setting and context as well as cognitive aspects impacting upon behaviour. He delineates the difference between literature on organizational transformation and organizational development (Porras, 1991). Other topics regard the importance of having different leaders for different types of change (Nadler, 1990) and the importance of trust and managing expectations of workers for performance and motivation of workers (Robinson, 1996). Population ecology has also brought forth concepts such as selection, variation and "liability of newness" (Hannan & Freeman, 1977; Stinchcombe, 1965).

Designing change.

Designing change for different levels of society has been a significant area of study for organizations and for specific subjects such as health and public administration. This activity is critical for this dissertation because deliberate change is the focus of many efforts targeting complex problems. For example, different ways in which deliberate change is being attempted include social innovation, social entrepreneurs, roles of sectors, policy instruments, cross-sector collaboration, different ways to influence the interest and commitment of politicians, forms of governance - using networks and digital technologies, engaging and attempting to change people at deeper levels and acquiring resources.

To elaborate further on these mechanisms, social innovation is an area receiving attention as it addresses the issues around innovating systems and social areas. Books on being a successful manager or self-help books are about improving individuals and coping with current society and its challenges through a deliberate change process. Collaboration as a mechanism, for example, has been instrumental in designing and implementing programs like anti-smoking campaigns within the public sector to change behaviour. Kurt Lewin's research focused on helping groups address conflicts through change (Burnes, 2004). Planned or deliberate system-wide change is best managed and governed at various levels of society if it is to be collaborative, effective and efficient with minimal negative impacts. In fact, facilitating and designing change, which is helpful in many circumstances, is a multi-billion dollar business.

Humanity's potential crises holds potential for deliberate change to be effective. The essence of a crisis period is an unusual openness to learning and different ideas while there is a desperate need to address the crisis even if it involves greater risk (Stern, 1997). There is significant work completed on crisis management and how a crisis is an opportune time to bring about deliberate change, whereas the times in between crises allow for a building of incremental steps and adjustment. In policy studies a period of crisis offers a "policy window" (Kingdon, 2011; Pal, 2013), organization and other scholars refer to it as a time of transition or revolution (Gersick, 1991) after a number of diverse small steps reach a cumulative or tipping point. Reaching a tipping point for change in complex problems can be a goal for several efforts.

Governing and managing change.

Governing and managing change areas effect the way implementation of change practices to alleviate complex problems are carried out and decision-making around changes occur. The documentation on these facets of change is almost as broad as the literature on change itself. The reason for this is that politics, organizational studies, management studies, psychology, sociology, governance, and history are only some of the topics it encompasses. Since change is a constant and human beings have a need to control their surroundings as much as possible, someone is in one way or another attempting to manage or govern the change. How this is done and the effects of these actions are widely studied.

Within organization studies literature recommendations are offered on forms of organizing to address a chaotic, crisis or continually changing environment. The work identifies flexibility and speed of reaction, formed as ambidextrous organizations and networks, as the type of organizations ideal for these environments (Powell, 1990; Tushman & Reilly, 1996). Continuous learning has also been identified as critical to addressing these types of environments (Argyris, 1977; Garvin, 1993; Sanderson, 2009). Many of these features of addressing turbulent environments apply to individuals as well as organizations (Whetten, 2011). Regardless of our knowledge of change, managing change is difficult.

Even if intentions are solid and well-coordinated the result may not be sufficient or even the original target of the intervention. For instance, the campaign against the inappropriate use of antibiotics has not had enough of the required effect. Alternatively, “successful” societies have been driven by technological and economic progress. They have typically received the title of success based on their definition of progress, such as productivity and wealth. However, this definition is being reassessed, as mentioned in the previous chapter, and thus the target of interventions is being altered.

Mechanisms for support and assistance.

The implications of change can be wide and varied; from globalization and medical advances to greater pollution and mass extinctions. Its effects are not entirely predictable. There are several variables that affect change and many of them do so in an unpredictable manner. For instance, the location, culture, timing, multiple human dimensions, benefits or disadvantages for the change occurring, drivers, and context, can all have an impact, some positive and some negative. Negative effects and barriers to change can develop for many reasons, such as a condition of the pervasiveness of change. Information overload, constant attempts of people being influenced in countless ways, and cross-efforts and mixed messages are creating distrust, apathy, lack of progress and confusion, such as found in climate change. Implementation issues and complexity exacerbate these barriers. Thus, it is extremely difficult to know the full implications of the turbulence being experienced by people or to offer one solution to remedy its effects.

Mechanisms for transitioning through the negative impacts from complex problems and looming crises are important at different levels for different reasons. For example, individuals need to be able to cope with the impacts or their wellness is affected and systems need to be able to adapt or chaos can ensue. Transitioning well through a dynamic state is also important because most unplanned change is unavoidable and people can be more or less prepared for the change. Preparation reduces risk that the unplanned change will have detrimental effects, may even allow the change to be prevented and finally reduces the potential impact on well-being of the people transitioning. In the meantime, people can continue to have the strength and desire to further address complex problems without jeopardizing integrity and humanitarian values. Support can

be provided through, for example, understanding, positivity, hope and just listening. Alternatively, those who "fall through the cracks" or are underprivileged may need others to advocate for them.

Whereas designing change is a planning activity, transitioning is necessary both for planned and unplanned change. A well-designed change can be defined in terms of whether the entity(ies) changing will make the transition in an efficient, effective, positive and least obtrusive manner. However, a good design does not necessarily result in good implementation (Pressman & Wildavsky, 1973). Careful steps and guidelines have been developed for different subject areas, contexts, entities and scales but implementation is built on wildcards such as personal interest, timing, communication and interpretation. Unplanned change such as encountered in complex adaptive systems and complexity are very difficult to understand and address.

Mechanisms which allow people to be involved and informed are important to their ability to deal with complex problems. Those who govern and/or manage change have had to address a growing desire for democratic engagement of all individuals in change processes. This movement is not entirely new. It is founded in the human movement in the earlier 20th century and in organizational literature work on sociotechnical systems as well as quality of work life (Cherns, 1976; Follett, 1949; Trist & Bamforth, 1951). Furthermore, from acquiring buy-in to engagement in co-production makes sense if the policy or business activity benefits from support of the public (which in many cases it does). However, engagement is not an easy task. The level of engagement, who participates, in what they should participate, how people should be engaged and how the relationship continues to evolve is a complicated process (Lindquist, Vincent, & Wanna, 2013).

Summary.

In summary, the study of mechanisms to change, support and assist people has resulted in a huge breadth of literature. However, it is still difficult to design, facilitate, transition through, manage and explain change. This is especially true in a complex environment in which several factors are interconnected, affects are uncertain, non-linearity exists and the system is subject to feedback loops. Fortunately, there are useful theories, recommendations and descriptive

information on the topic. Foresight offers one productive way in which to facilitate change as well as support and assist people in alleviating complex problems and their effects. By fully appreciating the context of a foresight project and the targeted intervention this dissertation delineates some key aggregate factors for resulting impacts. Yet, it will not be possible to account for all possible factors at all levels of a case study or all their effects within this dissertation. To proceed further, a literature review of foresight is vital.

Foresight.

Having outlined complex problems, people and mechanisms, this section turns to a detailed literature review of the concept of foresight, tracking its history and the current state of play in the field with respect to theory and practice. In the next chapter, foresight is examined in terms of its application to complex problems. The literature review is completed with suggestions on how to strengthen the foresight list.

Foresight is practiced worldwide and is taking root academically as well as in various private and public institutions. The field is growing quickly although being seemingly disorganized and incoherent as it emerges. Due to the unique attributes of foresight and the fit between these attributes and complexity, this dissertation argues that foresight is a promising practice for addressing complex problems and urgent complex problems. More surveys into the field are, however, needed to fill in gaps of knowledge and work is required to find ways in which to effectively and efficiently address complex problems while engaging a more diverse range of people from various backgrounds. Although research has been conducted and theoretical articles have been put forth in this regard, significant work remains. This dissertation further argues that there are different ways in which foresight can be considered more impactful for alleviating complex problems and their negative effects. Moreover, broader insights are to be gained in addressing urgent complex problems from assessing dialogue-based foresight through empirical research.

Foresight basics.

The basics of foresight consist of appreciating the field and practice as well as foresight types and foresight effects. This section will begin with a brief history of foresight and a

description of its status worldwide. To make sense of the information presented, the researcher's insights based on this description will follow. A presentation of limitations in this analysis concludes this section.

A brief history.

The idea of planning or visioning into the future is not recent, but its development into a discrete field of study is relatively new. The history of the field can be traced back more recently to pioneers such as H. G. Wells who early in the 20th century called for professors of foresight and the study of the future (Wells, 1932). Prior to and after World War II, significant work was completed around military planning and scenarios and then proponents such as Herman Kahn and the RAND Corporation in the 1950s expanded the use of scenarios to other areas such as policy. In the meantime, key individuals such as Gaston Berger and Michel Godet developed the foresight field further in Western Europe. Developments in statistics and technology facilitated the development of methods used in foresight work. Key contextual elements and drivers of this field included the critical events of World War II and the arms race, and the rise of environmental issues and social issues throughout the last half of the 20th century (Bell, 2003; Keenan et al., 2003).

The oil crisis in the 1970s further demonstrated the importance of planning for potential futures, considering interdependencies of a global society and preparing for limits to growth. Questions around quality of life, values and ethics, and societal progress grew in importance. Greater attention was given to decision-making, preparing for the future, addressing complex challenges, developing new technologies and achieving change both in society and in organizations (Bell, 2003). Large organizations, such as the Royal Dutch Shell Group, and the military were major proponents of using foresight for strategic planning and together with key organization members were especially instrumental in spreading the practice of scenario planning in the 1970s in North America (Keenan, Miles, & Kaivo-Oja, 2003; Schwartz, 1991). By this time countries throughout the world began to study and practice this new field (Burt, Bradfield, Heijden, Wright, & Cairns, 2009).

As the societal environment of complexity and uncertainty developed further, the interest in the use of foresight for planning, learning, facilitating change and decision-making grew in public, private and non-profit sectors. The highly competitive environment and drive for innovation in the 1990s in North America, Western Europe and East Asia furthered interest in the area (Öner & Beser, 2011). Similarly, globalization and movements towards deliberative democracy, multiple perspectives, transparency and participatory decision-making has had a noticeable effect on the prominence of foresight. Members of the field highlight the important role of foresight in facilitating greater engagement of stakeholders and giving individuals a voice in the future of their own societies (Giaoutzi & Sapio, 2013; Havas, Schartinger, & Weber, 2010).

Foresight, especially after the 1990s, is like a complex ecosystem. Several new bursts of foresight erupt in places, sometimes seemingly in an arbitrary way and sometimes with a strong sense of logic. The elements of the system are highly interrelated and dynamic. As the landscape evolves, foresight organizations and departments rapidly form, change and die, terms proliferate and create ambiguity, methods emerge and fall out of common use only to get resurrected elsewhere, and people not only assess and plan for the future but in so doing help create the future. This activity occurs in a continuous yet sporadic revolution that does not necessarily follow a clear or planned linear path. Yet, the concrete and systematic is as important to foresight as is the creative and unpredictable because it allows for some form of assessment, guidelines and ways for improvement as well as because some foresight methods necessitate a systematic approach.

Although foresight is like other disciplines, such as the study of history, the field is unique in that it has an action-oriented holistic, multidisciplinary/transdisciplinary and multi-perspective approach. Development of systems theory in the 1960s has had a great influence on foresight as has foresight's interaction with the humanities and popular culture. Yet, foresight is like many other new practice fields that have originated in the last century, such as evaluation, visual facilitation and governance.

The fields that have emerged since the 1950s are not evolving in the same societal context that mature fields such as mathematics or biology have developed and have arguably different relationships to research and practice. Kuhn (1970) described the revolution of paradigm shifts in research paradigms for the natural sciences, as emerging research concepts and practices that become accepted by the field. He indicated these paradigm shifts do not apply to the social sciences. These new "practice" fields in the social sciences are different than research and are evolving in a context in which there is a lack of clarity on the best practice and/or demonstration of revolutionary improvements through one approach. Furthermore, many more stakeholders are involved in the practice communities and powerful interests have a greater stake in these fields. A practice would need to be accepted as significantly better than another by most of the stakeholders for a paradigm shift to occur (Algoso, 2011; Eaton, 1996; Kuhn, 1970).

Even though a separate foresight community exists with publications, educational programs, and numerous practitioners, the discipline is still emerging and facing many developmental issues, such as whether professionalization is desirable, what are the role of values, should there be more alignment of foresight community members, and how will varying epistemological perspectives affect the field (Giaoutzi & Sapio, 2013; Marien, 2010). The relatively new disciplines discussed here are likely on a similar pattern of normal emergence but not at the same stage of development; with some fields, such as evaluation, more mainstream than others. A further examination and comparison of the development of emerging disciplines as compared to foresight is needed.

Foresight is a difficult field to comprehend. It has many layers, not unlike an onion, that need to be peeled away to fully appreciate its depth and contribution. Yet, it is critical to understand the field, the practice and how to work with it. Futures literacy, and foresight similarly, is defined as "understanding the nature of the future and the role it plays in what we see and do." It is why and how we "use the future" in the present (Miller, 2018, p. 22). The secondary concern is a familiarity with the field itself including approaches and methods used. Rhisiart et al. (2015) identifies three levels of foresight literacy: awareness, discovery, and choice. Awareness involves values and expectations being moved to an explicit state. Discovery

refers to imagination and rigour. Choice involves questioning of assumptions used for decision-making. Futures literacy results in benefits of learning and "using the future" for the present.

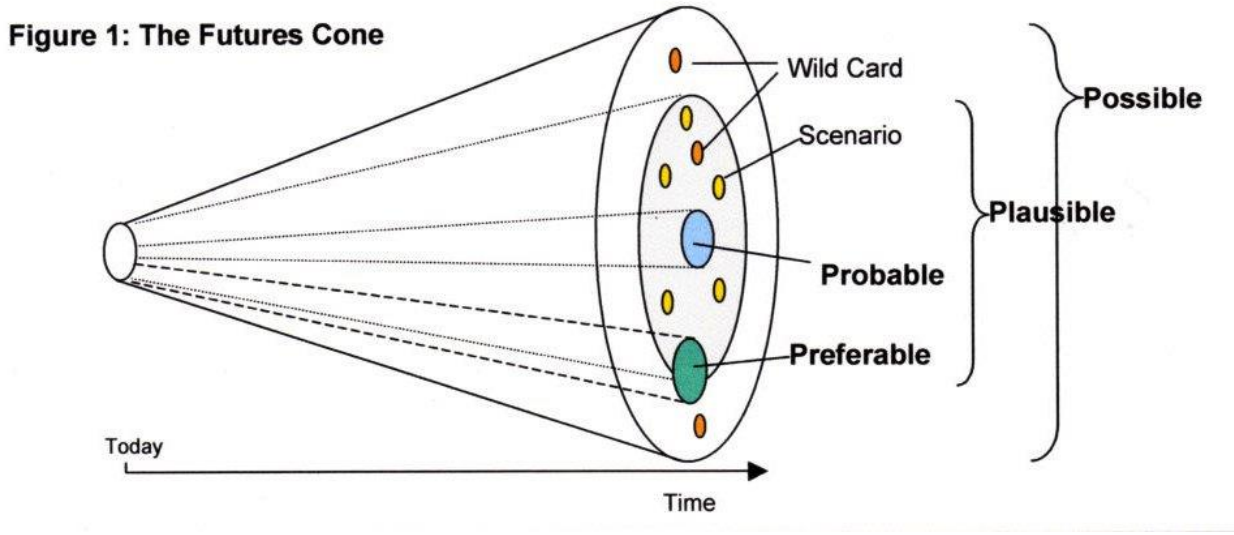
Futures literacy is strongly connected to the emerging discipline of anticipation, which is defined as "the form the future takes in the present" (Miller, 2018, p. 27). "Behaving in an anticipatory way means adjusting present behavior in order to address future problems" (Poli, 2010, p. 2). Individuals respond to what they unconsciously identify the future to be in their everyday existence, for example, weather predictions, a belief in routines, or how they think their financial situation will be a year or more into the future. However, this capacity is relatively innate and unrefined. The ability to consciously and with training improve how the future is used daily is mostly an untapped skill. The field of anticipation offers the potentiality of grounding foresight in future studies, the broader form of foresight, which can then be anchored in the here and now by the discipline of anticipation (Riel Miller, personal communication, September 1, 2018). Anticipation itself is not a new concept and has been studied within various topics like psychology, philosophy, and biology (Miller, 2018; Poli, 2010, 2018).

The depth of foresight has allowed for and has even called upon many authors to describe foresight in various ways to aid in its study and appreciation. For instance, these include principles, types, characteristics, generations or waves of evolution, epistemological/ontological, as a practice, as a theory, as a field/community, artifacts, purposes, quotes, and diagrams. To explain the field and relate its complexity to the reader, a range of examples from the literature is provided below. Of primary importance is the widely recognized Futures Cone developed by Hancock and Bezold (1994) and illustrated in Figure 3.

The cone represents four types of futures: possible, plausible, probable and preferable (Henchley, 1978). It also identifies a scenario and wild cards. The range of futures expands as per the increase in time duration. The possible future represents the full expanse of futures, all potential events that could take place including science fiction. The plausible future is less encompassing and limited by whether the future can reasonably occur, even if it is unlikely. The preferable future is differentiated by a future people aspire towards, while the probable future represents much of the same as is currently occurring enduring into the future ("Business as

usual”). The preferable is defined by values which people project onto futures they would like to see for themselves and their children (Bezold & Hancock, 2014, p. 66). It is important to note, as Jim Dator stated, "trends can take you with unerring accuracy to where you don't want to be" (Trevor Hancock, personal communication, November 9, 2018).

Figure 3. The Futures Cone



Source: This image was adapted by sjef (2016) from Joseph Voros (2003) who adapted the image from the work of Hancock, T. & Bezold, C. (1994).

Several different approaches are described within the foresight literature. An approach consists of the combination of methods used and the way in which they are used (Bishop et al., 2007). For instance, several methods can be used to scan for trends and drivers and the sequence, form of application of methods and combination of methods is one approach to a particular process. For example, Bishop, Hines and Collins (2007) and Mietzner and Reger (2005) delineate several ways to conduct scenarios. Further, there is a distinction made in the literature between the level of change pursued: incremental and transformative foresight (Johnston, 2012). Other distinctions in foresight are explorative and normative foresight (Popper (2008) provides further information on the way foresight practices are described).

Dialogue-based foresight is an approach focused on both process and outputs. The process reflects an open, honest and engaged exchange of viewpoints and ideas to "learn by revealing their *(individual)* perceptions and assumptions" (McLean & Egan, 2008, p. 252, italics added). Conditions for dialogue, according to Senge (1990), are: "(1) All participants must 'suspend' their assumptions, literally to hold them 'as if suspended before us'; (2) All participants must regard one another as colleagues; and (3) There must be a 'facilitator' who 'holds the context' of dialogue" (Senge, 1990, p. 243). The effects of dialogue-based foresight on the participants can be, e.g., increased understanding and respect; shared commitment; resolution of problems; consensus; changed mental models; more energy, momentum, action and optimism; improved connections, negotiation of issues and reduction of conflict (Conklin, 2006; Groff, 2013; Lohmann & Van Til, 2011; Veliquette et al., 2012).

Building on the work of other theorists, several foresight professionals have developed their own principles for foresight/futures by which they practice. These principles give insights into what practitioners think are defining parameters for the field. For instance, Conway (2015) identifies five (pp. 4-5):

1. The future does not yet exist, [thus], the future is not predetermined, inevitable or fixed.
2. The future is uncertain and not predictable – we have choices today.
3. There is always more than one future whether preposterous, potential, possible, plausible and preferable.
4. Futures outcomes can be influenced by our action or in action today.
5. We are all responsible for future generations.

Bussey (2014) identifies 12 principles and Bengston (2018) lists 10 principles. Dator (2007) offers laws of the future: (i) "the future" cannot be "predicted" because "the future" does not exist, (ii) any useful idea about the futures should appear to be ridiculous, and (iii) "we shape our tools and thereafter our tools shape us" (pp. 1-2). Inayatullah (2008) offers "six basic concepts of futures thinking: the used future; the disowned future; alternative futures; alignment; models of social change; and uses of the future" (p. 5).

The *evolution* of futures/foresight have also been described in several written works. Generations have been put forth in which foresight is entering its sixth generation while other generations continue to be practised (Çifci & Yüksel, 2018). These generations have been described as:

- First generation – experts and accurate predictions regarding technology mostly conducted by futurists and technical experts;
- Second generation – markets and technology combine with participation widening to industry and academia;
- Third generation – the second generation is expanded with the inclusion of a social dimension in which the stakeholders who participate are broadened;
- Fourth generation – different actors are the focus in the technology, innovation and science system;
- Fifth generation – stronger attention on policies of science innovation and technology, global and structural focuses; and
- Sixth generation – defined by industry 4.0, e.g., cyberspace, values, ethics, and co-creation (Çifci & Yüksel, 2018; I. Miles, Harper, Georghiou, Keenan, & Popper, n.d.)

Waves have also been used to define the evolution of futures (Schultz, 2015; Son, 2015), of which the most recent three waves, starting in the early 20th century, are defined by Schultz (2015) as: enlightenment and extraction, systems and cybernetics, and complexity and emergence. Another version of waves depicting the evolution of futures is offered by Son (2015). In addition, historical information is often provided on the development of foresight per region and/or nation in broader descriptions of foresight (Dreyer & Stang, 2013; Georghiou et al., 2008; Meissner et al., 2013; Rafael Popper & Directorate General for Research, 2009).

Different categories or types of futures are widely used as a descriptive tool in a variety of ways, e.g., based on purpose such as informative or instrumental (Könnölä et al., 2011), and discussed in greater depth throughout this document. In another example, types of foresight are founded on differing foresight scholars' and practitioners' views on the epistemological nature of the field (Slaughter, 2009). The definition and interpretation of foresight as a practice is also impacted by these varying views. Thus, these differences create misconceptions external to the

field and conflicts within it. Yet, divergent views of the extensive field of foresight are logical and the practice's flexibility and broad range of methods, approaches and techniques are part of its strengths.

These different epistemological forms of foresight can be noted in the depiction of foresight as a science versus as an art form or craft (Iden, Methlie, & Christensen, 2017; Loveridge, 2009; van der Heijden, 1996). Science can be defined as "the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment" ("science," n.d.). A definition for craft is "an activity involving skill in making things by hand" ("craft," n.d.). The Oxford dictionary defines art as "works produced by human creative skill and imagination" ("art," n.d.). All three forms are arguably inherent in the practice but depending on the approach, methodologies used, or purpose of the foresight project the degrees vary. For instance, use of methods such as modelling and quantitative analysis can be considered as scientific qualities. Elements of project management can also involve a rational focus. The approach and delivery of foresight, however, can be considered more craft or art like. The researcher argues foresight is closer to an art form than a craft form because there is a stronger creative and imaginative component that is difficult to acquire as a craft. Also, a set of values are embodied in every alternate future and as such are an integral part of foresight. Values typically have not had a role in traditional science.

Regardless or perhaps due to all these different descriptions, the foresight field is difficult to understand and requires layers of appreciation. Furthermore, diverging definitions of concepts, principles and terms as well as diverging values has resulted in ambiguity in the field (Slaughter, 2009; Son, 2015) Similarly, authors define "methodological chaos" in foresight (Bishop et al., 2007; Bradfield, Wright, Burt, Cairns, & Van Der Heijden, 2005; Varum & Melo, 2010). This has been both beneficial and detrimental. On the one hand openness to plurality allows for exploration and variety in development of the field and is supported by organizations such as the World Futures Studies Federation ("About Futures Studies," 2018). However, on the other hand, plurality hinders the appreciation of the field and the mainstreaming of the practice.

To add to the ambiguity paradoxes are found in the world of complexity, complex adaptive systems and foresight (Kaisler & Madey, 2009; Kuah, 2017a). These paradoxes are apparent in language, concepts and practice. For instance, the researcher will observe, through personal communication with interviewees, that the greater the ability of a foresight practitioner to assist in preparing for alternative futures the more likely individuals feel issues would not have been encountered and the less likely the practitioner will be recognized or rewarded for it. Similar to successful prevention in health care. It does not get rewarded as much as acute care. However, it can be observed that if acute care fails blame is abundant. Another example is addressing complexity has involved increasing the pace in which people work to address complexity, developing more complex technologies and products, and creating more relationships between systems; thus, increasing complexity. Finally, Jim Dator describes a paradox in his saying "'The most likely future' is often one of the least likely futures" (Dator, 2007, p. 2). He explains this by referring to the development of new technologies which foster novel behaviors and changes in values. Thus, often seemingly "ridiculous" ways of conducting oneself or innovative ideas are likely to form a future that is uncharacteristic of the past.

An overview of foresight activities.

The following builds mostly on findings from two recently completed surveys: a mapping foresight project completed by the European Foresight Monitoring Network for the European Commission and a survey of a selected range of national governments and international organizations for their involvement in foresight activities (Popper, R., & Directorate General for Research, 2009; Dreyer & Stang, 2013). The former study is based on over 2000 initiatives that have been mapped by members of the network between 2004 and 2008 (27 initiatives are mapped for Canada); approximately 1000 of these are considered "fully-mapped" (p. 8). Both sources provide further details and explanations of the processes and findings. To a minimal extent additional material is included and cited as appropriate.

Below is a list of some of the findings regarding foresight practices worldwide. The foresight activities examined in these studies do not represent the full use of foresight exercises in the private sector and the many projects that have not been accounted for through mapping processes like within Africa (Popper, R., & Directorate General for Research, 2009). Although

there are limitations to the comprehensiveness of these studies, they provide a good appreciation for the overall scope of foresight and foresight practices worldwide.

- Developed countries are more likely to have engaged in foresight activities, be less prescriptive regarding results of foresight analysis, and be more reactive and trepidatious about the future than developing countries (Dreyer & Stang, 2013).
- Countries with significant budget funds allocated to their military are more likely to have well-established foresight activities (Dreyer & Stang, 2013).
- Decentralized vs centralized and external vs internal governmental foresight operations vary amongst countries (Dreyer & Stang, 2013).
- OECD and NATO have very well-established foresight activities. Significant activities also take place in the European Union through the European Commission (Dreyer & Stang, 2013).
- There are at least 33 different methods used in foresight from which multiple methods can be used per foresight exercise (Popper, 2008).
- Governments are the largest funders of foresight activities in all regions. North America and Oceania regions have the largest amount of business sponsorship (Popper, R., & Directorate General for Research, 2009).
- Government is the main target audience for foresight activities in all regions (Popper, R., & Directorate General for Research, 2009).
- The time horizon pursued by foresight exercises is mostly in the range of 10 to 20 years into the future (Popper, R., & Directorate General for Research, 2009).
- Most foresight activities in North America, Latin America and Europe engage fewer than 200 participants per activity (Popper, R., & Directorate General for Research, 2009).
- All regions most commonly focus on the national territory for foresight activities (Popper, R., & Directorate General for Research, 2009).
- The foresight methods very commonly used are expert panels, literature reviews, scenarios and trend extrapolation (Popper, R., & Directorate General for Research, 2009).
- Outputs (not process related) that are most common are: policy recommendations; analysis of trends and drivers; scenarios; research and other priorities; forecasts; key technologies; and technology roadmaps (Excerpt) (Popper, R., & Directorate General for Research, 2009, p. 13).

- Research areas can be broad or specific but in North America and Oceania they are more targeted (Popper, R., & Directorate General for Research, 2009).
- Foresight activities mostly take place in services (socio-economic sector) (Popper, R., & Directorate General for Research, 2009)
- Three key categories of most common recommendations from foresight activity are:
    - "call for policy shifts and … call for the creation of new projects, programmes, strategies or discussion";
    - "incorporation of foresight findings into ongoing debates and strategies: suggested action for the private sector and non-governmental organization to pursue; and the need for further research"; and
    - "development of human resources; improvements in academia-industry links; increases in public spending; and greater cooperation across the innovation system, including international cooperation" (Popper, R., & Directorate General for Research, 2009, p. 15).
- "Most common foresight objectives:
    - fostering cooperation and networking; orienting policy development;
    - recognizing barriers and drivers of STI;
    - encouraging futures thinking;
    - supporting STI strategy and priority setting;
    - identifying research and investment areas;
    - generating shared visions;
    - handling Grand Challenges;
    - and triggering actions and discussions" (Popper, R., & Directorate General for Research, 2009, p. 12).
- Foresight activities form a " 'knowledge junction' between different research areas and sub-areas" (Popper, R., & Directorate General for Research, 2009, p. 14).

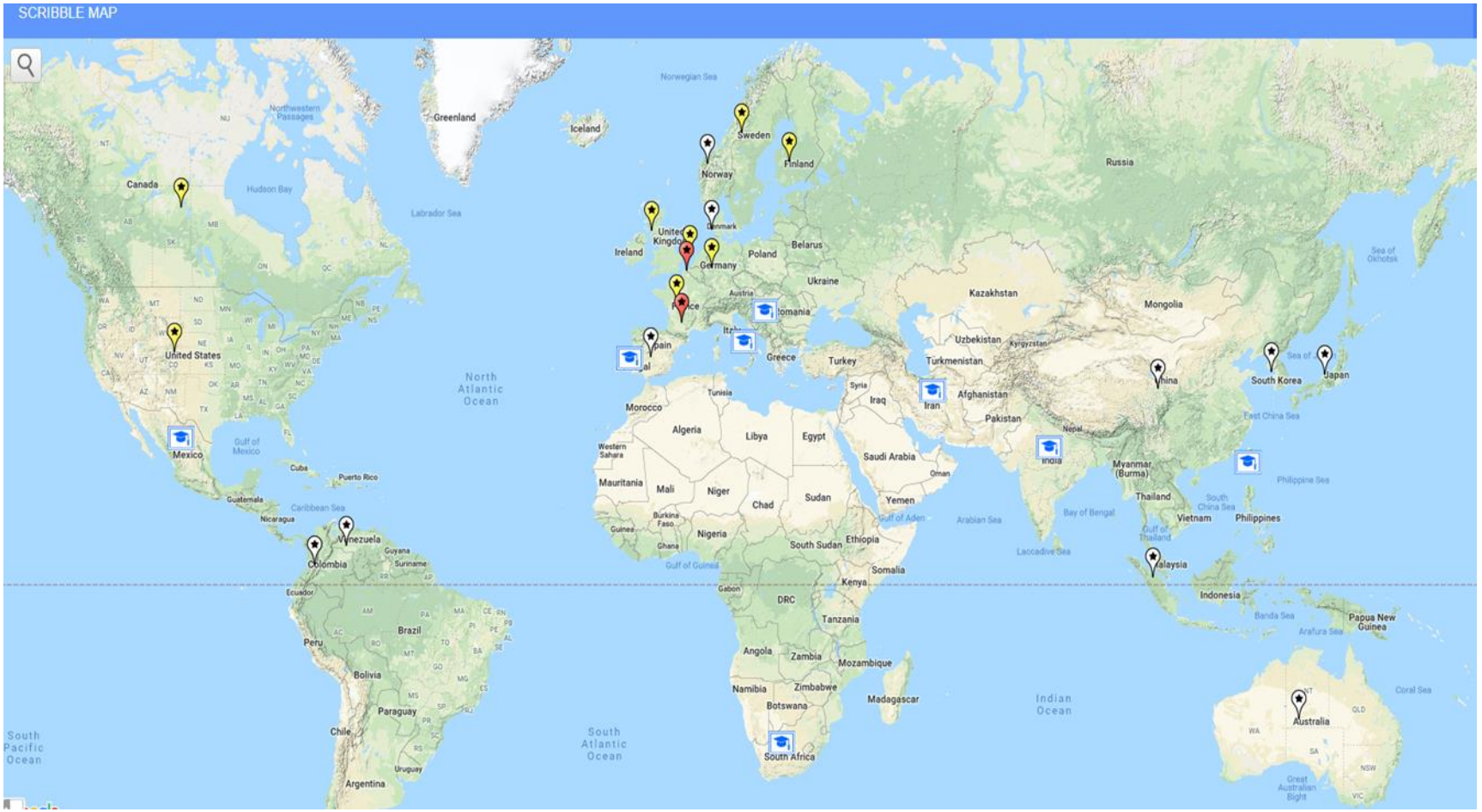
The world map identified as Figure 4 provides a representation of the countries that likely have the most established foresight activities and identified within each country are institutes, key governmental bodies and Masters or Doctorate degrees current as of 2014. Organizations and programs are constantly changing and the primary purpose of this exercise is not to provide a

source for current information. Rather, this map provides a snapshot in time of the utilization of foresight globally. This is not an exhaustive or precise list, for example, an organization may have been missed and a few private organizations added as institutes.

Further explanation is necessary to appreciate the map. If both of the main surveys utilized for this paper identify a country with well-established foresight (have a total of over 20 foresight projects mapped in "Mapping Foresight" (2009) and are listed as "well-resourced and widely used" in Dreyer & Stang's "Foresight in Governments – Practices and Trends around the World" (2013, p. 24), a yellow pin is placed on the country. If there is incongruence between the two sources as to how well-established foresight seems to be in a country a clear pin is used. For further detail, the information for countries with yellow pins are outlined in this document. Australia has also been described as it has been listed as a "top five" country in terms of scans completed in another metascan assessing foresight's status (Slaughter, 2009, p. 15).

The number of institutes within each country is based on the number of institutes that are active in foresight (Appendix A presents a listing of institutes). These organizations have been located through an Internet search conducted in 2014 and are primarily in the non-profit or government sectors. They have been selected if they had an active webpage at that time. Following the number of institutes is the type of degrees offered and abbreviated name of academic organizations that offer either a Masters or Doctorate degree primarily in foresight ("Foresight and Futures Studies Graduate Programs - Global List," n.d.). Next, the key government body involved in foresight in each country is identified if "Foresight in Governments – Practices and Trends around the World" (Dreyer & Stang, 2013) has one primary government body selected. Thus, some countries do not have government bodies identified. If the reader is interested in this information, Mapping Foresight (Popper, R., & Directorate General for Research, 2009) and The Handbook of Technology Foresight (Georghiou, 2008) list multiple governmental bodies per country. Finally, symbols for academic institutions has been added to the map for those countries who offer graduate degree programs but have not been identified otherwise as having the most established foresight activities. Additional documents have assessed the status of foresight nationally or globally (Bingley, 2014; M. Ramos, 2004; Slaughter, 2009).

Figure 4. Mapping foresight worldwide



Detail for Countries with Yellow Pins:

CANADA
4 Institutes
MDes offered – OCADU
Gov't: Policy Horizons Canada

UNITED STATES
32 Institutes
MA/MS/PhD offered – Regent U, U of Advancing Tech, U of Hawaii,
U of Houston
Gov't: Government Accountability Office

UK
8 Institutes
Gov't: UK Foresight Office

NETHERLANDS
2 Institutes

FRANCE
1 Institute, 3 Global Institutes
PhD offered – CNAM
Gov't: The Centre d'Analyse Strategique (CAS)

GERMANY
4 Institutes
MSc/Ma/MBA/PhD offered – European Business School & Institute for Future, Free University & Institute of Future
Gov't: Federal Ministry of Education & Research (BMBF)

SWEDEN
6 Institutes

FINLAND
3 Institutes
MS/PhD offered – Turku/Futures Academy
Gov't: Government Foresight Network Committee for the Future

AUSTRALIA
4 Institutes
MS/PhD offered – Swinburne U
Gov't: Commonwealth Scientific and Industrial Research Organization (CSIRO)

There have been significant developments over the last decade in foresight practice worldwide. The overview and mapping information demonstrates foresight is well-established worldwide, but primarily in developed countries. This is still the case, however, more recent studies identify Finland, Singapore, Japan, Russia and Korea as stable users of foresight and leaders in integrating foresight within their decision-making structures (Kuah, 2013; Saritas, 2018). Canada and the U.S. have not yet integrated foresight into their national government apparatus and therefore their existence is subject to the decisions or advocating of individual leaders (Jennings, 2017). The United Kingdom has diminished its use of foresight while other countries have substantially advanced their use of the practice, such as China (Li et al., 2017; Saritas, 2018). Nations use foresight in various ways, to different degrees, emphasizing diverse purposes, and through different political structures. For instance, Germany focuses more on specific activities rather than national scale projects and its foresight programme is decentralized (Dreyer & Stang, 2013; Kuosa, 2012). Also, there has been an increasing demand for foresight to be mainstreamed into work with developing countries (Bingley, 2014; GCPSE, 2014).

Foresight in Canada.

Foresight in Canada emerged in the 1960s. It has had a cyclical history with an upswing early on, then diminishing in the 1980s and an increase in interest in the 2000s (Foresight

Canada, 2018). Fred Thompson (1992) provides an account of the development of Foresight in the latter half of the 20th century. As of approximately 2016, Canada has a limited but strong capacity for foresight based on the number of individuals practicing foresight in the country and their activity in the area. A very rough estimate of 200 to 300 professionals are practicing a range of foresight types on varying topics and purposes from a range of public and private organizations. Some organizations and contact names of individuals involved in foresight are offered in Appendix C within a listing of around 100 projects conducted on Canadian topics over the last 15 years.

A further illustration of foresight in Canada includes, education, networks, research, and communities. One institution offers a graduate degree in foresight in Canada, the Ontario College of Art and Design (OCAD University) on foresight and design. A small number of workshops, courses and seminars are offered by a range of institutions. One active foresight network based in Ottawa is the Synergy Foresight Network and another based out of the U.S.A. but welcoming to Canadians is the Public Sector Foresight Network. Research on foresight is also conducted by various individuals in Canada from both practice and academic perspectives. One of the largest well-known international projects with a Canadian node includes the Millennium project ("About Us – The Millennium Project," n.d.). There are several websites offering information about foresight and links to foresight material. Global Foresight, for example, offers a link to various international communities practicing in the foresight area ("Foresight Communities - Global Foresight," n.d.). The Association of Professional Futurists is one of the most active communities in the field. Canadian foresight associations have been formed twice over Canada's history, during the upswings in the national interest in foresight, but neither are functioning currently likely due to the downturns in the practice over the past years (Foresight Canada, 2018; F. G. Thompson, 1992).

Governments in Canada are active users of foresight. The federal government has formed Policy Horizons, a foresight and knowledge organization for the federal public service reporting to a Deputy Ministers' Steering Committee. This group has completed, for example, several foresight projects, publications, training services, and a foresight training manual. There are at least eight government departments with internal capacity for foresight. This capacity has waned

and increased cyclically as well since the 2000s, with cost-cutting measures, changes in department leadership, and political leadership. Some of the impact factors for foresight success, as per comments of staff in these departments, are: lack of a champion, communication issues and ambiguity of foresight concepts, staff turnover, cultural factors, lack of skills or process focus, timing and budget, lack of foresight literacy, managing expectations and maintaining interest, and difficulty in maintaining a balance between several factors, e.g., technical and practical (Brian Colton, personal communication, September 11, 2018). Several studies have reviewed success factors for foresight in Canadian governments (Banfield, 2016; Calof & Smith, 2010; Schmidt, 2015).

The presence of foresight in different levels of Canadian government adds to the context of how foresight is practiced in Canada and potentially why it is or is not practiced. Canadian provincial and municipal governments also use foresight but some more so than others. For instance, Alberta has a strong presence for foresight, Ontario and Quebec have some presence, while Manitoba, Nova Scotia, and Newfoundland have little to no presence. A foresight presence in provincial governments is evidenced through projects listed in the Canadian project list in Appendix C, a recent study on science policy partnerships (Richards & Carruthers Den Hoed, 2018) and other recent research (Banfield, 2016). It is unclear from the literature, but noteworthy, as to why different levels of foresight presence exist but one can hypothesize it could be related to the wealth and size of the province as well as historical interest. Municipalities mostly use elements of foresight, such as scenarios and visioning, for strategic planning purposes (Cameron & Potvin, 2016). A few municipal projects are listed in the listing of Canadian foresight projects, as shown in Appendix C.

There are several initiatives in Canada relating to foresight of which a sample is listed below. For instance, the collaboration between the Balsillie School of International Affairs and the Foresight Division of the Foreign Policy Bureau of Global Affairs Canada have students produce an anthology of global trends impacting upon Canada (Global Affairs Canada and Balsillie School of International Affairs, 2017). Designing public policy tools like the Adaptive Design and Assessment Policy Tool for climate change and evaluating its usefulness is another example of types of initiatives related to foresight (Bizikova, Swanson, Tyler, Roy, & Venema,

2018). Another illustration of foresight-related efforts is developing an Energy Futures Lab to create a space for dialogue, experimentation and innovation (http://energyfutureslab.com/). In addition, providing presentations on foresight, such as the presentation to the Medical Council of Canada for their 2018 Annual General Meeting, provides exposure of foresight's value to Canadian groups. Furthermore, building a Collaboration Centre in the federal government for experimentation, collaboration and innovation with foresight style sessions is an innovative approach to applying foresight (G. A. C. Government of Canada, 2018). Finally, funding opportunities which list strategic foresight as an eligible activity is critical to the capacity to use foresight (for example https://canadacouncil.ca/funding/strategic-funds/digital-strategy-fund/digital-literacy-and-intelligence).

Preliminary insights from mapping and overview discussion.

Several preliminary insights can be drawn from the information presented. Foresight as an applied subject area: (i) is seemingly disorganized and incoherent, (ii) can be considered elite-focused, (iii) is in need of further surveys, and (iv) offers uncapitalized opportunities to generate significant value.

The first insight is that technically foresight is an emerging area of a relatively new field, future studies, and has been born in the 1990s into a rapidly paced world of complexity. As a new area, definitions of concepts such as foresight vary and practices are different and evolving (Amanatidou, 2014; Bell, 2003; Georghiou, 2008). Organizations are undergoing rapid transformations, common standards are not developed, different methodological directions are provided, no governing body exists and as such the growth of the area can seem haphazard. Other contributing factors are that the field traverses between art and science, different epistemological perspectives, different types of practitioners and an attempt to professionalize as well as make the field entirely accessible to lay individuals, creating confusion for academics, practitioners and participants alike (Bell, 2003; Marien, 2010; Varum & Melo, 2010). Furthermore, foresight is often susceptible to changes as soon as fiscal constraints become primary, sometimes constraints act as a driving force and other times they threaten the existence of programs (Dreyer & Stang, 2013). With the presence of foresight mostly in governments (Popper, R., & Directorate General for Research, 2009), the field is also directly exposed to the

instabilities of the political realm, while continuing to gain in popularity as uncertainty and risk spread.

Although foresight is in many ways attempting to be more open and inclusive (Daheim & Uerz, 2006), the next insight is that foresight can be elitist. Due to the nature of decision-making and strategic use of foresight, key officials usually need to be involved in the foresight process. Science and technical innovation build on the in-depth knowledge of technical and academic experts. Beyond these factors, for effectiveness of foresight activities, those foresight groups that directly report to and work with executives have a greater chance of recommendations from the activity being implemented (Daheim & Uerz, 2006; Dreyer & Stang, 2013; Johnston & Cagnin, 2011). In addition to this, many of the methods used in foresight are based on working with knowledge experts, such as expert panels and genius forecasting. There are methods that specifically attempt to include broad participants, like citizen panels, but these methods are fewer (Popper, 2008), not always appropriate, and are difficult to implement. Even if foresight methods chosen are more participatory it does not mean it is a true engagement or dialogue-based process, for instance, the goal of the project can be to confirm decisions and facilitation can be directed towards certain objectives (Baccaro & Papadakis, 2008; Giesecke, Giessen, & Etkins, 2012; Jenssen, 2007; Nikolova, 2014). What can be troublesome is that through some of these activities these experts are accessed to make value judgements for society as a whole. Of course, this is not that different from traditional non-foresight methods but is becoming a greater concern as transparency, stakeholder buy-in and citizen engagement become increasingly valued. Unless the foresight process changes, authentic engagement with citizens regarding their choice and shaping of societal values becomes left to an elite few.

The finding that some regions use less than 200 participants per activity and that the methods most often used by regions are expert panels indicate that there is a strong potential to involve experts more often than lay people (Popper, R., & Directorate General for Research, 2009). Restrictions on foresight activities due to resource availability, timing and confidentiality can increase this effect. Since foresight can be considered as nonessential work and can be resource intensive, developed countries with sufficient sized budgets tend to support and use foresight more frequently (Dreyer & Stang, 2013). Larger organizations, similarly, would likely

have more experience and resources to use foresight than small lesser-resourced organizations. Finally, the area of foresight is relatively new and difficult to grasp, especially for those individuals not directly exposed to the subject. Overall, then, the accusation of elitism has some foundation.

Third, more surveys are needed on foresight activities to validate data gathered and fill in missing information. Mapping foresight projects worldwide takes a significant amount of effort, especially in this dynamic environment. This dissertation is based on only a few available current sources. Considering different definitions of foresight as well as different approaches to collecting the data, different results would be likely if more studies are completed. Also, gaps in information exist in terms of overall usage of foresight in the private sector and non-profit organizations as well as in specific regions of the world (Varum & Melo, 2010). This information is difficult to obtain but valuable (Daheim & Uerz, 2006; Popper, R., & Directorate General for Research, 2009). However, beyond validating data these surveys could also, for example, help address questions regarding factors impacting successful collaboration among the five sectors (private, public, non-profit, mixed and citizens of a community). Further, it is important for the field's coherence that there be greater understanding of the diverse stakeholders involved in foresight and their roles, as well as the demand and supply side of foresight's development.

The last key insight offered is that verifying the value of foresight activities and identifying the areas in which foresight could hold opportunity to benefit organizations and society is an important endeavour. Governments and organizations that have practiced foresight for several years demonstrate that foresight is valuable enough for them to continue to expend significant resources to do so even when financial resources are tight. Foresight offers a way to address complexity and risk, while advancing innovation, learning, different perspectives and dialogue in order to achieve process and outcome benefits.

These benefits can facilitate the current transformation of societies at different levels through organized collaborative change in a time period when doing so is invaluable but very difficult. The value of foresight needs to and continues to be documented (Amanatidou, 2014;

Keenan et al., 2003). Most countries focus on the national level in their foresight activities, yet there are projects pursued at the international, regional or community level. There appears to be an untapped value to which foresight can contribute (Klomp & Van Der Duin, 2014). Meanwhile, most activities in some regions have 200 or fewer participants. Yet, some regions use greater than this number and there could be the possibility with current technology to increase the number of participants in activities (Popper, R., & Directorate General for Research, 2009). This could also mean involving more non-experts. The question exists as to whether this is an untapped resource.

Evaluating the value of foresight exercises and the increase of participation by non-experts in foresight activities is being researched (Miles, 2012; Rohrbeck, 2012). This could shed light on whether outputs and recommendations actually get implemented and determining if outcomes are improved. Finally, foresight is not yet a part of society's mainstream knowledge or activities (R. Johnston, 2011; Varum & Melo, 2010). Clear distinctions between the application and benefits of current non-foresight practices and foresight practices used for similar purposes in all sectors could be beneficial to advancing foresight (Rohrbeck, 2012). Similarly, more consistency and transparency in foresight could be helpful.

Limitations.

Based on the above information, foresight is a multi-sector, multidisciplinary field that is well recognized in the international academic and practice communities. However, there are several limitations to this review: it does not cover the private sector's overall involvement in foresight exercises as well as it does the government sector's (more private sector focused surveys are needed); specific exercises are not reviewed in-depth; some projects and tools are not listed; indirect foresight activities are significant in number but not accounted for; and, identification of numbers of activities are not absolute (especially considering that organizations rapidly change in the current fast-paced environment). As such it is difficult to know how much point-in-time analysis either over or under estimates the size and scope of the foresight discipline and its impacts on thought, practices and outcomes.

Nevertheless, these limitations do not detract from the broad overview of foresight and from the ability to generate useful preliminary insights. The likely effect is that numbers provided in this document are less representative of foresight's pervasiveness than the actual numbers (Bell, 2003). However, the way in which the private sector works with foresight needs to be examined in greater depth, especially in context of cross-sectoral interactions to form a more complete picture of foresight. Without the better integration of the private sector, understanding the full ecosystem remains elusive. More work including the use of typologies may be helpful in drawing out basic elements of foresight that can be easily visualized, measured and analyzed over time, e. g., cost, approach and time involved. Organizations, such as the European Union (http://www.foresight-platform.eu/european-foresight-platform) and academics continue to assess this dynamic and emerging field on an international scale. To better understand these assessments a discussion of the foresight practice is warranted.

Foresight: the practice.

Based on the literature, this section explains the foresight process in general and then describes the phases of the process in detail. Foresight is a promising approach for the current environment and addressing complex problems. However, it is a complex practice with many nuances. As previously presented under the section "A brief history", many approaches, methods, types and classifications of foresight are identified in the literature making comprehension, measurement, and successful application of foresight difficult. Through presentation of foresight literature, clues are revealed as to what type of knowledge still needs to be developed and how foresight can be considered more effective, efficient and collaborative for particular types of uses. The practice of foresight is explained in terms of four phases: scanning, scenarios, strategies and outputs. This section also attempts to highlight the importance and potential for increasing effectiveness, efficiency and collaboration within the foresight practice for addressing complex problems.

Foresight as a field offers value to society through the knowledge and concepts it has generated in working with the future; through its different worldview and through its application to several activities like innovation, planning, public engagement, and subject areas such as health, nanotechnology, and with the ability to address the current complex and turbulent

environment (Wilkinson et al., 2013). The reason foresight has developed and continues to grow is that this value can provide society with the ability: (i) to vision and plan for the future, (ii) identify images of a potential future and what it may hold, (iii) determine how these potential futures may affect society and how as a society people can anticipate and prepare for different potential futures or avoid them, (iv) assess how our current actions may affect the future, and (v) to help us adjust to a world to which people may increasingly become unfamiliar (Dator, 2007; Schwartz, 1991; Toffler, 1965; Wells, 1932). Furthermore, the additional benefits of foresight include but are not limited to the following outputs: preparing policy recommendations, fostering innovation, identifying research opportunities and advancing actions (Inayatullah, 2008; Popper, 2008). Of particular value for complex problems are the process-related outputs, such as, foresight's ability to incorporate diverse values, resolve conflicts, build cooperation, create new ways of thinking and deconstruct assumptions, enhance learning, and develop shared values and interests among its participants.

Upon reviewing the literature, it is apparent that different types of foresight can be classified according to the broad objectives of foresight and the circumstances in which they are applied; as in corporate foresight, science and technology foresight, foresight innovation, strategic foresight and policy-oriented foresight. However, it has been documented that foresight is not appropriate for use in every circumstance. For example, if the timelines are very short or resources are scarce foresight may not be the best option. Strengths and weaknesses of foresight and scenarios are discussed by several authors (Alcamo, 2008; Bowman, MacKay, Masrani, & McKiernan, 2013; Chermack, 2011; Glick, Chermack, Luckel, & Gauck, 2012; MacKay & McKiernan, 2010; Mietzner & Reger, 2005; Ogilvy & Smith, 2004). The types of foresight and the reason for their use, for example, to increase organizational competitiveness or enhance the development of new technology, affect the kind and extent of impact of a foresight exercise. This does not mean there are distinct concrete approaches per foresight type but the literature focuses on types, and certain approaches may be more impactful for certain objectives.

Academic literature across a broad range of topics also focuses on foresight approaches used in specific thematic fields such as health, environment, military and nanotechnology. Certain aspects or characteristics of the thematic areas influence the way in which foresight is

practiced through, for instance, the subject matter and stakeholders involved. As such, it can be concluded that different field knowledge, e.g., nanotechnology, and alternate subject knowledge, i.e., per impact or intended use of foresight, is being applied to foresight theory and the way in which it is being practiced (Vecchiato, 2012). For instance, Van der Steen and Van Twist (2012) provide an excellent discussion of policy analysis and the fit between foresight and policy use. As is apparent, the different types of foresight have different impacts (Könnölä et al., 2011). Thus, the variety of approaches can make effectiveness measurement tricky.

Another characterization of foresight in the literature concerns private sector or public sector orientation. Private sector foresight or corporate foresight is more difficult to research than public sector foresight due to confidentiality concerns and usually a lack of need to publish projects. Although there are significant similarities, there are also differences in the application of foresight to these sectors. The public sector is identified as more complex for foresight practitioners for several reasons: need to clearly delineate the client and the stakeholders; focus on participation of the stakeholders and related issues (Ogilvy & Smith, 2004); and more complex objectives (MacDonald, 2004; Volkery & Ribeiro, 2009). Johnston (2011) identified the driving force for governments to be in narrowing down possible futures to a single less uncertain future while business is more interested in new opportunities. Further, the level of technical expertise is less in the public sector and difficulties in aligning with the political agenda exist (Wehnert & Wolfram, 2009). Corporate foresight is driven by the companies' operations need for a long-term view and/or a proactive stance is required in working within a generally difficult business environment (Öner & Beser, 2011).

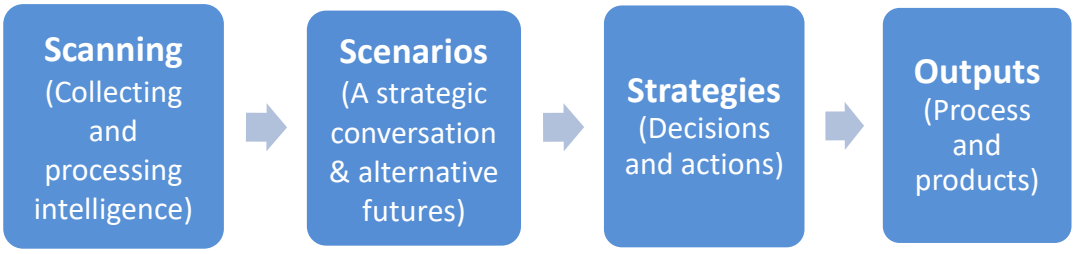
Overall, the literature suggests public directed foresight is more politically risky and sensitive than private-sector foresight with the greater need for transparency, accountability and broader stakeholder management in the public arena. While problems are likely to be more complex and results openly scrutinized, it is more difficult to allocate funding to foresight, enable an entirely open environment to seek imaginative options, and manage foresight projects. Thus, it is not as much a difference in how foresight is practiced between the two sectors but the surrounding context providing added difficulties for acquiring projects, conducting foresight on an ongoing basis, and delivering foresight well in the public sphere.

The literature offers different ways of describing and grouping the methods involved in the foresight process. For example, an approach to categorize different methods by phases of foresight has been used by Miles (2002) and then Popper (2008), like pre-foresight, action and renewal. For this document, four phases will be used: scanning, strategies, scenarios and outputs (as per Figure 5). Outputs is not really a phase as much as a description of the results of the foresight process. Other ways in which methods and the foresight process have been explained include but are not exclusive to: the types of methods used, e.g., qualitative, quantitative, mixed; exploratory or normative; knowledge source of the information, such as evidence, interaction, creativity and expertise; and concepts, pillars and questions (Inayatullah, 2008). Several factors, such as resource availability, timeline, objectives, have been listed as variables that help define which methods are chosen for the project and how they are implemented. The foresight team influences the selection of methods through various factors such as their epistemology, experience, preference and knowledge of methods. Expert advisors and/or sponsors may also be involved in scoping or framing the project. The choice of methods and the way in which they are applied are very important but there is no one correct way to proceed with a project (Popper, 2008).

Scanning.

The language in the literature around scanning is not always clear. Scanning, sometimes referred to as horizon scanning or environmental scanning, can refer to a process in which information is collected about changes in an environment. It can also include the processes of synthesis, analysis and communication of this information. Scanning is common in the field of management in which organizations try to be informed of the changes in their external environment (Bukowski & Michael, 2012). Scanning for foresight is different in that there is: a focus on trends and a longer future horizon as well as earlier signs of change, more comprehensive scanning, an examination of highly unlikely possibilities (Bengston, 2013), and at an organization level a desire to integrate systems so findings can result in action and a central process to use and link foresight methods to functional units (Rohrbeck & Bade, 2012). In light of this, this particular type of foresight scanning can be thought of as scanning adapted for the

Figure 5. A simplified representation of the foresight process



conditions of increasing complexity in which expedience and greater awareness of what's happening in the external environment is becoming more important.

As the literature states, scanning for foresight is important because it can: (i) provide basic and interpreted information about the area studied and related trends (Choo, 2002; Inayatullah, 2008); (ii) help society anticipate the future, plan and act on this information in a timely manner (Molitor, 1977); and, (iii) contribute to a culture of continuous learning and readiness for change (Bengston, 2013). Incorporated within these benefits of scanning, and defined by the overall scanning technique and how specific methods are used, are the social processes that can take place during a scanning for foresight exercise like the outputs of the interactions between the actors involved (Hiltunen, 2010). Knowledge of our surroundings and how we fit into these surroundings on an ongoing basis is fundamental to basic awareness and action (Inayatullah, 2008). However, the changes in attitudes, beliefs and behaviours that can occur through dynamic relationships and social activities involved in some approaches to scanning can provide a transformational result that dictates whether foresight adds value or improvement to how society confronts complex problems. For example, scanning can make the difference between the success and failure of an organization or community. As such, it is promising for society that both the scanning process and the outputs of this process can be invaluable.

As Bengston (2013) presents in "Horizon Scanning for Environmental Foresight: A Review of Issues and Approaches", before proceeding with a specific scanning project an organization may wish to make or assess practical decisions concerning the broader implementation of scanning as an ongoing organizational activity: who completes the scanning

process, how often and for what time horizon. For instance, an organization has choices to complete scanning internally, through an internal team in conjunction with a network, contract an external firm or choose a variation of these options. Another example of a decision to make, is that scanning can be a critical ongoing activity or completed less often depending on the organization's need for the information and the turbulence of the industrial context. In this case, a combination of scanning and monitoring (similar to scanning but different in that it focuses on tracking only a few specific early indicators or weak signals identified previously in the broader scanning process) may be used. Finally, the time horizon for the monitoring process can be broken up into periods that make sense to the organization. Some general recommendations have already been made by Bengston (2013) to design better ways in which to generally conduct scanning for foresight activity in natural resource management organizations. For instance, both broad and focused scanning are important. Diversity is important in terms of the scanning team, the information sources accessed and the way in which the scanning results are communicated.

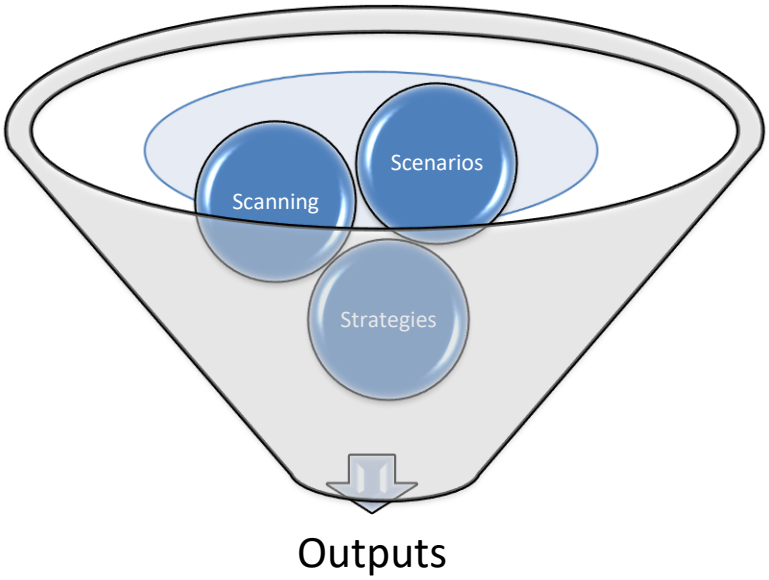
Similar to foresight itself overall, the technique or approach used for scanning for foresight, as outlined in the literature, depends on the foresight team and the objectives, timelines and other variables that help scope out the foresight project. A few examples are provided to explain the different ways in which scanning can be conducted. Scanning can be composed of one foresight method such as a literature review, or a group of methods like panels, literature reviews, and SWOT analysis. The depth of each method can also vary. For example, data collection from the literature review can be extensive or limited by number of years, sources and terms. The scanning process, as it is determined, can take place at any time during a foresight project. For instance, scanning may be conducted to scope out the project and choose the methodology; it may be used again to explore the topic in greater depth to inform panels or to gather further information in order to take action (Popper, 2008).

Popper (2008) outlines different scanning approaches, as per combination or order of methods that may be used depending on the objectives of the project, i.e., building cooperation, facilitating competition or producing visions of the future. Bengston (2013) also outlines two conceptual models of scanning systems and methods used to improve scanning. A different approach is posited by Inayatullah (2008) that includes multiple stakeholder perspectives as well

as a deeper level of examination of their mental models of the future. Figure 6 provides a revised depiction of Figure 5 as a complex foresight process. This diagram takes into consideration the non-linearity and somewhat messy nature of a foresight process. “The scanning process, with context provided by scenarios, can bring into prominence other unusual events that may appear at first in our peripheral vision…” (Gregory, Harris, & Ogilvy, 1998, p. 5).

The documented methods used for scanning are numerous. Procedures used for gathering information and perspectives include a number of informal and open activities, such as talking to people, skimming printed material and exposing yourself to new experiences, as well as several more formal and systematic methods, such as conducting literature reviews, surveys,

Figure 6. A representation of the foresight process



benchmarking, and bibliometric analysis (Bhimji, 2009; Popper, 2008). Fundamentally, this step of scanning requires an open mind, curiosity, an ability to organize, and the skill to keep focused (Schwartz, 1991). Additionally, it also helps to know what to look for, e.g., looking for wild cards, broad scanning for emerging trends through volumes of material or being able to anticipate a change in public policy (Molitor, 1977; Schwartz, 1991), and to have the technical expertise to use some of the more sophisticated methods. Several specific tools are also available

in the foresight literature to aid in a likely second step of scanning; organizing and analysing the information acquired. A sample includes the futures wheel, STEEP, futures triangle, trend and driver analysis, causal layered analysis, system maps, cross-impact analysis, impact likelihood, scenarios, issues trees, and expert panels (Bengston, 2013; Bhimji, 2009; Inayatullah, 2008; Popper, 2008).

Scenarios.

Scenarios, also referred to as scenario planning, forecasting, visioning or alternative futures, is a critical area of foresight (Dator, 2009; Hines & Bishop, 2015). It had been developed in the mid-1900s, in the context of military planning during World War II and furthered by Herman Kahn and the RAND Corporation in its application to other fields. Since then, its use has grown significantly throughout the world in government, business, nonprofit and hybrid sectors (Popper, R., & Directorate General for Research, 2009). Gregory Van Alstyne (2010) provides a good review of the historical development of scenarios. Successes have been touted by large corporations such as Royal Dutch Shell, experts in scenario work such as Peter Schwartz, and scenarios continue to be used by non-governmental organizations, such as the United Nations, and a range of governments, including Canada (Bengston, 2013; Schwartz, 1991).

The use of scenarios in addressing complex problems is promising, however, the literature shows the field is ambiguous and evidence of scenario effectiveness could be strengthened (Georghiou, 2008). Also, insights into counter-productive scenarios are limited in the literature (Mietzner & Reger, 2005). These findings coincide with the overall call in the literature for more empirical research on measuring and demonstrating foresight impacts (Amanatidou, 2017; Bourgeois, 2014; Calof & Smith, 2012; Könnölä et al., 2011; J. Smith, 2012; Volkery & Ribeiro, 2009). To use scenarios effectively and make an impact on addressing complex challenges, scenarios need to be widely and well understood; especially in terms of how they could be considered counter-productive, effective or can become more effective (Healey & Hodgkinson, 2009). In addition to advancing foresight and its use, these insights can be critical as complex challenges are time sensitive and resources need to be expended wisely (Jose Ramos, 2011).

In foresight literature, scenarios are both referred to as a methodology and a description of stories that depict different worlds. They are used, for example, to reduce surprises, understand risk, envision alternate futures and offer ways in which to discover and explore new strategic options (Wack, 1985a).

> …scenarios, and the rigorous yet imaginative, participatory process of envisioning them, provide the sponsoring organization or team with a high quality, multifaceted, shared mental model, such that subsequent strategies and initiatives may be built in ways that are more attentive to change and resilient in the face of uncertainty (Van Alstyne, 2010, p. 71).

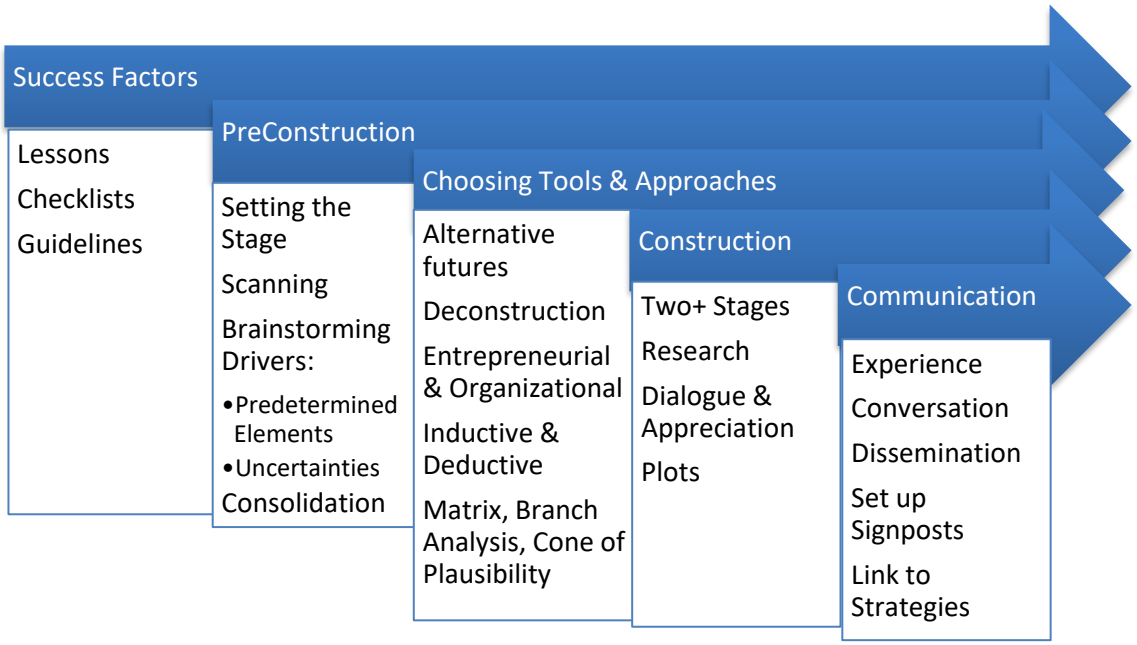
In some circumstances, the literature shows scenarios as the focus of the foresight activity with limited use of other foresight methods creating the impression that scenarios define foresight. In other circumstances, scenarios are portrayed as a part of a foresight project that incorporates many other foresight tools of which scenarios are only one component. Foresight practitioners have indicated the greatest value in scenarios is not necessarily in getting the scenario "right" as much as in the process of developing and having alternate scenarios with which to work (Flowers, 2003; Wack, 1985b). On deeper examination of scenarios it is evident that they are more than stories and can hold greater importance than appears at face value. For example, the development of scenarios points to an important social process of exchange and learning as well as an art of creating and envisioning a potential future. This shared meaning-making process can yield positive benefits including shared identity, surfacing and potentially resolving different perspectives and preempting disputes. Variables in which change can dramatically affect possibilities are identified through this process. Identifying these variables might not otherwise take place but even more importantly without a suitable process the story may not resonate with the participants, thereby losing opportunities to establish connection and motivation.

Foresight literature defines scenario development as a social process that can change people, organizations, and the future (van Der Heijden, n.d.). "…scenario work is more about changing more than just mental maps: it is also about addressing emotional, spiritual, and cognitive frameworks." (Gregory et al., 1998, p. 17). This methodology allows for the potential

of societies' members to be a part of creating the future, reframing their present or deconstructing the present and the past (Inayatullah, 2008). This occurs through the art of deeply connecting with individuals and groups on all levels. "Our real target was the microcosms of decision makers: unless we influenced the mental image the picture of reality held by critical decision makers, our scenarios would be like water on a stone… I cannot overemphasize this point: unless the corporate microcosm changes, managerial behavior will not change; the internal compass must be recalibrated." (Wack, 1985b, p. 84)

There are many ways of conceptualizing the scenario process. Figure 7 is one analytical outline of the scenario process. Other useful illustrations of the scenario process can be found in an article by Gregory Van Alstyne (2010). The components outlined in Figure 7 do not necessarily occur in the linear fashion as illustrated. However, it is the general path likely to be followed. There is a significant amount written on this process and not all this literature will be reviewed or addressed in detail. Rather, some key elements/possibilities of the process are highlighted to provide a general overview. As the documentation indicates, there is no correct way to progress through a scenario process. Rhydderch (2009) and Dator (2009) offer a sample of informative summaries and step-by-step descriptions of the process.

Figure 7. Describing the scenario process



Based on the literature, the scenario process can begin with a review of success factors and then a preconstruction phase. As with most practices, scenarios have success factors that have been garnered from practice. Some of these are presented as lessons learned, guidelines or checklists. They are important to take note of before the scenario process begins (for example: Hines & Bishop (2015), Ogilvy & Schwartz (n.d.), Rhydderch (2009), Bezold (2010) and Schwartz (2011)). The next step in the process is setting the stage, i.e., determine the overarching elements of the project, such as: who should be involved, what is the key question being addressed, and what is the time horizon for the project. Once this has been delineated the information gathered and assessed through the scanning phase becomes critical. However, not always is there a separate scanning process and even if there is a scanning process brainstorming during a workshop session can help identify key drivers (Dator, 2009). Further research or scanning can be completed throughout the scenario process as necessary.

The foresight literature continues with presenting drivers that are typically grouped into predetermined elements and uncertainties. Predetermined elements are those which are known to occur, such as aging of the population. Uncertainties are the drivers which are plausible in that they can occur, but it is uncertain as to whether they will occur, such as shift of attitudes. Once these groupings are made there is a consolidation of the groupings into only a few key drivers. This entire stage is not simple: it involves significant engagement of the participants and there are various tools, concepts and approaches that can be used. Furthermore, the deepest concerns of the participants need to be utilized (Dator, 2009; Ogilvy & Schwartz, 2004; Rhydderch, 2009; Wack, 1985b).

The next phase, which can also be considered as a part of the preconstruction process or/and as a separate process is Choosing Tools & Approaches. Literature indicates that there are several approaches to scenarios, for example, scenarios used for organizational learning are different than for generating strategic options or for deconstructing scenarios (Inayatullah, 2008; van Der Heijden, n.d.). A strategic organizational use of scenarios can be very different from examining alternate futures for a community (Dator, 2009). Also, the methods used, which can vary significantly, can be part of an inductive or deductive approach. The matrix method is an

example of what seems to be a commonly used scenario tool (Ogilvy & Schwartz, 2004; van't Klooster & van Asselt, 2006).

Construction is the stage that in the foresight literature refers to the actual development of the scenarios. This can take place in several stages but at minimum Wack (1985b) recommends two stages to allow for refinement of the first set of scenarios. Scenario development usually takes place in workshops with several participants. Further research is conducted to develop the elements of the scenarios and better understand the connections between the drivers. The critical pieces of this stage are the dialogue generated and the appreciation of the scenarios. At this point, views of alternative worlds are generated and old worldviews are dismantled (Wack, 1985a). The participants need to be fully engaged with these scenarios in order for them to be useful (Schwartz, 1991; van Der Heijden, n.d.; Wack, 1985a). Flowers (2003) argues how crucial the writing of the plots can be to bring a story to life in such a way as to make it important and memorable for the participants of the process. Kees Van Der Heijden (n.d.) further describes the cognitive dimension of scenarios and how building the "scaffolding" between tacit knowledge and codified knowledge means that scenarios have to be customized for a specific group. There are several ways in which, usually three to six scenarios, are developed, including: four generic futures, including a wild scenario and an official future, using archetypes, and using two key drivers (Dator, 2009; Hines & Bishop, 2006; Ogilvy & Schwartz, 2004).

Finally, based on the literature, communication can be understood as a distinct end phase because it is a critical step once the scenarios have been developed. Whilst the literature does note communication is important throughout the foresight process, it is not mentioned enough relative to its importance, as will be identified in the dissertation's findings. Communication includes the methods used to fully engage the participants and the rest of the members of an organization or community, such as in foresight preparation, facilitation and dissemination. These methods provide for capacity in which people can perceive a scenario emotionally, experientially, mentally and spiritually. The literature suggests that communication is also a link to strategy development, implementation and continued foresight activities, like monitoring (Gregory et al., 1998; Rhydderch, 2009). How well this communication takes place is fundamental to the process of connecting with the microcosm of the manager and the

organization (Wack, 1985b). Significant resources are expended through the invaluable use of various art forms and design processes to communicate effectively (Bleeker, 2009; Candy, 2010; Gregory et al., 1998; Raford, 2012; Van Alstyne, 2010).

Strategies.

The strategy process or strategies in foresight is usually the last component of the foresight process to be utilized to produce outputs. From the portrayal in the literature, foresight strategies are like traditional strategy development (or strategic planning) and implementation; vital and well-recognized functions in management. Foresight does not substitute the traditional planning process in strategic planning but rather augments it using various foresight methods and widening the approach taken. Activities for both foresight and traditional strategic planning traditionally encompass research, assessment, communication, deliberation, decision-making, action and monitoring. However, foresight has a stronger focus on assisting executives to be creative in working with uncertainty and change further into the future than traditional strategic management. It also helps the organization to develop insights by working with more depth and breadth on external elements and positioning itself strategically. Traditional strategic planning, on the other hand, tends to be driven more by internal elements, quantitative data, and implementation (Macklin, 2010). In other words, foresight focuses more on why and what to do. Traditional planning in management is more directed at how.

To explain the differences further, one difference in the foresight strategy process is that it usually follows a scenario process or other similar foresight tool that has been used to create images of alternative futures. This difference provides a key added value in that the participating members are prepared through shared mental models to anticipate, adjust and re-perceive reality for common action. Another difference is certain foresight methods and techniques are applied to the strategies process. For example, wind-tunnelling tests the robustness of potential strategies against scenarios of the future. Further, the literature describes the foresight strategy process as a continuous change process that promotes the enabling of an emerging future through shared learning and engagement, visioning, flexibility, risk-taking and creativity (Hines & Bishop, 2006; Ogilvy & Schwartz, 2004; Schwartz, 1991; Wack, 1985a, 1985b).

The literature suggests that the strategies stage is an important area of foresight because it can translate the work completed in the first two foresight areas into action and a continuous and full foresight process. Popper (2008) refers to this stage as the action and renewal phase. Hines and Bishop (2006) talk about this area as the visioning, planning and action phases. The foresight documentation continues by indicating it is not necessary to complete this component of foresight, as scanning and scenarios can both be completed independently. However, without strategies the experiences and information garnered from the previous areas can leave a "so what" question for the participants (Gregory et al., 1998). Thus, it is evident that a foresight strategy process can be invaluable to facilitating tangible outcomes and plan for action and ongoing review. Moreover, Van Der Heijden (n.d.) writes, incorporating a strategic conversation, stakeholder engagement, multiple views and maintaining an appropriate balance of convergence and divergence of ideas to minimize group pathologies, such as groupthink, are typically vital steps in this strategy process.

From a review of the literature, the researcher has defined strategies overall by six key components:

1. assess the organization and develop a strategic vision (van Der Heijden, n.d.),
2. use alternative futures to test the strategic vision and assess robustness of options (Ogilvy & Schwartz, 2004; Rhydderch, 2009; van Der Heijden, n.d.),
3. come up with new options (Wack, 1985a),
4. develop contingency plans (Rhydderch, 2009),
5. develop and communicate an action plan (Gregory et al., 1998), and
6. monitor (early indicators), evaluate and reassess (Gregory et al., 1998; Hiltunen, 2010; Rafael Popper, 2008; van Der Heijden, n.d.).

The first component, as outlined by foresight literature, consists of assessing the organization and/or situation to determine what the vision is and what is the value being offered by the organization. The strategic planning literature outlines several ways in which this can be done. Foresight also offers unique ways of formulating visions and determining aspirational futures. Van Der Heijden (n.d.) explains one way as developing the business idea. His approach is to bridge tacit with codified knowledge about the organization to identify key information

about the organization. Seeing strategic planning as a social activity, Van Der Heijden believes that for strategy to be effective it needs to be "…shared among people: it must be articulated, discussed, and negotiated" (van Der Heijden, n.d., p. 12). Only when an organization understands itself can a strategic vision be developed.

Once a strategic vision has been formulated, the foresight material indicates alternative futures can be used to test the vision. This is called wind-tunnelling (Rhydderch, 2009; van Der Heijden, n.d.). At this point, the opportunity also exists for strategic conversations that examine implications and assumptions surrounding the vision and the alternative futures. Strategic options can then be tested for robustness along multiple dimensions and within each alternative future. For example, options to expand services or geographical presence can be assessed for success in each alternative future as well as along economic and social dimensions. Moreover, the literature concludes that new strategic options and contingency plans can be generated through this iterative social process (Rhydderch, 2009; Wack, 1985a).

The last two components in the foresight literature, develop and communicate an action plan and monitor, evaluate and reassess, are critical for engaging the stakeholders in an ongoing strategic and learning process (van Der Heijden, n.d.). Developing and communicating an action plan is typically the function of the traditional strategy process. Although communication is critical throughout the foresight process as well as within the strategy development and testing process, communication is essential to continue to engage stakeholders and inform them of the action that needs to take place. Further, monitoring the trends and early indicators for alternative futures allows for continual assessment and adaptation of the strategic plan (Gregory et al., 1998; Hiltunen, 2010). Evaluating the strategy process provides for lessons learned and future adjustment of the process. Finally, the material indicates reassessing the strategic plan on a regular basis, as carried out in traditional strategic planning processes, can enable an emerging future for the organization that is strategically aligned to its uncertain and turbulent contextual environment (Popper, 2008; Van Der Heijden, n.d.).

Some overarching principles can help in guiding the strategies part of foresight; a few of which are presented here. Each strategic process must be customized to the specific group

involved (van Der Heijden, n.d.; Wack, 1985b), as no group of individuals or situations is identical. Communication and understanding of the self, including personal perceptions or worldview, are critical to the strategies process; as already alluded to earlier in this review (Gregory et al., 1998; Ogilvy & Schwartz, 2004; van Der Heijden, n.d.). Manager involvement to guide the process as well as decentralized management to enable organization flexibility, responsiveness and engagement are helpful principles for strategies (van Der Heijden, n.d.). As such, a shared worldview in a decentralized environment is important for organizations to be able to anticipate and adjust to new circumstances (Wack, 1985b). Other than following principles and guidelines available in the literature, there are other ways in which foresight can be considered impactful in certain areas and these are discussed under the Outputs section.

Outputs.

It is important to be able to distinguish outputs from the other phases of the foresight process as the goals of conducting other phases is to achieve results or outputs. Outputs or foresight results can be described in several ways, such as: process related or product related; positive, neutral or negative; immediate, short-term or long-term; intended or unintended; and primary, secondary or tertiary. To further explicate, specific examples of commonly offered strengths/opportunities and weaknesses of/threats for foresight factors and outputs drawn from the literature are:

- Strengths and opportunities (benefits) identified: Collaboration, engagement, socio-ecological and well-being dynamics, dialogue and new technologies, linking to other approaches
- Weaknesses and threats identified: resource and time intensive, not matching policy cycle, science and art balance, technical issues, not well evaluated, disengagement, alienation

This part of foresight is critical because all these factors impact upon the overall outcome. Outputs are ultimately related to how and whether outcomes are impacted. In aggregate, the monetary and non-monetary costs incurred need to be assessed to fully appreciate the value of foresight in a holistic sense. Thus, this section focuses on how foresight stages, as well as foresight generally, could be considered efficient, collaborative and especially effective.

Foresight's effectiveness in a project can be based on its results, such as: if benefits, goals and/or overall outcome is achieved or improved. Collaboration is likely achieved when cooperation occurs, and stakeholder participation and engagement are realized. Efficiency can result per phase and/or in the overall foresight process if there is a wise use of resources. The circumstances dictate an appropriate combination. Offering insights into a foresight process that can improve this mix as it addresses complex problems can be invaluable.

There are several benefits that have been attributed to each stage of foresight and to foresight in general. The effectiveness and collaboration in one stage also depend on how well the other stages are performed. Examples of process benefits include: if issues are better understood broadly by members of society a higher quality dialogue may occur and more options may become visible; by experiencing what the world could feel like could help alter behavior; and if scenarios can be delivered with fewer resources, more people may be exposed to scenarios as a tool and lens to address complex challenges at different levels of society.

Through an analysis of the literature, this dissertation offers seven representative ways in which the full foresight process can be considered effective, by assessing whether:

1. product outputs have been implemented;
2. product outputs are modified on an ongoing basis;
3. participants can anticipate issues and trends and how well the organization(s) or community(ies) can respond;
4. product outputs are appropriate and well developed;
5. decisions are informed;
6. process benefits have changed individuals and groups; and
7. process benefits have included building collaboration and networks.

There are more than seven ways offered in the literature in which foresight can be considered effective. Alternatives are important because some approaches are more applicable to certain types or objectives of foresight projects. For instance, the goal of the project may not be to change individuals and groups. Thus, a measure in this regard would not be appropriate. Several other ways to think of a foresight project as effective or impactful are identified in the literature

and can be drawn upon per the development of a project specific evaluation (Calof & Smith, 2010; Havas et al., 2010; Hines, 2016; Iden et al., 2017; Piirainen et al., 2012; Poteralska & Sacio-Szymańska, 2014; Rohrbeck & Schwarz, 2013). Yet, it is important to keep in mind that the ultimate measure is whether the foresight project results in the alleviation of complex problems, for example, as determined over time by well-being measures and achievement of specific concrete common goals. As such, the seven means to determine effectiveness must also be related to the ultimate measure.

For foresight a key concern is that product outputs and process benefits are realized. Further, if the action plans are implemented and modified as changes occur in the external or internal environment, this is a sign that the process and/or product have to some extent been effective. A further indicator of effectiveness is whether issues and emerging trends have been prepared for in such a way so that parties involved are able to respond well and in a timely manner. Next, whether the product outputs are appropriate and informative to the organization and decision-makers is vital. Wack (1985b) provides a description of how difficult it can be to discover and address the concerns of decision makers so that they find the foresight process relevant.

There are two fundamental process outputs that can reveal whether strategies have been effective in addressing complex problems change within the individual or group and change related to the complex problem. A significant impact on how groups view or feel about the world can ultimately result in changes in behaviour. For example, a strategic conversation on water resource management can result in individuals knowing more about factors relating to the complex problem and placing an increased importance on addressing this problem personally. This can have a direct and significant impact on the complex problem, especially if this effect is visible in many individuals. Another example of a process output that may demonstrate effectiveness is the collaboration and networks that can result from the foresight process.

Finally, the ultimate measure for foresight project effectiveness is direct impact on complex problems. This is particularly important as there are countless activities and resources placed on this objective, and yet it is very difficult to achieve progress. Although complex

problems are inherently difficult to address, their improved management as soon as possible is critical and needs to be ascertained (Jose Ramos, 2011). Foresight offers both an opportunity to directly and indirect impact complex challenges. The effects may or may not be beneficial and should be assessed. For instance, increased collaboration does not necessarily lead to greater impact on addressing complex problems. A strategy can also have minimal benefit or even be a detriment for several reasons, such as second or third impacts, inappropriate implementation, unexpected result and delayed impact. As such, these are reasons it has been difficult for the foresight literature to provide definitive determinations on direct impacts on outcomes. Although not definitive, assessments and value judgements are still critical and are made.

Summary.

This chapter has reviewed two critical areas: change, support and assistance mechanisms as well as foresight. These areas are important to place foresight within many different functions that need to be fulfilled so that people can advance work on complex problems and their consequences. Several topics have been addressed throughout this chapter, for instance major topics have included:

- how people are influenced;
- different theories of change;
- how to design, govern and manage change;
- how to support and assist people to perform activities and sustain their well-being during their efforts;
- what foresight is and its history;
- foresight activities globally and nationally;
- ways in which foresight can be thought of as effective; and
- how foresight is practiced.

The section on change mechanisms has offered several key pieces of information. First, change can be brought about in various ways as well as can be significantly hindered. As such, many different tools and approaches are being used to address complex problems. Second, behaviour change may be a way in which to facilitate cognitive and cultural change. Targeting groups rather than individuals to change may also be more effective, but to bring about system-

wide change it is best to target change at various levels. Third, a crisis holds potential for deliberate change to be more quickly adopted. Fourth, governing and managing change is important to decision-making and implementation of efforts.

Assist and support mechanisms also have an important role in alleviating complex problems and their consequences. The complete negative effects of significant change, such as during times of crisis, are unknown but likely to be numerous. Transitioning well through this complex situation and its challenges are important so both people and systems can cope and adapt. Assisting people through preparation, support, and advocacy strengthen their efforts and allow a society to stay true to its humanity. Furthermore, many people have a need to become more involved and informed. The literature presents foresight as a tool and a conceptual lens that are a very good fit for the types of mechanisms required in working with this complex situation.

Foresight can be considered as an emerging discipline that still has developmental issues, e.g., ambiguity and no governing body, and has not yet been instituted as a practice into the mainstream of Canadian society. Foresight is valuable and has spread globally, but in Canada it has a limited albeit strong capacity for its size. Overall, the field is dynamic, seemingly haphazard and for many reasons seen as elitist. More transparency and consistency in the field would be positive. Literature has indicated foresight can address a complex environment and complex problems with broad and incremental effectiveness. As the field is difficult to comprehend and there have been many ways in which it has been described. It has been likened to an onion with layers of depth to fully appreciate both the concepts and the practice. An outline of foresight process elements and, through literature analysis, seven ways in which foresight can be considered effective are provided. To conclude, foresight is a relatively new and encouraging field that is as much an art form as a science.

Chapter 4: Literature Review for Foresight and its Use for Humanity's Long-term Well-being

This dissertation responds to a research question which asks how foresight has been used for complex problems and how dialogue-based foresight can assist society in alleviating complex problems and their impacts. This chapter presents findings from the literature regarding foresight's use for complex problems and humanity's emerging crises as well as useful material to develop a conceptual framework and research design for this research. Foresight is examined in this chapter in terms of its use for complex problems, how foresight has been assessed, ways in which its potential impact on complex problems can be considered as strengthened, and areas of the foresight literature that could benefit from further research and documentation. The literature review is completed with a presentation of a conceptual map to pull the main concepts of the review chapters together. This chapter builds on the context of the previous reviews of complex problems and their context; understanding people; mechanisms of change, assistance and support; and foresight.

Use of foresight for complex problems.

Broad approaches to societal change and complex problems in the literature include less commonly cited areas of foresight, such as transformative foresight, civic scenarios, civilizational foresight, or social foresight (Hassan, 2014; Hebinck, Vervoort, Hebinck, Rutting, & Galli, 2018; Kahane, 2002, 2012; Könnölä et al., 2011; Slaughter, 2009, 2012). The first two approaches target practice and focus on the impacts of dialogue, participation and shared understanding for achieving conflict resolution. Slaughter focuses on a theoretical shift to a critical approach and the use of an integral paradigm (Slaughter, 2004). Other theoretical explorations addressing societal change and current global dilemmas also exist (Hames, 2012; Sharpe et al., 2016; Slaughter, 2013). Clement Bezold among others, Kuah (2015) for instance, advocates for the concept of anticipatory democracy and aspirational futures as approaches for improved governance (Bezold, 2010a).

Foresight is widely applied to complex societal problems. For instance, efforts have been widely used for development foresight in developing countries, including pro-poor efforts, but foresight still struggles to become mainstream (Bezold, 2017; Bingley, 2014; Bizikova, Pintér, &

Tubiello, 2015; Msangi, 2013; Muliro & Eyakuze, 2013; Pereira, Hichert, Hamann, Preiser, & Biggs, 2018). However, substantial literature or guidelines on foresight application for the long-term well-being of humanity or for societal foresight is lacking. Perhaps, the concept is difficult to "box in". As a whole, there is a call in the material for foresight to better address complex problems and societal change (Bezold, Juech, & Michelson, 2009; Dahle, 2007; Destatte, 2010; Könnölä et al., 2011; Riedy, 2009). Moreover, there seems to be a gap in the foresight literature on how to address urgent complex challenges in a transformative way. Research in this area is gaining importance as humanity faces a pressing timeline in its struggle for survival. Foresight is typically a lengthy process with incremental benefits being more prevalent than transformative outcomes.

Foresight is a social process that promotes full engagement of participants to be prepared for a turbulent and uncertain environment. Beyond this, foresight provides an opportunity to help create a livable future. In terms of complex problems, this is essential. Guidelines for ways in which foresight can be best used for different contexts and purposes are already found in the literature. Undoubtedly, further developing and applying new guidelines for a dialogue-based foresight approach to address urgent complex problems can be important for outcomes. Foresight authors have indicated using guidelines rather than prescriptions is imperative to not limit the creativity or art in the foresight process, provide for the uniqueness of each foresight project and for foresight to maintain the ability to be flexible in a complex system (Bhimji, 2009; Gregory et al., 1998).

Assessment of foresight.

This section examines the literature in regard to assessing foresight. First, assessments are usually conducted as either a unique assessment of a foresight activity or tailored to a foresight type, like environmental. Second, the emphasis of these assessments is on impacts and approaches. Third, there are many theoretical articles related to performing assessments. Fourth, it is extremely difficult to conduct assessments, especially in any comprehensive manner. Fifth, overall the literature has established that foresight provides a range of benefits in various areas and is, thus, broadly and incrementally effective. Further research is required to strengthen and

elaborate on this finding. Finally, the authors of foresight material offer the view that it is possible to improve the effectiveness of foresight.

Although several different approaches have been used to assess foresight effectiveness, thorough systematic work still needs to be completed in this area (Amanatidou, 2014; Georghiou, 2003; Johnston, 2012; Lundsgaarde, 2011). Research approaches that have been used so far to assess effectiveness include evaluation, case study, quasi-experimental, survey, action-research, literature review, meta-analysis and participant observation. Common to evaluation research, the assessment needs to be tailored to the exercise's rationale and objectives because no one model fits all situations (Georghiou & Keenan, 2006; Meissner, 2013). Assessment, as such, tends to be labelled and contextualized per type of foresight such as corporate or policy, (Georghiou, 2003; March et al., 2012; Masum et al., 2010; Rohrbeck, 2012; Rohrbeck & Schwarz, 2013) or more often treated uniquely per the specific exercise or activity. For example, foresight has been evaluated in thematic areas; e.g., March et al. (2012) completed a review of 52 water related scenarios and Volkery & Ribeiro (2009) completed a review of 52 evaluation documents on environmental related scenarios.

Assessments also focus on specific approaches or impacts, for instance, a participatory approach (Destatte, 2010; Helm, 2007; Karuri-Sebina & Rosenzweig, 2012; Quist & Vergragt, 2006; Rask, 2008; J. Robinson, Burch, Talwar, O'Shea, & Walsh, 2011) or learning impacts (Bootz, 2010; Robinson, 2003; Schartinger et al., 2012; Van der Steen & Van der Duin, 2012). Many theoretical papers and literature reviews address the development of assessment frameworks, methods or indicators. Additionally, researchers design a new evaluation or assessment framework for their research studies (Amanatidou, 2014; Chermack, 2005; Georghiou & Keenan, 2006; Ron Johnston, 2012; Könnölä et al., 2011; Piirainen et al., 2012; Schartinger et al., 2012; Van der Steen & Van der Duin, 2012). Difficulties occur in conceptualizing foresight types and impacts at different aggregate levels and systematically addressing all the pertinent entangled variables while trying to account for other assessment issues and ambiguity in the emerging field. There is at least one exception to having a unique assessment. Terry Grim (2009) proposes a way to measure foresight effectiveness based on general best practices for foresight as per Bishop and Hines' (2015) guidelines and a maturity

model to determine an organization's level of maturity in practicing foresight (Grim, 2009). Additive and interactive effects further complicate assessments. An additional limitation is that many organizations who may assess effectiveness do not publish evaluations (Bourgeois, 2014).

The overall findings of the literature on measuring foresight effectiveness are that foresight is widely and incrementally effective with a number of impacts in a number of different areas (Calof et al., 2012; Calof & Smith, 2010; March et al., 2012; Masum et al., 2010; Meissner et al., 2013) but the extent of this effectiveness, the mechanisms involved and the specific benefits of foresight per type of exercises could benefit from further research and evidence. A number of scholars and practitioners believe the potential exists for increasing the effectiveness of foresight exercises (Riedy, 2009; Wilkinson et al., 2013). Other findings indicate policy use and implementation of action items arising out of foresight exercises are suboptimal or not achieving their potential due to a number of challenges, such as timing, physical location and skills (Riedy, 2009; Van der Steen & Van Twist, 2012; Wehnert & Wolfram, 2009). Regardless, the types of impacts are numerous (Amanatidou, 2014; Johnston, 2012). Alternatively, the continuing survival of foresight, foresight practitioners and departments are an ultimate indicator of effectiveness (Miles, 2012).

Miles (2012), as a sample of more specific research results, highlights the role of the co-producer and the significant influence constraints and context can have on impact (Miles, 2012). Volkery and Ribeiro (2009) further argue the target group needs to be engaged and the manner in which scenarios are conducted are very important. Schartinger et al. (2012) discover major thinking does not change as a result of foresight. Foresight experts determine that the direct value of foresight is not assessed in larger aggregate sets and this would be helpful for measurement (Amanatidou, 2014; Calof & Smith, 2010). Appropriateness of foresight approach is identified as critical to achieving impact (Johnston, 2011; Miles, 2012; van der Steen & van Twist, 2012).

Can certain applications of foresight be considered to have stronger positive impacts than a rudimentary foresight approach in current practice?

With all these tools, methods and approaches in what ways can foresight be considered as more impactful in certain circumstances than others? Drawing from the literature as outlined in

the above sections on foresight, there are several ways in which variables can potentially be improved. Improvements can be made, for instance, depending on the ways in which the process takes place and the methods are used, fit between context and use of foresight type, and application of new technology. This section begins with the scanning phase as an example of how foresight overall can be considered more effective, efficient and collaborative. It then builds on this information as the analysis reviews whether these ways can be applied to scenarios and strategies. Further, the section looks at whether these techniques can also be applied to the foresight process as a whole.

First, the literature is clear; implementation of scanning is not trouble free. Broad implementation factors of an organizational scanning system or a one-off scanning project can have a significant impact on the results of scanning. To illustrate, basic issues arise from factors such as lack of: resources, management support, appropriate participation, open thinking and foresight knowledge or experience (Lesca & Caron-Fasan, 2008). Even then, performing the scanning phase well is not an easy task. For instance, the material is overwhelming and the reader can miss change signals, especially the wild cards (low probability but highly disruptive events) are easily discounted because they are not actively in consideration. Interpreting the wide array of information is fraught with challenges such as cost, time and complexity (Bengston, 2013).

Second, as Bengston (2013) mentions, certain approaches to scanning may be more effective than others (pp. 4-5). Approaches can be distinguished in various ways including use of a participatory or other type of approach that has a particularly suited focus and selection of certain methods or the way in which methods are combined. Third, in the foresight material, there are means identified in which scanning approaches are already being improved; namely using new technology and social media. A key benefit of the digital age allows for more efficient use of resources and, thus, more available resources to scan the horizon. Digital scanning methods include, for example, the use of the Internet and databases for MetaScanning (reviewing scanning resources already compiled by others), webcrawlers, RSS feeds, listservs, blogs, and other online social methods (Bengston, 2013, pp. 8–10). This suggests the opening of the possibility for greater breadth and depth of scanning and because less resources are required, for

more organizations and individuals to perform scanning. Other secondary benefits may include facilitating diversity and creativity in the scanning process and in the use of particular methods, like literature reviews.

Improving individual methods, or in other words, sharpening the toolset is a fourth way in which scanning can potentially be more effective and is likely implemented by practitioners. This can include assessing and refreshing the use of methods and how they are carried out. Alternatively, linking to related literature and practices in other disciplines is likely to provide assistance in identifying prospective improvements (Rohrbeck & Bade, 2012). Next, linking foresight activities to other activities, such as a department retreat, can potentially create more effectiveness, efficiencies and greater collaboration overall.

Although improvements to scanning can be made in general, the degree of effectiveness of these as well as other improvements and the specific conditions under which better results are most likely to be observed has to be determined through assessing practices. Not all improvements actually result in more effective scanning, or are effective to the same degree under a range of diverse conditions. Thus, the sixth way scanning can be more effective is by tailoring scanning to the context in which it is being conducted. The literature clearly indicates this through the ways in which it is used, the guidelines offered and in the importance of art to successful foresight practice.

Literature shows scanning used to specifically address complex problems can be more effective if it is tailored to one or more contextual factors, for instance, complexity, global progress, type and location of the problem, and social environment; and by linking to other disciplines and their applied methods, such as organizational, business and policy studies (Molitor, 1977; Rohrbeck & Bade, 2012). Global progress measures could potentially be used to help assess and frame the status of complex problems. Alternatively, there may be certain success factors in including community members on expert panels to interpret data on fresh water shortages in the developing world or there may be certain types of information that should be collected to address whether community members should be included. By drawing lessons from context and other disciplines key mitigating factors, such as those described by Amanatidou

(2014), for addressing specific complex challenges can also be identified, e.g., multi stakeholder participation and dialogue, addressing multiple perspectives, cross-sector collaboration, data sharing and governance issues. The scanning process can then be further tailored. Thus, assessing the ways in which the scanning approach for addressing complex problems can be considered effective and the ways in which effectiveness may be improved is important: with potential for greater efficiencies and collaboration.

There are further examples to illustrate the ways in which scanning could potentially be tailored and improved in its impact on complex problems. For example, the effort and methods assigned to understanding the history of a complex problem could be more clearly outlined. The ways in which scanning currently is employed in addressing complex challenges and the effectiveness of these approaches could be better understood and assessed. Additionally, defining the extent of public engagement that is ideal for scanning and related concerns as well as how engagement can best be facilitated are important. More research addressing these types of areas, including testing different approaches to identify which methods are more appropriate for different circumstances and which approaches provide better results in meeting objectives and improving outcomes could help improve scanning more generally.

Finally, the foresight literature is suggesting that scenarios, especially but not exclusively, hold out a promise for more democratic engagement of citizens in the creation of the future (Nandy, 1996). The opportunity for citizens to become equal participants in the deliberation of key issues by addressing goals and values is an exciting prospect democratically and practically (Amanatidou, 2017). Policy and organizational literature often promote wider engagement of stakeholders for buy-in and successful implementation of plans. Furthermore, engaging members of society on an ongoing basis to the extent of co-creation, changing worldviews, planning strategies and carrying out implementation can provide insights and ideas that would otherwise remain hidden (Baccaro & Papadakis, 2008; Charalabidis & Koussouris, 2012; E. Lindquist et al., 2013; B. L. Smith, 2003).

However, on deeper analysis there are many facets of the foresight process that do not always seem to be democratic, e.g., involving mostly managers and executives in the process and

leaving out members of society from strategizing. In addition, the literature indicates there are some circumstances in which democratic engagement may not be possible, can be very impractical or may not produce better outcomes, such as concerns of confidentiality in military strategies (Bourgeois, 2014; Ernst, Biß, Shamon, Schumann, & Heinrichs, 2018; Helm, 2007; Nikolova, 2014; Saritas et al., 2013; Visvanathan, 1991). Further research on the implications of participatory foresight or including more lay citizens fully in the stages of the foresight process will be important to address the potential for more democratic engagement.

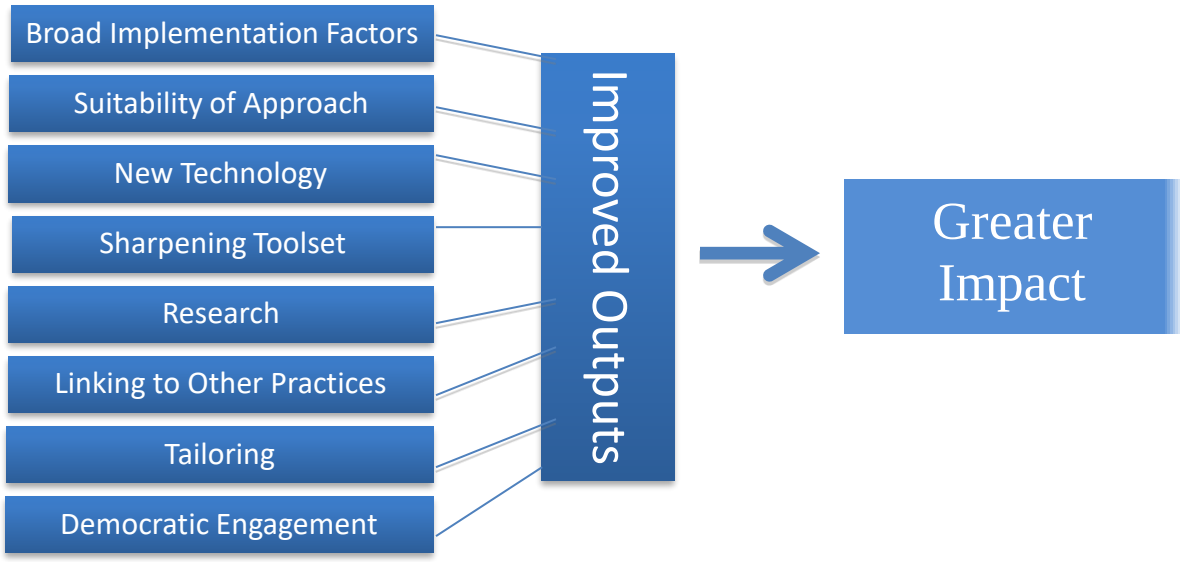
Other elements, such as linking and tailoring, as discussed for scanning, are broadly generalizable and apply to scenarios and strategies as well. As an example, linking scenarios to other related disciplines, such as policy, design or dispute resolution, could offer insights into using the process for addressing complex problems, e.g., how can scenarios be used to facilitate conflict resolution by presenting participants with different worldviews. Alternatively, using new technology to convey scenarios or strategies more clearly and realistically could also assist with effectiveness and efficiency (Saritas, 2018).

Based on the literature, this analysis draws out at least eight possibilities for which the different stages of foresight could potentially be considered to generate more positive impacts overall in alleviating complex problems and their effects. For instance, these eight adjustments to one or more of the foresight stages could translate into, for example, more outputs being created, more effective outputs being produced, greater expedience in the foresight process, stronger impact on outcomes, and specifically targeted outputs/outcomes generated for the problem. Figure 8 illustrates this section.

These improvements alone are insufficient unless they result in greater positive impacts on addressing complex problems. The evaluation literature has shown that making these causal links is not an easy task, but it is necessary to some degree because outputs can be meaningless or even detrimental to the cause if they are not leading to results, such as wasted resources, secondary negative impacts, unintended negative impacts and long-term impacts. To illustrate, legislation within North America for prohibition of alcohol in the early 1900s addressed a society ‘ill’ or what could now be termed complex problem of over-consuming alcohol, but the impacts

of the prohibition had a significant negative impact on these societies. In addition, accessing related literature for evaluations of foresight could be very helpful in assessing the degree of impact of foresight, comparable to using education literature to determine the extent of learning taking place.

Figure 8. Ways in which the foresight process could be considered more impactful than a common rudimentary foresight process



Improvements can apply to foresight as a whole not just its phases such as scenarios and strategies. For example, both the foresight approach and the scanning area within foresight can be tailored to address complex problems by creating better linkages to other disciplines and the pertinent context in which complex problems occur generally and specifically. The approach, selection of methods used for a foresight project and how the methods are used are critical for success (Popper, 2008). In addition to tailoring the foresight approach for a particular project, foresight processes in general tend to be studied and applied differently depending on contextual categories. For instance, business directed foresight is referred to as corporate foresight and technical innovation directed foresight is referred to as technical foresight.

Thus, it seems that foresight practice could be more effective if taking into consideration the context in which it is practiced by assessing for and tailoring foresight practice to the

contextual category and overall purpose of the project, like improving innovation or generating organizational competitiveness in businesses and addressing public policy challenges in the environmental sector. As such, foresight may be more effective in addressing complex problems if it is tailored (Rohrbeck, 2012; Schoen, Könnölä, Warnke, Barré, & Kuhlmann, 2011). Furthermore, foresight effectiveness can be assessed through linking the knowledge acquired from this process to literature and methods used in other disciplines related to complex challenges (Molitor, 1977; Rohrbeck & Bade, 2012).

State of the practice and literature.

Overall, foresight is being used more, it is increasingly inclusive, the practice has integrated new information and communication technologies which has shortened the foresight process, and foresight's application to specific areas has grown. The literature indicates it is likely that foresight will expand further, especially in the social and technical spheres, and will likely be more transdisciplinary (Dator, 2017; Saritas, 2018; Smart, Foresight U, & FERN teams, 2017). Unfortunately, overall support for graduate level education in foresight programs is still limited worldwide (Smart et al., 2017).

Noteworthy is the enduring quality of many of the themes Slaughter (2009) had presented in his article on findings from an international research project: State of Play in the Futures Field (SoPiFF). These themes reflect the state of foresight practice in 2009 and suggestions on making foresight as a field and practice more effective. Some of these included (pp. 16-17):

- foresight lacks social legitimation;
- foresight quality is inconsistent;
- foresight use is "patchy" and often based on the goodwill of individual decision-makers;
- foresight is not embedded into specific contexts;
- foresight needs a civilization/societal focus;
- foresight lacks international coordination and learning across the field;
- foresight needs to be embedded into the context of education and other institutions;
- foresight literacy and mainstreaming are required; and

- foresight's contribution to global sustainability needs to be defined.

Foresight literature overall is fragmented, diverse and rapidly expanding. There is an abundance of literature on foresight methods, descriptions of foresight and its processes and approaches, relay of personal experiences, success factors, and information per types or uses of foresight. However, the breadth and plurality of the literature has been achieved to some extent at the cost of depth and cohesiveness. Recent literature reviews, in addition to the article written by Varum and Melo (2010) recommend further work be conducted in linking and grounding the foresight literature (Iden et al., 2017; Rohrbeck, Battistella, & Huizingh, 2015; Saritas, 2018).

In addition, there are other areas which could benefit from further examination, such as foresight evaluation and empirical measurement of foresight impact/value, and descriptions of foresight practice in the private sector. Although the application of foresight to societal concerns has increased and likely will increase further, more research and literature on this topic is necessary (Adegbile et al., 2017; Iden et al., 2017; Saritas, 2018; Smart et al., 2017; Wiebe et al., 2018). All the above gaps in the literature are also enduring from previous findings (Dreyer & Stang, 2013; Rafael Popper & Directorate General for Research, 2009; Vecchiato, 2012). A more in-depth general list of ways to strengthen the literature is offered in the next section. Specific avenues of research are reviewed in Chapter 11.

Strengthening the literature.

It is difficult to keep track of all the developments related to foresight because there are so many disciplines related to foresight such as public administration and education, and so many areas within foresight, e.g., technical foresight and corporate foresight. Although the foresight literature is burgeoning, there are many areas in which it can be strengthened and gaps can be filled. Indeed, efforts are underway to continuously strengthen the literature as evidenced by the ongoing published works. The areas identified in this review are not exhaustive and can be disputed for their priority. The latter is highly subjective and will vary due to the perspective of the individual making the determination. The review begins by describing some of the topics that could benefit from further research and examination and then includes a list of these topics as well as others identified in this document.

There are several ways in which the existing literature on foresight (including its stages) and complex problems can be strengthened through further research and analysis. For example, another in-depth systematic review of the literature on foresight and its stages can be conducted to draw out success as well as hindering factors from specific cases for specific types of foresight. A different qualitative lens would also be helpful in reviewing the foresight process as a social process. Other literature on social processes, such as cognitive psychology, can have a bearing on foresight. The marriage of design and foresight also holds great potential and needs further attention than what has been provided (Clarke & Craft, 2018). Although very informative empirical evidence has been provided by some authors, the literature could be strengthened regarding theoretical explanations of the mechanisms of how foresight produces benefits (Chermack, 2011; Glick et al., 2012).

It would be helpful if the foresight literature would be more consistent and clearer in presenting foresight as a field. Literature reviews have called for addressing the fragmentation of the literature by a more organized, cohesive and in some cases theoretically-based approach (Bradfield et al., 2005; Iden et al., 2017; Rohrbeck et al., 2015; Saritas, 2018; Slaughter, 2009). The state of the research in the literature and findings could also be documented more often by interested foresight academics to provide a synthesis which offers easier accessibility to non-academics and external parties on foresight developments and provides guides on developments in foresight research for practitioners. For instance, these types of documents have been invaluable in this dissertation process.

Empirical research continues to be critical in providing evidence as to which practices for foresight may be more effective. Generating a typology of the different kinds of foresight approaches used in practice would be helpful. More research can also examine how problems and solutions are being conceptualized and then addressed in foresight practice. Additionally, identifying the state of scanning practice, such as, who conducts foresight activities, what do they do and how, would further enrich this work. It would also illuminate whether there are ways in which the impact of foresight stages are affected by the way the practice is carried out, e.g.,

inherent team work or organizational issues. Literature could also be stronger on when foresight does not work as expected and why.

Areas for further research include, but is not limited to:

- Conduct a further examination and comparison of the development of emerging disciplines as compared to foresight;
- Describe overall usage of foresight in the private sector and non-profit organizations as well as in specific regions of the world as linked to complex societal problems;
- Address questions regarding factors impacting successful collaboration among the four sectors (private, public, non-profit and mixed);
- Assess trade-offs in foresight practice, such as internal versus external function, funds diverted to communication efforts and evaluation, and scaling-up the practice;
- Identify the diverse stakeholders involved in foresight and their roles;
- Conduct a research study to assess public knowledge and perception of foresight;
- Identify clear distinctions between the application and benefits of current non-foresight practices and foresight practices used for similar purposes in all sectors;
- Provide more consistency and transparency in foresight;
- Develop more state of the science type summaries to facilitate appreciation of advances in the field;
- Review specific foresight exercises that have occurred in-depth and present more instances when the exercise may have been counter productive;
- List foresight projects/exercises, including Canadian, and helpful tools;
- Examine how integration and linking of foresight and other approaches is best utilized from case evidence and delineate results of these activities;
- Attempt to identify the extent of indirect foresight activities in a given country such as Canada, e.g., used for strategic planning;
- Conduct empirical research as to which practices may be more effective in addressing complex problems in Canada, how and when;
- Generate a typology of the different kinds of foresight approaches used in practice;

- Identify the state of foresight practice in Canada, such as, who conducts scanning activities, what do they do and how;
- Identify ways in which the impact of a foresight activity is affected by the way the practice is carried out, e.g., inherent teamwork or organizational issues;
- Conduct an in-depth systematic review of the literature on foresight stages and activities to draw out success as well as hindering factors from specific cases, particularly on participatory approaches would be essential to examining ways in which democratic engagement is possible and can be beneficial;
- Use a different qualitative lens in reviewing the scenario process as a social process;
- Link to other literature, like cognitive psychology for social processes, that has a bearing on foresight and can continue to be utilized to understand and strengthen foresight theory; and
- Develop guidelines for a tailored approach to address urgent complex challenges in a transformative way.

This dissertation meets part of this challenge by furthering the knowledge in some of these research areas. For example, a list of Canadian foresight projects will be provided in Chapter 7 as research findings on the activities of the foresight community in Canada and empirical research is conducted on foresight as a potentially more effective practice than traditional methods to addressing complex problems.

Conceptual map for the literature reviews.

As background, the world is in a situation in which its survival, at least in its current form of humanity and as it has developed into civilizations, is in jeopardy. The number of interrelated global complex problems and associated risks, such as nuclear war, sustainability, climate change and pandemics, are putting humanity at the brink of crises. Taken as a whole, this predicament has arisen from several factors of which this dissertation proposes a major one is a lack of fit between human systems and the current context including complexity. To explain further, human systems do not fit with or yet have the capacity to engage with rapid technological advances in a secure way. For instance, nuclear arms development, biogenetics and artificial intelligence are some examples of technological developments beyond the scope of

society to manage or minimize related societal ramifications. Human systems and the development of human society have endangered natural systems with global complex problems apparent in climate change and sustainable development.

Furthermore, in a world of complexity the institutions, processes, and paradigms society functions within are seemingly unable to adapt in the time necessary to address these upcoming crises. Several trends and indicators reveal the increasing likelihood for a potential global crisis to occur (Marien & Halal, 2011). Individually, as global complex problems, or as a cascading effect these global problems could destroy or change humanity as people currently know it. To explain further, the complex adaptive systems may not adapt in such a way so as civilizations and basic human values can fundamentally continue to exist. Several terms in the literature have been used to refer to this complex situation, for instance, global or planetary emergency, global megacrisis, a crossroads or turning point for humanity, time of transition, human crises, civic collapse, and "world-scale systems crisis" (Marien & Halal, 2011, pp. 66–68). Humanity's struggle for survival is mostly used in the remaining chapters of this dissertation to refer to this complex situation.

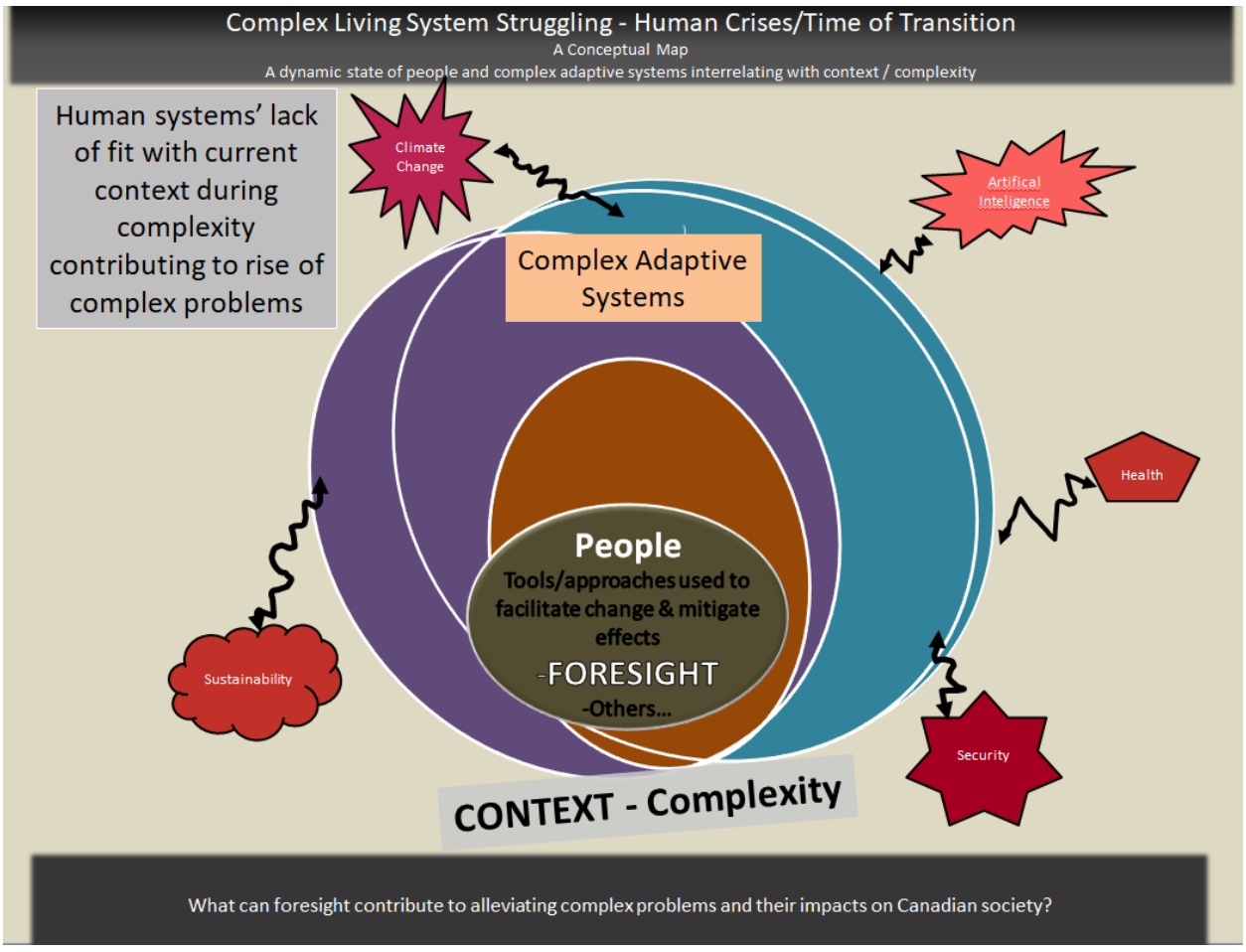
The conceptual framework for the literature reviews, as illustrated in Figure 9, depicts the interaction between five broad areas of literature: complex problems, context/complexity, complex adaptive systems, people, and foresight. This interaction takes place in a dynamic state of people and complex adaptive systems interrelating with context/complexity. Depicting and understanding the interaction of the five factors impacts upon the research providing the answer to the question found at the bottom of the diagram: What can foresight contribute to alleviating complex problems and their impacts on Canadian society?

Specifically, the research that is proposed will illuminate the role foresight has played and can potentially play in assisting, supporting and influencing people to change the critical factors creating a struggling complex living system. People are using tools and approaches to facilitate change and mitigate the effects of this complex situation. Foresight is one of these tools or mechanisms. People may choose to focus on one or more of each of: the problems, the

systems, the tools/mechanisms, and/or the context. For instance, some groups focus on knowledge dissemination in the health care system.

Although foresight is not the only or the major approach used to address complex problems, this dissertation submits it is a part of an overall process in which its role needs to be identified. Foresight itself typically does not operate on its own but in connection with other tools used to implement it and other efforts to address complex problems; these tools and efforts also have an impact on people, the problems, as well as foresight's effects. As such, foresight needs to be placed in context with these other efforts and tools. The question is whether foresight in conjunction with other tools can ameliorate the problems by reducing their number and/or severity or increasing their manageability as society transitions within their effects.

Figure 9. Conceptual map connecting literature review sections



Summary.

This literature review built on the context provided by two previous reviews to identify work that has been completed directly related to this topic, formulate an appreciation of the study area and offer suggestions for building the knowledge around foresight. Specifically, the chapter: (i) presented information on the use of foresight for complex problems and society's well-being, (ii) described the existing approaches that have been used to assess foresight, (iii) identified ways in which foresight can be considered to have stronger impacts, (iv) reviewed the state of foresight practice and literature, (v) offered ways in which to strengthen the literature, and (vi) provided a conceptual map for the literature reviews.

Foresight has been widely used for complex problems and this work has also been defined in different ways in the literature, e.g., transformative, social and civilizational foresight. However, the literature on this type of foresight is limited. Yet, there are several insights that can be gleaned from foresight's use that could potentially assist in alleviating urgent complex problems in a transformative manner. Experts have already begun to take steps in this regard.

There are many articles on the assessment of foresight. Some of the conclusions are: there is not one form of assessment for all of foresight, it is very hard to complete a comprehensive assessment, foresight can be improved, and more research is required to explore broad and incremental benefits. Based on the literature review, it is also evident that the foresight practitioner's ability, and client's or participant's openness and capacity to engage with foresight information and processes are important to the achievements of a foresight project but a number of other dynamics also have an impact. These additional dynamics include the context of the project, quality of foresight process and products, and link to senior decision-makers (Calof & Smith, 2010; M. van der Steen & van Twist, 2012; Volkery & Ribeiro, 2009). Upon an examination of the foresight scanning process and ways in which it could be considered effective in addressing complex problems it is evident that foresight as a whole and all components of the foresight process (scanning, scenarios, strategies and outputs) are relevant. This dissertation offers eight different ways which can result in foresight impacts being judged as stronger.

On the whole, the reviews of foresight practiced internationally and the current reviews of foresight literature indicate foresight is expanding and improving, as per some of the suggestions above on increasing effectiveness, like using new technologies. Yet, there remains ways in which to strengthen the literature and the practice, such as conducting more empirical assessments of foresight's value and increasing foresight literacy.

A conceptual map concludes the chapter by linking the basic concepts of the literature reviews from Chapter 2 to 4. The next section in this document builds on this chapter to develop a conceptual framework and the beginning of a methodological framework for the primary research required for this dissertation.

Chapter 5: Conceptual Framework for Research

A conceptual framework (Yin, 2009) has been derived from the first four chapters of this dissertation to suggest propositions on the assessment of dialogue-based foresight outputs and outcomes as a technique to address complex problems in Canada. These propositions will be tested through the research process to develop insights into assisting society to address complex problems and ultimately address the research question (Imenda, 2014). The objective of this chapter is to outline the conceptual framework that will be used in the dissertation to, in part, address the research question. This framework is also important because it provides a way in which to portray and understand the variables, theories and assumptions involved in the research process and how they interrelate.

Design of the framework.

This framework is based on identifying the impact of a foresight approach, dialogue-based foresight, on different types of complex problems based on the effects on people and outputs produced by foresight. To single out these effects or outputs, groups of variables, i.e., complex problems and foresight, have been manipulated across the cases while some variable groupings, i.e., context, people, foresight extras, change factors and alternative interventions, are considered as equally randomized throughout this framework. This framework assumes data will be collected through various means for data triangulation and satisfaction of data collection needs. Based on its applicability to the timeframe and type of findings required for this dissertation: data was collected through four methods, i.e., comparative case study, document analysis, surveys and interviews. These methods, which are explored in the next chapter on research design, have been chosen to identify and examine specific groups of resource inputs, activities, outputs and outcomes in a foresight project as well as potential mediating and confounding factors, such as context and change factors.

Resources, such as time, funding, and people are utilized in every foresight project. The traits of these resources impact on the affects and effects of the project. Activities selected through the literature review process have been grouped into three key areas that are expected to impact upon a foresight project's resulting outputs and final outcomes: delivery of foresight, types of foresight and extras, or additional significant features. Figure 10 depicts the interaction

of these groupings. These three groupings have been chosen because they are feasible and comprehensive of high-level important activities. Delivery of foresight refers to the quality and mechanism of implementation of the foresight project. Type of foresight includes dialogue-based foresight projects, primarily qualitative, with the use of a range of methods including quantitative methods such as simulation modelling. Mechanisms that enhance the impact of a foresight project are grouped under the heading of extras. Contextual factors also have influence, and these include the surrounding external circumstances related to the specific project and the problem being addressed, like new technological developments. Finally, alternative interventions are actions or events that are specifically directed towards assisting individuals to work with complex problems, such as social innovation practices and/or governmental initiatives. Change factors include those mechanisms that impact change, such as institutional inertia. These groupings need to be assessed to better understand and isolate the role of dialogue-based foresight, the primary independent research variable. Data is collected for all areas.

The conceptual framework.

Through the process of examining the factors and elements of the conceptual framework, as per Figure 10, the contribution of dialogue-based foresight including outputs and outcomes can more clearly be delineated. Outputs and related changes in outcomes are based on participant and non-participant perceptions as well as document analysis within each complex problem area. Outputs include, for example, a document or contacts made. Outcomes are identified as improving upon a targeted situation, for example, conservation of resources, maintaining or increasing well-being, and in terms of whether people are more prepared to transition to the forthcoming changes while minimizing potential negative effects.

Working assumptions for the framework.

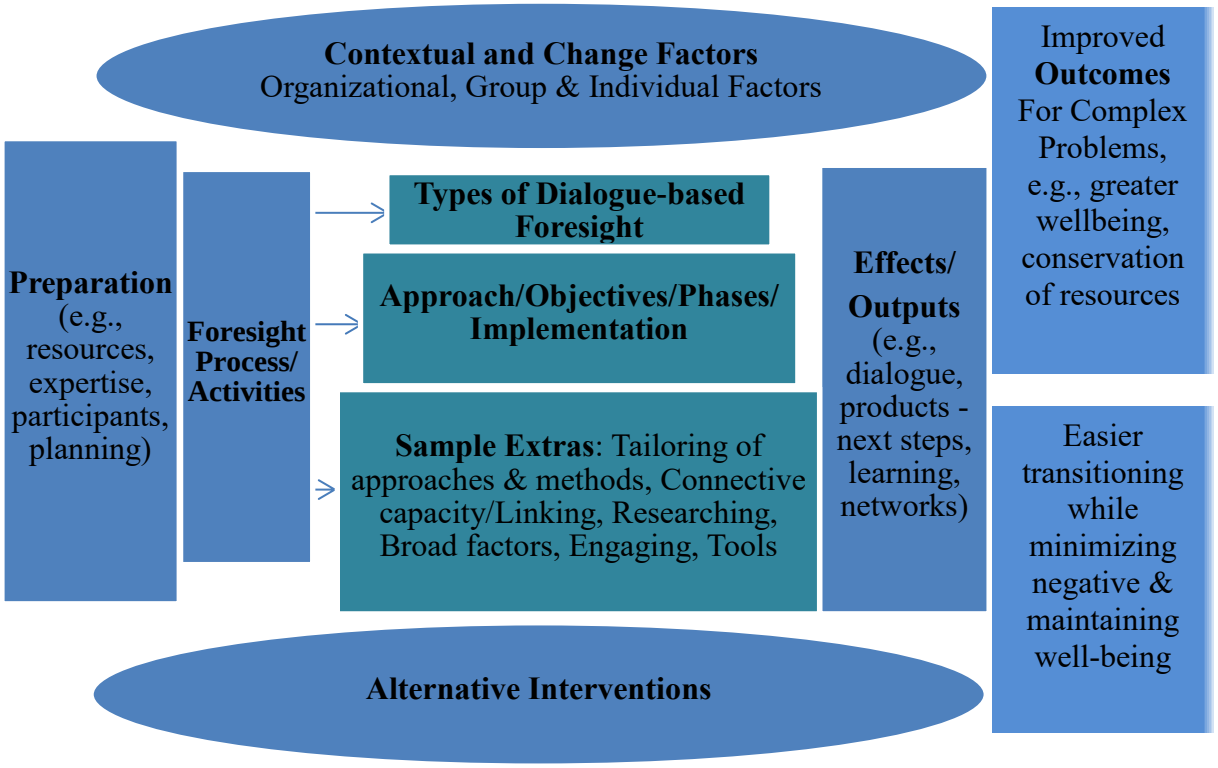
Several assumptions form the function and structure of this framework and are outlined below.

- Some approaches to foresight can be more effective than others in addressing particular types of complex problems.

- Dialogue-based foresight has the potential to offer insights into significantly improving efforts addressing complex and/or urgent complex problems.
- Ways in which dialogue-based foresight has impacted complex problems is by either one or more of: process, delivering outputs, affecting some conditions (factors) associated with outputs and/or directly affecting outcomes.
- Certain factors improve or hinder addressing of complex problems through an indirect affect on outputs, i.e., moderating, mediating and confounding factors.
- Outputs, outcomes and factors can be the same, e.g., collaboration can be each.
- These outputs, outcomes and factors can be identified in aggregate (mostly) through a literature review and further defined through research.
- Preparation and alternative interventions have an impact on process, factors, outputs and outcomes.

Figure 10. Conceptual framework

How are foresight practices used to address complex problems and how can dialogue-based foresight assist society to alleviate complex problems and their effects in the Canadian context?



What is the potential role of foresight in alleviating complex problems?
What is being done to address complex problems? Describe.
How does dialogue-based foresight then (possibly) impact outputs and outcomes?

Propositions.

The following propositions are tested through this framework:

1. Most of the major findings from the research on the perspectives of the Canadian foresight community confirm findings found in the foresight literature (as findings are appropriate and available).
2. Dialogue-based foresight projects have significantly changed/assisted individuals and groups of people. The changes/outputs have had a positive impact on the management of complex problems in Canada.
3. Dialogue based foresight is widely and incrementally effective with numerous impacts in several different areas. The value of dialogue-based foresight is worth the resources invested. The degree of this effectiveness, the related mechanisms and the specific benefits of dialogue-based foresight per project have been studied per the cases in this dissertation.
4. Process, context, tools and alternative interventions have a significant effect on the success of dialogue-based foresight.
5. Process outputs are greater than product-based outputs for dialogue-based foresight. Process outputs have a greater impact on complex problems than product outputs.
6. Dialogue-based foresight provides product outputs and they further outcomes.
7. Inclusion and engagement of a wide range of stakeholders has a positive impact on outcomes.
8. Outcomes related to complex problem management have improved if dialogue-based foresight was used. This improvement is likely due to the use of dialogue-based foresight.
9. Dialogue-based foresight has played an important role in creating effective, efficient and/or collaborative ways address complex and/or urgent complex problems and their effects.
10. There are at least eight ways to increase the positive impact of foresight and thus improve outputs, these are: broad implementation factors, suitability of approach, new technology, sharpening toolset, research, linking to other practices, tailoring and democratic engagement (as per Chapter 4).

11. Dialogue-based foresight has been used to address Canadian complex problems and can play a unique and valuable role in continuing to work with these types of problems. This is much more likely to occur: within certain parameters such as appropriate use of foresight and well conducted foresight, with the advancement of foresight research and practice and with attention to multi-level organizational and system issues.

This framework is seeking aggregate results and not a specific or exact measure for a particular output. In consideration of this point, dialogue-based foresight is typically a small to medium sized group activity. Thus, changes are occurring in individuals as well as groups of individuals. In several instances larger communities, like a region or a practice area, are targeted, however, scaling dialogue-based foresight to work with large communities is a challenge (Wilkinson et al., 2013). Assessing mid-term outputs rather than immediate outputs and cumulating individual responses can capture group changes. The social dimension and other process dimensions also assess group changes. The last step in the framework is the development of broad insights into how dialogue-based foresight can assist society's efforts to alleviate complex problems and their effects.

Although this framework aids in the identification of the interplay of several elements that then result in specific consequences, there are several important unintended consequences arising during social processes and creative spaces through various mechanisms such as emergence and serendipity. These are not identifiable in advance or necessarily rational but critical nonetheless. Through the research design flexibility and depth is provided to ascertain unintended consequences, for example, through qualitative methods.

Causality and interaction between complex problems and the dialogue-based foresight process.

This section attends to the issue of causality regarding the dialogue-based foresight process and the specific complex problem to which it is applied. Due to the complexities involved in foresight and the surrounding context involved, including many variables and time lapse since the projects were completed, a direct causal attribution cannot be achieved. Rather,

correlating factors and a contribution analysis has been conducted to determine whether dialogue-based foresight could have significantly contributed to the outcomes of the complex problem during the period of study.

It is the purpose of this dissertation to determine whether dialogue-based foresight, if well delivered, can contribute to the alleviation of complex problems and their effects. Since there is no one definition of successful foresight, success has been gauged by the foresight practitioners delivering the foresight process, other foresight community members and the clients. Both foresight types, successful and unsuccessful, are reviewed to assess whether there is value in a well-delivered project that is not considered successful as this will provide a comparison of different problems and assess whether certain factors may have implications for alleviating the problem.

Chapter 6: Research Design

The philosophy of using qualitative and/or quantitative methodologies as best suited and feasible for the research is pursued. This multi-method study embraces a grounded, empirical and qualitative research approach to understanding and analyzing foresight activities as they relate to complex problems in the Canadian context. The overarching methodology is a comparative case study design, with an emergent design, using the following methods: document review, survey and interviews. The research began with garnering a better understanding of the foresight community as related to complex problems in Canada. For the purposes of this dissertation, this community is defined as those individuals and organizations that have conducted and/or contracted for a foresight project focused on Canadian content within the last 10 years. Also included are those individuals and organizations that have performed and/or consumed education, consulting and/or research services on foresight for more than one year within Canada in the last 10 years. This step assisted with the selection of specific cases embedded within a diverse set of complex problems.

Once the cases were selected, the study of four cases commenced. Background material had been prepared for each of the four case studies through a document review. Case study interviews were conducted based on the document review to collect further data and triangulate data already obtained. Thematic, pattern, comparative, multi-perspective, and contribution analysis describe the analytical component of the research process. Finally, foresight and complex problem experts were consulted for feedback on preliminary insights. The Operational Table, Table 4, provides greater detail on research steps.

Table 4. Operational table

PHASE 1: COMMUNITY SCAN	PHASE 2: CASES	PHASE 3: INSIGHT DEVELOPMENT
GROUPS	GROUPS	GROUPS
Foresight Professionals Foresight Clients Complex Problems (general) Foresight Graduates Foresight Related Academics Foresight participants	Foresight Professionals Foresight Clients Foresight Participants Foresight Non-participants Complex Problems (general)	Foresight Experts Complex Problem Experts Other Disciplinary Professionals

PHASE 1: COMMUNITY SCAN	PHASE 2: CASES	PHASE 3: INSIGHT DEVELOPMENT
	COMPLEX PROBLEM (Specific SUB-GROUPS) Executives Managers Administrators Technical Experts Community Members Business/Public/Non-profit/Social Enterprises	
RESEARCH STEPS	RESEARCH STEPS	RESEARCH STEPS
1. Research & develop draft scan (identify potential participants and projects as well as key factors for scan)	1. Research complex problem community as well as context for case and write-up Modified Briefing Note	1. Findings
2. Interview 21 key people	2. Interview 3-15 key people	2. Come up with preliminary insights
3. Send out computer survey to 107 people to augment data in scan	3. Repeat for 3 more cases	3. Review more literature as appropriate
4. Thematic Analysis	4. Analyze data: • Data cleaned and coded (use NVIVO) • Thematic, pattern matching and time series analysis • Populate the conceptual framework • Comparative analysis • Contribution analysis • Multi-perspective analysis	4. Revise insights
5. Case Selection	5. Augment information with brief review of 2 additional Canadian cases	5. Interview 8 experts for input
Proceed to phase 2 – ask some community scan questions as part of phase 2 interview		6. Finalize revisions

Different research approaches have been used to assess foresight effectiveness. The literature review has called for further empirical research on the impact of foresight exercises (Amanatidou, 2014, 2017; Bourgeois, 2014; Calof & Smith, 2012; Eriksson & Weber, 2008; Georghiou, 2003; R. Johnston, 2012; Könnölä et al., 2011; Lundström & Zhou, 2011; J. Smith, 2012; Volkery & Ribeiro, 2009). By far the research approach used most for foresight research on impact is the case survey but comparative case study research has been less prevalent. Other

more common primary research methods have included evaluation, quasi-experimental, survey and participant observation (Chermack, 2011; Georghiou, 2003; Macklin, 2010; Schartinger et al., 2012; Soroka, 2016). The bases for assessing these methods for this dissertation have been appropriateness of methodology for objective of research, feasibility, degree of context and depth, allowances for comparative review, and exploration of human perspectives. Table 5 illustrates the criteria and methods assessed for deciding upon research design. These criteria comprise two basic tests of overall appropriateness and feasibility, and three additional criteria based on the literature reviews.

As presented in Table 5, the case study approach has been most suitable for this research due to the fit with research objectives and research parameters, the literature review and literature on research methodology. Survey methods and evaluation methods are adapted and utilized within the case study approach. Quasi-experimental method and participant observation,

Table 5. Criteria for selection of research approach

	Appropriateness	Feasibility	Context & Depth	Comparative	Human Aspect
Case Study	Yes	Yes	Yes	Yes	Yes
Evaluation	Yes	Intensive for effectiveness and approach development	Yes	Not feasible due to length of time	Yes
Quasi-experimental	Not for mid to long term impact	Difficult for full process	Limited	Yes	Limited
Survey	Yes	Yes	No	Yes	Limited
Participant Observation	Prefer a more replicable approach	Long length of time for full process	Yes	Not feasible due to length of time	Yes

two other methods that have been used in similar research, have not been feasible or strongly suited to this research in which comparison of in-depth case studies are targeted. The former approach did not provide for an in-depth study of the context, and the latter was not feasible for a review of effectiveness of foresight exercises that already took place.

Multiple perspectives are used throughout the research design, including the conceptual framework, and through gathering and analyzing the data. This is accomplished through the research design, questions in the data collection process and through considering multiple perspectives in the analysis. The relative impacts provide for measuring changes based on foresight approach type, delivery success and type of problem. A further outline of multiple perspectives used includes:

- Design: formative (process), summative (results), context, relative (impacts per case), varying projects
- Data collection: Document review and questions, as appropriate, to identify *values/beliefs, per role* (e.g., org./personal), *lenses***:** transdisciplinary, temporal, mixed methods, multiperspective, pragmatist, multi-level, probe *human dimensions*: emotional, spiritual, cognitive, physical, social and additional information as appropriate
- Data analysis: per stakeholder and sector type, values and role, impacts across cases, human dimensions (as in data collection)

Measuring different perspectives is important to garnering comprehensive research results: understanding how people are affected, how their roles affect change, how changes have an impact over time and what types of impacts can be seen from the foresight process and outputs as well as outcomes. To elaborate, motivations to participate depend on the stakeholder's role and personal perspective. Stakeholders can be grouped according to foresight participants and nonparticipants and their personal perspectives as well as per role: client, foresight team member, policy-maker, industry member, community member, advocate/interest group member, and academic/technical expert. By grouping responses according to stakeholder roles and perspectives different viewpoints can be provided and information can be triangulated. Furthermore, replicability and validity of the research can be strengthened.

Empirical information was compiled, mostly from the foresight community scan, on how foresight practices are being used to address complex problems in Canada. Completed case studies have enabled the development of practical insights from how dialogue-based foresight has been applied to specific complex problems and the value of this practice. More importantly, by using comparative case studies with significant attention to context, people, change factors

and alternative interventions, this discussion is able to present insights into how dialogue-based foresight can assist society in a holistic sense by working with complex global problems and their effects. A comparative case study of dialogue-based foresight for complex problems has allowed for clearer and more in-depth definition of various impacts of key factors that affect complex problems. With the use of a multi-perspective data analysis, a conceptual framework and contribution analysis, these factors have been isolated to some degree and analyzed over a short to medium period, approximately 15 years. Context, change, alternative interventions and human factors are not typically measured as variables but are important and have been identified through this research approach.

An Operational Table, Table 4, is provided to allow for a visual representation of the research method and analysis process. The process has been separated into three phases: community scan, cases, and insight development. The consulted groups and the research steps, including the number of the research sample, are listed within each column. The dissertation supervisory committee and experts have been consulted to vet the steps and provide suggestions from a transdisciplinary perspective as issues have arisen.

The research approach is a study of four cases covering four different complex problems. Thus, allowing for enough material to generate relative assessments and fitting within a feasible time frame for the scope of this dissertation while also allowing for replication of findings (Yin, 2009). The studied cases are dialogue-based foresight projects within four specific complex problem areas in Canada that are also urgent problems on a global scale: sustainability; emerging animal infectious diseases; effects of digital media; and energy. These projects are chosen as cases per criteria identified in Table 6 and discussed in the next section. To augment the findings of the four case studies, a brief review of two additional dialogue-based foresight projects documented and assessed previously by others in detail has been provided.

Building on these findings, a further literature review was conducted in particularly relevant areas, including governance literature and transdisciplinary practices, as related to the results and through areas that are working to improve efforts to address complex problems. Eight foresight and/or other disciplinary experts working with complex problems were consulted to

refine these insights. These individuals were identified through the research process and augmented information searches and selected based on interest, expertise and availability.

Foresight project selection.

During the foresight community scan, foresight professionals were asked to delineate good quality projects delivered by recognized foresight practitioners, as well as whether the cases have been considered as successes or non-successes. The reason for selecting good quality delivery is quality is a key consideration in this emerging applied field that is best controlled for in this study. By holding this factor constant at a level that does not leave the quality of delivery as an unaccounted variable controls this factor in the research. There are a significant number of foresight projects that have not been delivered *well* and thus have been excluded from the research design (Anonymous, personal communication, July 2014). Selecting a mix of projects for study in which some are deemed by foresight professionals and/or project proponents as successful and other projects are deemed as not successful allows for assessing value contributed as per case findings for two different project variables. For instance, projects deemed as unsuccessful by project proponents may still contribute benefits with the aspects of interest being what type of benefits and the extent of benefits. It is also important to know if projects deemed as unsuccessful may still have valuable outputs that are worth investments made and whether, for example, successful projects can provide transformative outcomes.

The dialogue-based foresight projects have been selected based on the following criteria: a Canadian case completed within the past ~15 years, ease of access to information and individuals, recognized by foresight practitioners as quality delivery, and as outlined in Table 6. The reason for selecting these parameters is to create the feasibility for completing this research and for studying diversity while maintaining similar conditions across cases and problems to assess the impacts of limited variables. With the understanding that finding cases meeting all these conditions is difficult and not always possible, alternatives have been outlined. For example, if the four cases cannot all be on different scales, the preferable alternative is to have most cases at different scales. Variation across problem areas is preferred. Foresight projects tailored for different scales, i.e., separate approach for communities (Bezold, 1999), are important but it is not within the scope of this dissertation to address different scales as a

variable. Evidently, it is also important that the selected cases' clients and foresight practitioners have been receptive for the use of the case in this research.

Table 6. Case criteria for selection

Minimum Selection Criteria	**Ideal Selection Criteria**
Either an intelligence gathering or long-term vision building process, but both aims towards decisions and actions are necessary	Full definition of Foresight, which includes both an intelligence gathering and long-term vision building process
Full definition of Project with modifications as per above for Foresight	Full definition of Project
Some similarity exists among cases	Variety of cases: in different locations, different topics and small as well as large scales
Successful or unsuccessful determined by at least one foresight professional	Successful or unsuccessful determined by several respondents, case clients & case foresight professionals
Good quality as determined by at least one responding foresight professional	Good quality as determined by several responding foresight professionals
Project occurred within 15 years	Project occurred within 10 years
Interest of the foresight project client and practitioner	Interest of foresight project client(s) and practitioner(s)
Canadian case – Canadian content	Canadian case – Canadian content and Canadian client
At least 75 individuals involved overall	Over 100 individuals involved overall
Access possible with easily surmountable barriers	No barriers to access
Some dialogue is included	Dialogue is prominent

Data collection.

Description.

Data collection has been conducted through mixed methods to triangulate the data. Case study, document review, surveys, and semi-structured interviews have been utilized. To understand the different communities involved, data collection included the completion of one community/environmental scan of the Canadian foresight community, and several smaller scans of Canadian complex problems communities. The first scan built on the initial information gathered on the global and Canadian foresight community as outlined in the literature review chapter. The purpose of this scan is to add to and describe the members, gather information about the foresight practice, garner insights into the way in which foresight is used to address complex

problems, identify potential cases and practices/tools supporting foresight, and views on foresight. The types of information collected is presented in Appendix B. Thus, the foresight community scan, which has begun with an additional literature review to identify the community and its members, has involved focusing, verifying and developing the foresight literature review primarily through a computer-based survey and interviews.

The smaller scans conducted in phase 2 of the research, as per Table 4, are important for understanding complex problem communities in general but more specifically to understand the community per problem area related to the dialogue-based foresight projects examined as cases. Unlike the foresight community scan, these community scans coincide with research of the problem area for a modified "policy briefing note". The information collected and format used to present this information are similar to a policy briefing note with the scan portion expanding the note by identifying and describing the stakeholders involved for each problem area. Secondary data sources provided by the foresight professional or client have been accessed for these scans, followed by a review of the data for clarification, verification and missing of key information by the dialogue-based foresight project client, professional and interviewees also reviewed the information once a near final draft of the findings has been completed.

To provide sufficient context, the complex problem community scans entail a document review (including problem definition, issues, background, stakeholder analysis, STEEP, options and basic information about the dialogue-based foresight project) of each problem area mostly for the time the dialogue-based foresight project took place. A document review of the complex problem area around the time the dialogue-based foresight project was active allows for review of the case context before and after the foresight project. Once the community and the context for the dialogue-based foresight project have been well understood, cases confirmed, and policy briefing note completed, data collection proceeded with interviews. Foresight community scan questions still needing to be addressed or newly emerged, as appropriate and in a limited fashion, were included in the continuing interview process.

Ethics.

This dissertation follows the standard ethical guidelines as set out by the Human Research Ethics Board of the University of Victoria. The research in this dissertation, as described earlier, can be divided into three phases: the first phase is the foresight community scan, the second phase is the case studies, and the last phase is the development of insights. In total there are 14 groups of individuals, as listed in Table 7, that participated in the research and six subgroups of individuals within the case studies.

Table 7. Groups of research participants

PHASE 1: COMMUNITY SCAN	PHASE 2: CASES	PHASE 3: INSIGHT DEVELOPMENT
GROUPS	GROUPS	GROUPS
Foresight Professionals Foresight Clients Complex Problems (general) Foresight Graduates Foresight Related Academics Foresight Participants	Foresight Professionals Foresight Clients Foresight Participants Foresight Non-participants Complex Problems (general) COMPLEX PROBLEM (Specific) SUB-GROUPS Executives Managers Administrators Technical Experts Community Members Business/Public/Non-profit/Social Enterprises	Foresight Experts Complex Problem Experts Other Disciplinary Professionals

The instruments used to collect data have been document review, computer-based survey, semi-structured interviews, and consultation with experts. This section on ethics is structured according to these instruments. There is minimal risk in this research to the participants in that possible harms from this research are not greater than those encountered by the participants in professional life.

The risk for harm occurring is minor in comparison to the value and benefit of the research. Potential harms identified include use of research participants' time, potential travel to

an independent location, reflecting on past events, and sharing of information. These harms could have resulted in minor emotional and psychological discomfort that may result from reflection on past events that may not have been as successful as the participant had anticipated. Loss of privacy and reputation is another low-level risk as the identity of the participant was protected in several ways.

Confidentiality and anonymity have been ensured as much as possible throughout the research process. Informed consent has also been obtained through verbal or implied methods, as signed consent may cause undue stress and effort for the participant. The researcher aimed to minimize length of time required of participants, information provided in adequate time including reminding participants of potential employment policies as appropriate, clarifying the voluntary nature of the exercise including the participant's ability to withdraw at any time and potential for ongoing consent. Although there are limits to the confidentiality the researcher can provide because of the size of the group and the selection of some individuals by potential referral, the researcher has taken extra precautions to hide the identity of individuals through language used in the final write-up and has allowed the participants to review the near final document for potential concerns. Benefits to the participants have included learning from the experience and results of the research, discussing a topic with someone who has a mutual interest, contributing to valuable research and the potential generation of new ideas for participants. Identification of the expert remains confidential unless the expert has wished to be identified and this does not affect the confidentiality of other experts involved. To ensure confidentiality, codes have been used rather than identifying information with the responses.

A near final draft document was sent to all experts and interviewees consulted via email for their review to ensure their confidentiality was maintained and they continued to agree to participate in this research. If the participant had wished to withdraw at any time, they would have been contacted by phone and asked whether any of the information they have provided for the research can still be used. The resulting agreement would have then been documented either in person on hardcopy if the researcher had been on-site, via email (either signatures or email confirmations have been utilized) or phone/Skype (via log). No participants withdrew.

The data collected has been stored on computer files, an external hard drive and memory stick that are all password-protected. The data does not have any identifying information associated with it, rather codes have been used. The coding sheet is on a piece of paper that is in a separate and discrete location. The data is stored for 10 years to provide the opportunity to re-analyze or for alternate purposes such as education or information in the future. At the end of the 10-year period of data storage, the hard drives and memory stick will be deleted or reformatted, and the coding sheet will be shredded.

Specific steps followed.

Beginning September 2015, the first step in the collection of data has been a document review to gather as much information as possible on the foresight community within Canada. The main purpose of this step had been to gain a better understanding of Canadian foresight and its stakeholders, especially as it pertains to working with complex problems. The document review began with identifying potential participants through publicly available information: the Internet and a literature review of magazines, newspapers, government documents and academic literature. This information has not been coded for thematic purposes as the principal purpose of this review has been to identify individuals and organizations for an interview and then a computer survey, as per Table 4.

To ensure that 10 to 25 prominent community members provided their perspective, 21 semi-structured interviews were scheduled with these members. In addition to document reviews, snowball sampling was used to select individuals. Potential interviewees were chosen based on representation of stakeholder groups, extent of participant's involvement in foresight and complex problems enabling in-depth responses, respect within community and lastly random selection within groups. After inviting potential interviewees by phone or email to participate in the research and receiving a positive response, a follow-up email was sent out. This email included a consent form. Notes were taken during the interview with the backup of an audio recording, if the participant provided permission. Codes were used to separate responses from identifying information to ensure participant's confidentiality. Interviews were conducted by phone, in–person and via Skype, and most of the time did not last longer than one hour and 30

minutes. The answers were coded and analyzed thematically using NVIVO software. Survey questions built on the interview questions.

Based on further document searches and interviews, potential participants were identified for the computer survey. An email was sent to these individuals inviting them to participate in the survey. The email included a link to an invitation page which both provided information and details about the survey and acquired the participant's implied consent. Screening of potential participants occurred through self-selection, i.e., participants chose to complete the online survey and delineating questions selected the applicable participants. All data collected has been anonymous. The design of the survey questions was based on filling gaps in the literature, building the foresight community membership, verifying data collected, identifying projects for the case study and addressing propositions that have been laid out in this dissertation. A reminder email was sent out two weeks prior to the deadline. No more than five minutes should have been required to complete the survey.

The second phase of the dissertation encompassed case study research. This included the identification of four diverse cases, as per Table 5. These problem areas and cases were confirmed once preliminary results of the complex problem community scan findings were available. The reason this phase began with a document review is to provide background information on the problem area and identify stakeholders involved. Once identified, the clients and foresight practitioners of the dialogue-based foresight project case were contacted, as appropriate, to secure overall support for the research. If overall support could not be obtained, the case was reassessed and a new case chosen. The reason for this is access to important documents and stakeholders would have likely been unavailable if key stakeholders had not been in favour of the research. Information utilized and generated by the dialogue-based foresight project around the time when the project was active was reviewed for the document review and written up in a modified briefing note format. During this process further sources of non-publicly available information was identified. Access to the resource was attempted through a phone call request to the individual or organization having this resource. The material as supporting information did not need to be coded but has been cited.

Once the modified briefing note was completed, interviews were set up with a sample of diverse stakeholders involved in the dialogue-based foresight project and targeted problem area to be able to access more in-depth information. The procedure for conducting the interviews was similar to the procedure used in phase one of the research. Each interview took no longer than one hour and 30 minutes. Interviewees were selected based on representation of the stakeholder groups involved to ensure diversity, sufficient time of participant's involvement in problem area to provide responses, and to some extent random selection within the groups. Next, the modified briefing note and interviews were conducted for the second case. Data analysis was completed after concluding the data collection for all cases.

Population

The case study research population is composed of a range of stakeholders associated with each case, i.e., foresight clients, foresight professionals, foresight participants, foresight non-participants, involved in the dialogue-based foresight projects selected for study. Interviewees as well as clients and foresight professionals were also consulted at the end of the data collection process as appropriate to clarify, verify and identify key gaps in the data collected.

For the scan of the Canadian foresight community, e.g., practitioners, organization members and clients, 61 individuals have been surveyed and interviewed. Although important, it was not feasible to consult with other stakeholders beyond those identified, such as the broader public. As per phase 3, eight experts were interviewed for feedback on preliminary insights to ensure validity of data and practical considerations were addressed.

Sample

Purposive sampling was used to ensure a relevant sample of the population was chosen per specific fit to a set criteria based on their connection with the dialogue-based foresight project conducted in each case, such as number and type of participant (Bouma, Wilkinson, & Ling, 2008). Semi-structured interviews with 39 case participants and non-participants was completed in total through Skype and/or telephone to minimize time involved for both parties. These people include foresight professionals, foresight clients, foresight participants, and

foresight non-participants. Non-participants have included individuals who were not able to participate in the dialogue-based foresight project but worked within the problem area community thus providing a different perspective on how and whether changes occurred. A sample of questions follows:

Sample overarching questions follow.

- To what extent are specific foresight outputs achieved?
- To what extent are outcomes achieved – complex problems addressed/wellness increased?
- To what extent do foresight outputs lead to positive outcomes in addressing complex problems?
- To what extent are foresight outputs affected by factors and how?
- How do other similar tools to foresight compare in effectiveness?
- What is the broad value of the foresight project in comparison to the invested resources?

In addition to this process, two external cases were selected and added to the case study to build on findings from the other four. These two cases were selected from the ongoing review of case material and the discovery of cases that have been examined in-depth by foresight practitioners. Additional criteria for selection included, as appropriate, the criteria used for selection of the initial four cases. The additional two cases were not explored through primary research or described extensively but were reviewed in brief as per the analysis conducted by the case authors.

Phase three of the dissertation is insight development. The data collection process included contact and recruitment of experts to vet preliminary insights drawn from the previous research processes for validity, gaps and practicality. Experts were selected from the broad pool of experts identified throughout the research process based on interest in participating, relevant knowledge and respected credentials within the foresight community. Once invited either by email or over the phone, eight experts agreed to participate in a brief interview. Upon receiving their agreement, the potential participants were followed up through an email with a consent form. A brief overview of the project was provided to the interviewees through a PowerPoint

presentation emailed and then orally delivered at the time of the interview. The interviews took place in-person, by phone and Skype.

Data analysis.

To achieve systematic rigour, the research methods chosen have triangulated data analysis and allowed for an inductive approach. Once the entire data collection step was completed, the data was cleaned (as necessary) and coded. Upon the coding and thematic analysis of the interview data for the case analysis, comparative, pattern matching and time series analysis was used to analyze the data and appropriately populate elements of the conceptual framework portion of the research framework (Yin, 2009). The contribution analysis technique was then used to further analyze the data collected on the cases in combination with the foresight community scan (Mayne, 2001). Multi-perspective analysis was also conducted and insights documented. Based on the literature reviews related to complex problems and their context, people, change and foresight, as per Chapters 2 to 4, and the analysis of data collected for the dialogue-based foresight cases, the researcher conducted an additional literature review and developed preliminary insights into how complex problems and their effects can be alleviated based on the use of foresight and dialogue-based foresight. At this stage of the dissertation, the researcher consulted with several complex problem experts, foresight experts and/or other related experts to refine the researcher's insights (Creswell, 2003, Yin, 2009).

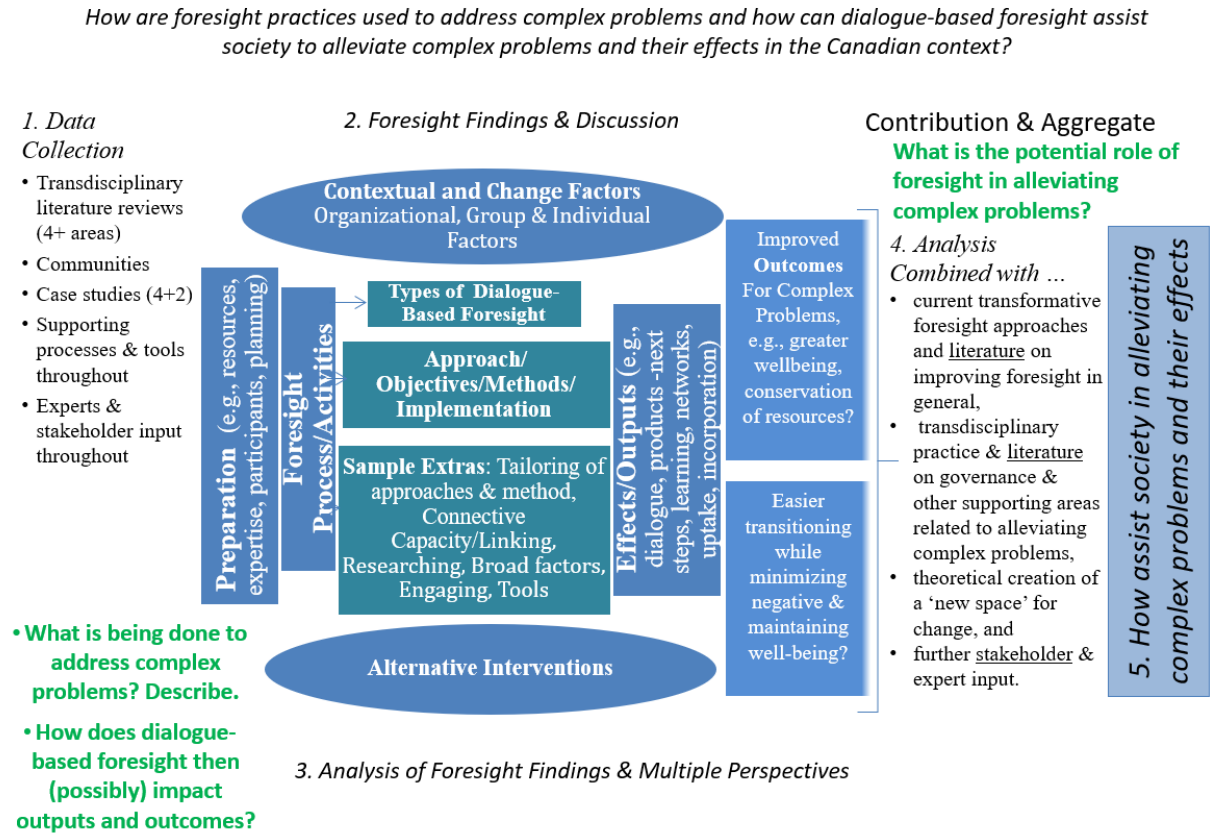
Figure 11 presents the analytic framework for the research design. This image builds on the conceptual framework presented in the previous chapter by adding in research design components, i.e., data collection, assessment framework, multiple perspectives, data analysis and insights. This framework also highlights the aggregate and contribution versus direct causation qualities of this research. Detailed evaluation of specific outputs according to other disciplinary research, e.g., education literature on learning processes, is not within the scope of this dissertation. Rather, overall identification of benefits and aggregate sets of factors was pursued. This has been based on the findings of the literature review that an aggregate examination of foresight effectiveness is desirable and a detailed comprehensive evaluation or a full impact assessment is very difficult to conduct. As such, direct causation has not been sought.

Strengths and limitations.

The strengths of the research approach and methods selected are triangulation, robustness and replication. Limitations exist in case assessments, especially those cases completed several years ago due to: memory distortion; challenges in finding participants; obtaining support from organizations and/or representatives involved in delivering and/or funding projects; access to materials; limited variety of available cases; reliability of data and findings; confounding variables and potential for related biases in the use of subjective methods (Wiek, Talwar, O'Shea, & Robinson, 2014; Yin, 2009). Several methods as outlined by Yin (2009) have been used to address the above limitations and strengthen construct, internal and external validity. For instance, as difficulties have occurred in accessing key documents and individuals, flexibility was built into the research design. The selection of cases has also taken into consideration access to data. Overall, the research design is robust and problems have been addressed as they have arisen.

Other tactics have been applied, as available, to potential limitations of this research. Nevertheless, some limitations remain. Timelines, regular internal meetings and project management skills have been used to keep the project on track. Reliability is an issue with a case design. To counter this, multiple cases and problem areas have been used as well as an examination of multiple perspectives. Further, it is understood from the literature that foresight is very contingent on the context and variables in a project, and as such findings remain unique to some extent. Thus, generalizability is limited. Although causation is very difficult to determine, contribution analysis supported by other analytical methods allowed for a preliminary finding on dialogue-based foresight's potential contribution to working with complex problems and complexity. The use of cases analyzed in-depth by others and insights from experts on discoveries have also strengthened these findings.

Figure 11. Analytic framework for research design



Section 2 Research Findings, Preliminary Analysis and Discussion

This section describes the world of foresight and then its interaction with complexity and complex problems. This voyage of discovery begins with fostering a greater appreciation of the Canadian foresight community; their culture and practice. The second, and last chapter of the section, provides excursions into six different complex situations and the application of dialogue-based foresight to them. Themes from the first chapter in this section as well as each of the excursions in the second chapter in this section are grouped and presented within each chapter. Outcomes from the research on insight development, the last component of the dissertation, will be presented near the end of this document.

Chapter 7 provides an examination into the practice of Canadian foresight, with special emphasis on the views of the Canadian foresight community. For this research, a Canadian foresight community member is defined as an individual who has worked in the area of complex social/policy problems and either: (i) conducted or contracted foresight projects with Canadian content within the past 10 years; (ii) delivered education, consulting and/or research services in Canada for more than one year; and/or (iii) consumed education, consulting and/or research services in Canada for more than one year. Alternatively, he or she could have participated in several foresight activities or an ongoing project. The primary reasons for conducting 21 interviews and a survey with members of this community in phase 1 were to gain a better understanding of the community and its practices, how foresight projects directly related to managing complex societal problems are being conducted in Canada and identify potential dialogue-based foresight projects to analyze in phase 2 of the dissertation. The findings and thematic analysis of these interviews and survey responses are outlined and discussed. Information from a document review is integrated throughout the material.

Chapter 8 provides findings and their discussion as well as preliminary analysis for the second phase of research: case studies. These findings describe how dialogue-based foresight has been applied to complex problems and offer an assessment of the practice in this context from mostly the perspectives of participants in specific dialogue-based foresight projects. Two larger

case studies, the Foresight for Canadian Animal Health project (Fore-CAN) and the Georgia Basin Futures (GBFP) project, and then two smaller case studies, 2020 Media Futures and Canada in a Changing Global Energy Landscape foresight projects, are reviewed. Two secondary case studies are presented in closing. The main reasons for working with case studies were to delve further into the question of how dialogue-based foresight is used to address complex problems in Canada, and develop insights from assessing these practices and their value.

Chapter 7: Inside the Foresight Practice: A practical overview

To appreciate foresight and its potential contribution to addressing complex problems this chapter conveys information on the foresight community and perspectives on the practice from a representative sample of 61 community members. To begin with, foresight professionals working within Canada and/or on Canadian topics are a relatively small community at approximately 200-300 individuals, not including many individuals working in the area in private corporations such as Weyerhaeuser or IBM. Members of this latter group have been difficult to identify and are not significantly represented in this research. Regardless, the Canadian capacity for foresight is limited.

Based on interviews conducted, this research has found members of the foresight community have divergent views on the foresight practice and its concepts. In addition to information about the participants and the findings, this chapter describes the community and its views on the definition of foresight, successes and failures, difficulties in achieving value in foresight, and challenges and opportunities in delivering foresight. The last section describes typologies and foresight projects completed in approximately the last two decades. The findings also provide insight into the critical role foresight may have in addressing complexity and complex problems.

There are several limitations on foresight effectively performing this critical role. In addition to foresight's challenges and difficulties in achieving value as offered by interviewees, limitations include divergent views and the inability or lack of desire to come to a common understanding among the broader Canadian foresight community members (and possibly in other nations) on foresight's key concepts. Even if one argues that divergence is appropriate in the stages of the development of a discipline or field of study and in terms of working with complexity, this is a hindrance to effective performance.

Another limitation is the lack of available information on the Canadian foresight community and Canadian projects undertaken in the last few decades. Without a common understanding and available information obstacles are greater in the: (i) management of expectations, (ii) delivering quality foresight, (iii) formulating an appreciation for foresight and

futures literacy, (iv) using foresight appropriately and (v) addressing challenges within the practice as well as within its further development. As outlined in the literature review, foresight is not an easy field to comprehend. The findings indicate that a broader understanding of foresight and its concepts are critical to foresight practice as well as to determining its potential value and whether it could provide a satisfactory return on investment for a specific initiative. This understanding is pertinent to all foresight community members and most of those individuals who may have some association with foresight in the future. However, it is important to note foresight is a dynamic field and these findings are not entirely novel to all members of the community, as such, some efforts target this predicament on an ongoing basis.

Further to interviewees' suggestions on improving foresight, such as through education and communication, other ways to address limitations on foresight are through: (i) typologies, like corporate foresight, strategic foresight and technology foresight; (ii) guidelines, such as Calof and Smith's "Critical Success Factors for Government-Led Foresight" (Calof & Smith, 2010) and Hines and Bishop's *Thinking About the Future: Guidelines for Strategic Foresight* (Hines & Bishop, 2006); and (iii) a central resource area, e.g., websites like https://www.fernweb.org/globalforesight. Although different types or groupings of foresight can be confusing, they can be important for understanding and improving upon foresight practice. Further research and analysis into defining types and aspects of foresight can be useful and are undoubtedly pursued. In addition, guidelines are important for several practices and have benefited foresight as well. The continuous testing, revision and specification of these guidelines is essential. Furthermore, a central repository of information on Canadian foresight projects or exercises, key concepts, and community members would be helpful for research and the community.

Individuals consulted.

Several individuals were identified and then selected to participate in the research, based on document review and responses from initial interviews. Those interviewed included eight females and 13 males equally distributed among non-profit, profit, educational, and government organizations. Approximately 16 individuals spent more than 10 years working in the foresight area and five were relatively new or less involved in the field. These individuals were also

divided almost uniformly among academics, consultants and organizational practitioners. In identifying the exposure these individuals have had to foresight, 17 of the 21 individuals had indicated that they had been a foresight participant and 12 have indicated that they had been clients. However, once these interviews were conducted it was difficult to identify a strong set of successful and unsuccessful foresight projects. Further, clarification appeared to be required on a few of the concepts around foresight as interpreted by the foresight community. Thus, a survey was designed and distributed to numerous foresight community members who were identified from the interviews and additional secondary document reviews. Forty out of 107 individuals responded to the survey. They also provided a representation of a range of Canadian foresight community members from organizations and sectors, as identified in Table 8.

Table 8. Findings per question–participants

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q1 Principal Professional Role	Roughly equal distribution.	~33% organizational practitioner, ~33% academic, ~33% consultant
Q2 Past Participant in a Foresight Project	Large majority have been participants.	Yes – 81%
Q3 Past Client for a Foresight Project	Majority have been participants.	Yes – 57%
Q1 Principal Role (survey)	Many participants see themselves in more than one principal role, 2 individuals self-identified as futurists.	Consultant – 19, Educator – 15, Researcher – 15, Executive – 14, Technical Expert - 11
Q2 Organization (survey)	Distribution of participants among sectors approximately equal in order of size of sector.	Business – 14, Public – 12, 8 Non-profit, Other (e.g. university, social entre. – 6)

[a]Percentage of those interviewed providing response or number of times comment made. [b]More than one response may be reported by one individual.

Findings.

As an overview, the definition of foresight and its value, and the identification of foresight community members, projects and success factors are types of information sought through this research. Detailed findings are presented throughout the chapter. Lists of sample questions for the interviews and for the survey have both been included in Appendix B.

Some of the findings for specific questions are not discussed in this section as per the direction offered in Table 8.1. For example, questions in relation to identifying Canadian foresight projects are addressed under the section heading of List of Canadian Projects found later in the chapter. Also, a question on identification of stakeholders working in foresight, as related to complex societal problems, was primarily included in the interview to identify additional individuals for interviews as well as for the distribution of the survey. These names are not listed in this document to ensure respondents' confidentiality. In addition, there are likely many more Canadian foresight community stakeholders than the sample identified in the data collection process as only three names were requested per respondent.

Table 8.1. Findings not addressed in this section

Questions in abbreviated form	**Overall finding/comments**
Q9 – Q10	List of foresight projects to be addressed under list of projects section. Commonalities amongst successful projects are minimal and reluctance/lack of knowledge results in short list of unsuccessful projects. Thus, successful and unsuccessful projects are not differentiated in the list provided.
Q12	This question was used for identifying foresight community stakeholders primarily working in the area of complex societal problems for researcher's methodological purposes. Of note: significant diversity with duplication uncommon.
Q20 – Q23	Addressed in Chapter 11.
Q6 Identify 3 projects (survey)	Located in the section "List of Canadian Projects".

Findings and discussion for phase 1 of the research on the foresight community and how foresight is used in Canada are provided immediately below under headings that describe the findings.

Collecting data and diversity of responses.

Challenges in the data collection process are worth noting: it is difficult to locate data on projects, identify foresight community members, and significant diversity exists among responses from research participants even in the basic definition of terms. There is no repository

of information for accessing names of foresight community members or information on projects. Work involves searching the Internet, databases of journal articles and asking for individuals to provide information. In many cases, information about projects is private. In other situations, the organization may not be forthcoming with a report or information related to their project. For the question regarding foresight community stakeholder identification or identification of successful and unsuccessful projects, mostly different individuals and projects were identified with overlaps only occurring a few times.

As can be seen from Tables 9.2 through 9.3 several different descriptions were given by interviewees as to key foresight concepts. A fundamental reason for this may be the different interpretations of commonly used terms in the field both regarding foresight, e.g., foresight, dialogue-based foresight and successful foresight, as well as terms used in association with foresight, such as complex or wicked problems, democratic engagement, participatory, and urgent. Questions raised by interviewees around the second set of terms were usually due to different interpretations around the extent of their use, for example, does participatory mean designing the foresight process or just attending the sessions. These diverse interpretations signify the evolving nature and specificity of these terms and illustrate the ambiguity around evolving social concepts. In addition, one can see the epistemological differences within the foresight community around: what foresight is, whether it is quantitative or qualitative or both and what constitutes successful foresight. Although there is variability amongst the understanding of key terms, there is some agreement on notions within the definitions. These commonalities are outlined for key concepts below.

What is foresight?

The different understandings of common terminology in the field and the importance placed on foresight's definition are reflected in participant's responses. For instance, several interviewees asked for the definition of 'foresight' used for the project. Also, strong feelings were associated with foresight used for predictions. Several interviewees expressed the significance of separating predictions and "forecasting" from foresight and changing mental models. The question as to how foresight is defined was then put forth to a set of foresight

community members in a survey following the interviews. The most common concepts included in the definitions of foresight are outlined in Table 8.2.

The following quotes illustrate some of the divergence in terminology. Block quotes will be italicized throughout the document for ease of reading.

> *Foresight is the art and science of imagining various possible futures. It involves pushing the individuals involved out of their comfort zones and looking for weak (as opposed to strong) signals in the environment as well as including "outside in" thinking - incorporating the views of those outside one's circle or organization.*

> *I define foresight as the disciplined analysis of alternative futures; not prediction, not vision, not intelligence, but a distinct process that addresses the complex or even wicked context in monitoring prospective oncoming events, analyzing potential implications, simulating alternative courses of action, asking unasked questions, and issuing timely warning to avert or deal with a threat or seize an opportunity*

> *Anticipating the future in a systematic way.*

> *I see foresight as risk management with the hypothesis that many forms of foresight provide information which can allow lower risk policies, choices and overall decisions.*

The definition of foresight could also be approached from the response to another question, the uniqueness of foresight. In this respect, responses centered mostly on a longer time frame; working with complexity and uncertainty; greater depth and breadth; and outside-the-box thinking (Table 8.4). All these points have been identified in some form in the concepts in Table 8.2.

Table 8.2 presents a range of different words and concepts interviewees used to define foresight and the different elements of successful foresight. However, there is some agreement on key concepts. Primarily, time, systematic and planning are mentioned as particularly

important definitional dimensions to describe foresight. Information or learning and influence or impact are also key elements of successful foresight.

Table 8.2. Findings per question–terminology

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q3. Define Foresight or the Key Defining Elements of Foresight (survey)	Similar terms/concepts have been grouped and the number of times mentioned tallied	Time: trends/long-term/future/present - 31
	Rational, structured, scientific elements in combination with art, creative and unstructured elements as well as pragmatic components	Systematic: or research/structure/process/ analytic/assess/evidence - 22
		Planning: or strategic thinking/contemplating/strategy / policy development/implications - 18
		Potentialities: possible/risk/uncertainty/plausible - 12
		Participatory: or range of perspectives/outside views - 11
		Tools: or techniques/methods - 10
		Information: or insights/knowledge – 9
		Creative: or imagine/outside thinking/alternate/vision – 9
		Action: or use – 8
		Complex: or systems - 6
Q4 Foresight Project is Successful If (survey)	Several responses reinforce previous responses to other questions and interestingly the basics around client satisfaction and meeting goals is not mentioned often	Information or learning - 13, Influence or impact – 11, Accuracy or quality/Action or change/Thought – 8@[c], Better handle future – 6, Client Satisfaction and confidence – 4, Met goals - 2

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "accuracy or quality" was mentioned 8 times as was "action or change".

Successes and failures.

The identification of successful foresight is another important but challenging concept. Typically, only if the individual had been involved in the project do they report the project as a success or failure. Even so, from the limited identification of project successes or failures one can assume it is either difficult to provide a judgement on foresight success because the parameters are very subjective, information on projects is not widely distributed, or there is a reluctance to select. Foresight can be seen as an art form, as apparent from the concepts used to define it and sample definitions above, which makes judgement on successes very subjective.

Successful foresight practices (Q11 Table 8.3) are described similarly to successful foresight projects (Q4 Table 8.2) as either one or more of the following: learning and thinking innovatively or differently, making a difference, not being a failure, useful products, a well conducted process, findings talked about, better choices made, or practices leading to action. On the other hand, a successful foresight project means either one or more of: the project is done well, provides valuable information, learning takes place, changes in mental models occur, and the project was useful or it made a difference – resulting action is not necessarily key to success. Interestingly basic objectives for commonly delivered services, for instance, client satisfaction and meeting goals, are not mentioned often.

Samples of responses to classifying a foresight project as successful include (Q4 Table 8.2):

> *Influences people's attitudes, behaviors, knowledge, or decisions towards a more long-term view.*
>
> *Documentation of degree of positive change experienced and witnessed by participants.*
>
> *A foresight project is successful if at least 1 of 2 conditions are met: meaningful and insightful information about the plausible future is surfaced and/or participants engage with the future in a proactive manner that did not exist before the project (meaning, a new culture potentiality).*

Preparing for an anticipated future through strategic planning vs reacting to the event after it's happened.

So far, some elements of success are evident, but the description is not clear or definitive. Furthermore, other factors also affect the definition of success. Success may be defined differently by participants and sponsors, for example, according to the extent of meeting objectives, action taken, or achieving one critical criterion, e.g., changing one regulation. As well, interpretations are affected by how foresight is defined and what is seen as the potential of foresight. Success is also impacted by context. For instance, how can one define success when it comes to addressing complex problems in a world of complexity? Each problem is defined in various ways and the smallest little change can have a butterfly or tipping point effect. To explain further, the impacts of successful advances in wellness, sustainability, and conservation can originate in restructuring the problem, finding common ground and making one better decision.

As very few projects were identified as failures by the respondents, the projects may be even harder to judge as a failure or there is a greater reluctance to make the indication. Failures have been identified as unsuccessful projects or projects that have not achieved their full potential, for example: not enhancing vision, a blind application of tools, an incomplete project, no resulting activity, and missing surprises. Not achieving a project's potential can arise from several difficulties in foresight as a practice. Although common for practices to have challenges, those specific to foresight are couched in ambiguity and subjective areas of the practice as outlined in question 17 (Table 8.3).

Foresight is a social process that has limits placed on it from various stakeholders, the uncertainties it addresses, and the resources it requires. Furthermore, challenges are inherent in the process of communication, engagement and appreciation of the practice. These difficulties are also illuminated by the negative effects that can result from foresight (Q18 Table 8.3), such as mismanagement of expectations and issues with the foresight process, e.g., facilitation,

follow-through and comprehension. The negative effects support the finding that foresight is hard to do well.

Table 8.3 presents the responses to several questions related to improving foresight, including those questions identifying negative or challenging components of the practice. The level of agreement for a reply to a question is nine or less individuals from approximately 21 participants. This level of agreement demonstrates there are a variety of views on foresight related areas within the foresight community. Although an array of answers was provided to these questions, there are commonalities across and within questions.

Table 8.3. Findings per question–improving foresight

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q11 Difference between Successful Foresight Practices Versus Failures	There are a range of responses. Success also means not having failures, which can include missing out on a wide range of success factors or it can mean: not enhancing vision, blind application of tools, incomplete project, no activity, missing surprises, etc. (each mentioned once)	Successful practices mean: learning and thinking innovatively or differently – 9, not being a failure – 7, making a difference – 6, having useful products – 6, having a well conducted process - 5, findings talked about/making better choices/leading to action - 4@[c]
Q14 Improving Foresight Generally and for Complex Problems Specifically	Again, many different comments were provided (>20)	Education and training in foresight – 9, client education – 7, Communication – 6, having broad participation and information sources – 4, use quantitative & qualitative methods - 3
Q17 Two biggest challenges with foresight	Challenges identified mostly relate to communication/appreciation of foresight, difficulties in conducting foresight well and the resources involved	It is not well understood – 6, it's hard to do well/it is hard to have meaningful engagement – 4@, not easily graspable/limits are placed on the full application of the foresight process/lack of funding/it is expensive and resource intensive – 3@

Q18 Negative Effects of Participating in Foresight	These responses further strengthen the points under difficulties with foresight in the previous question: communication/appreciation/hard to do well	Management of expectations - 4, lack of understanding/issues with facilitation or follow through/no negative effects – 3@, views are not captured well/'fake' foresight practitioners – 2@

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-4@" each comment separated by the slash symbol is offered four times.

Challenges and opportunities in achieving value through foresight.

Value of practices and projects can be assessed in different ways, for instance, in terms of benefits gained for addressing an issue in relation to the cost of those benefits, the extent of those benefits obtained exclusively, or the relative assessment of cost and value for alternative or similar practices that deliver similar benefits. However, in foresight these methods are difficult to apply. For example, the value of foresight-based information to policy development is likely dependent on and judged based on several factors such as the cost, long-term impact, extent of achieving previously listed success factors, in what areas and for whom. These are hard to measure and there is no guarantee or recipe for realizing any or all of the success factors. The importance of the factors may also change over time.

Although demonstrating value can be challenging and multifaceted the potential outcomes of a foresight project can be worth the resources as well as the effort. One of the significant challenges with participating in, conducting and/or funding a foresight project is that it requires significant investment for a problem or question not necessarily seen as a major current concern; perhaps viewed as a luxury in the context of constrained time and resources. Regardless, risk reduction and maintaining a public image while minimizing losses from potentially averting a disaster can be invaluable.

Another challenge with achieving value is that foresight does not fit all situations well, for example, addressing simple problems, providing immediate solutions and working with resource constrained projects. Yet, it can be very valuable for addressing complex problems depending on how well the practice is carried out and whether it's appropriately applied (further

details available in Table 8.3). The data collected from both the interviews and survey corroborates the literature in that 81% of the individuals interviewed find foresight to be very valuable and 65% of those surveyed thought it is very valuable while 28% thought it is valuable (Q4 and Q5 Table 8.4). In the survey, respondents were also asked to provide reasons for their rating (Q5 Table 8.4). One reason for a high value rating is foresight provides long-term thinking in a short-sighted system and this can be invaluable even if it is equally difficult. Others identify the value in facilitating people to think in a very different way, e.g., holistic, transdisciplinary, diverse, future term, context of complexity and creative. Wider breadth of input and more robust decisions and options are additional benefits. Although difficult to deliver, these unique strengths can be critical to addressing complex problems. Specifically, interviewee quotes include:

> *It can reduce the risk of making decisions that lead to catastrophic outcomes - and increase the likelihood of a robust, satisfying future trajectory.*

> *It provides possible scenarios for the future state. Although the realized future may not materialize as imagined, the building of the scenario highlights aspects/components of an imagined future that can be optimized or minimized if given enough lead time. It is important that the foresight input is one part of a larger information gathering exercise.*

> *It will at least involve all stakeholders in problem(s) identification, surfacing those discussions and introducing potential frameworks to governments, public, industry and all stakeholders.*

As identified above, it is important to practice high quality foresight. Yet, challenges exist in doing this. Naturally, this is partially because foresight and successful foresight do not have a solid or agreed upon definition. Even so, what can high quality or well-delivered foresight mean? The data provided in relation to this question again highlights the divergent views among the community. Although this question was not asked of the participants, the approach to some questions can shed light on related views. In question 8 and question 14 (Table 8.5 and Table 8.3 consecutively) diverse responses were provided for why shared mental models are important and how foresight should be improved. In terms of the former, shared mental models are seen as both

helpful and not helpful – demonstrating a need for nuance. One interviewee commented “it is not necessary in the early stages of understanding diverging aspects… Later on important not early on… Could lose opportunity to rally around a cause”, another interviewee said “if there isn’t shared basis of understanding any dialogue is at risk. On the other hand, if conducting broad consultation want to speak to people with different worldviews and epistemologies” and a final example “collaboration and construction of models is key to understanding big picture, so very important”.

As to how foresight should be improved, there is some agreement within foresight practitioner circles on several different practice related areas (Table 8.3). To illustrate, education and training in foresight is seen as important, as is client education, communication and appropriate use of diverse methods and expansive sources of information. Interviewee comments included “recognize the discipline involved in doing foresight properly not just one foresight approach solves all problems”, “not a lot of great training material generally” and “need to do a better job of describing success stories and following up with participants”.

Many respondents also felt the appropriate use of foresight and related tools, services and interventions are important to deliver a high quality and valuable practice. This includes selecting the practice for certain types of projects, being able to refine the question being addressed by the project, and designing the foresight project as best suited to the parameters of the clients’ expectations while delivering a well thought-out and designed project. Some respondents indicated there is a large variety of tools and techniques within foresight’s repertoire that can add value if appropriately used. In addition, in questions 15 and 16 of Table 8.4 foresight is found to be more valuable if a variety of other tools, services and interventions external to foresight are integrated into the project’s design, for example, policy, gaming, online integrative discussions and research. Yet, this is complicated further by foresight community members who think foresight is primarily qualitative and those who think it is primarily quantitative. Thus, the ‘true’ foresight practitioner should only make use of the applicable methods and techniques. Others see value in the combination of the qualitative and quantitative; hence epistemological differences reside in how the practice should be carried out.

There are other ways in which foresight value has been identified. Individuals occasionally identified the value of foresight through strategic ongoing use, e.g., embedded in routine organizational activities. As previously described, an additional value of foresight is that it can build on other tools, services and interventions; both social processes and those based in science and technology (Q15-16 Table 8.4). As an example, approximately half of the interviewees believe dialogue-based foresight is more valuable than other foresight approaches (Q5 Table 8.4). This is illustrated by a respondent's answer to why foresight is valuable (Q5 Table 8.4): "Because it forces people to creatively think long term and for multiple objectives, and to talk to people we might not ordinarily interact with. All of these things can lead to better, more inclusive decision-making."

Table 8.4. Findings per question–value of foresight

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q4 Value of Foresight in Addressing Complex Problems	Large majority found it very valuable if certain criteria met	Very valuable – 81% (29% qualified per definition & quality) Valuable – 14%
Q5 Value of Dialogue-based Foresight in Addressing Complex Problems	Approximately half believe dialogue-based is more valuable than other foresight approaches	Very important – 48% It depends – 19% Same – 14%
Q5 How valuable rating (survey)	Most participants think foresight is very valuable for complex problems if it is well-delivered	Very valuable – 26 Valuable – 11 Limited value - 3
Why? (survey)	Again, responses reinforce other questions' responses	Holistic thinking & includes external input (enhances futures literacy) – 19, More robust decisions & more options – 17, Better understanding the future (learning) – 14, Long-term thinking – 10, Forces creativity & innovation (space for this) - 8
Q13 The Unique Critical Foresight Offering is	Foresight offers a diverse range of unique benefits. Furthermore, based on Q22, it provides visioning, assists in making judgments, and in structuring problems	Offers a longer time frame - 14, identifies and works with complexity-8 /uncertainty/greater breadth &

		depth – 7@[c], outside-the-box thinking - 5
Q15 Foresight More Valuable If Used with Services/Interventions …	Foresight is more valuable if used with a variety of other services/interventions	Good skills (communication and various other) - 9, competitive intelligence & business analytics – 3, policy/product development/real-time data /interagency coordination – 2@. Several foresight related areas: strategic planning - 8, scanning/expert opinion consulting/multiple stakeholder involvement – 2@.
Q16 Foresight More Valuable If Used with Tools…	Foresight is more valuable if used with a variety of other tools as appropriate (not as many diverse responses provided)	Appropriate use of multiple unspecified tools – 6, online integrative discussion tools – 5.

[a]Percentage of respondents providing response or number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-4@" each comment separated by the slash symbol is offered four times.

Overall, participant's responses, presented in Table 8.4, on the value of foresight and dialogue-based foresight identify both as a very valuable practice. More importantly, the answers provide insight into why; for instance, holistic thinking, more robust decisions as well as options, and offers a longer time frame. Foresight can also be more valuable if it is used with certain services/interventions and tools, e.g., well-honed skills and online integrative discussion tools.

Challenges and opportunities in conducting foresight.

Challenges and opportunities with delivering foresight need to be considered further before an assessment of foresight can be conducted. Foresight can be resource intensive and thus expensive. Limitations are often put on foresight practice for this reason. This can limit the project's success and its critical need to demonstrate results, which are not always readily visible, as well as the project's completion. In addition and to restate, foresight can also be difficult to practice well. At minimum, there is room to improve foresight, communication surrounding it and appreciation for the field (Q14 & Q18 Table 8.3).

Moreover, several decisions and trade-offs need to be made when designing the foresight process. For instance, a couple of questions in the interviews arose around whether one should spend limited funds to have substance or to promote/communicate about the project and trade-offs between timing/funding for the project versus how to have key people involved in the process. Also, one third of interview respondents think foresight needs to be evaluated and slightly more think evaluation should be improved. Of note, there is no agreement as to how or in what areas evaluation should be improved but there does seem to be some concurrent thought that quantitative or detailed evaluations are unnecessary. Client or end-user surveys are used the most to determine usefulness of the exercise (Q19 Table 8.5).

Further, democratic engagement and dialogue-based foresight are seen as important by half of the interviewees, but challenges are also recognized within both of these areas (Q5 Table 8.4, Q6 & Q7 Table 8.5). Close to one-third of the respondents for both questions 6 and 7 replied the use of these approaches depends on the situation. Responses to question 7 highlight the challenges in incorporating democratic engagement: high expectations from participants, effort and time required, appropriate representation, facilitation and ensuring engagement. More than 20 types of difficulties can be identified in the responses for this question.

A sample of responses for questions six and seven (Table 8.5) include the following.

> *Foresight - no matter how well delivered - can only go so far. However, when considered as simply one tool in a suite of policy development tools (alongside research, systemic design, evaluation, social psychology and others) it can help to develop better, more robust, and more actionable policy options. On its own, foresight has limited value because it tends to exist only in the esoteric, and not in the real.*

> *Few scenario ventures are properly commissioned and linked to participants that should be part of the discussion of alternatives.*

Makers of decisions and policy too often cannot 'see the forest for the trees', typically seeing tomorrow only in terms of today's problems and not understanding the need to prepare for a range of possibilities.

Overall, Table 8.5 illustrates not only the challenges foresight practitioners face but the varied perspectives on what is important and how to address the subject. These findings build on the

Table 8.5. Findings per question–challenges in improving foresight

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q6 Importance of Democratic Engagement in Addressing Complex Problems	Majority think there should be democratic engagement. However, nearly one third indicated depends/question not clear	Why it should be – 76% Why it may not be – 24% Depends/not clear - ~29%
Q7 Two Major Difficulties in Incorporating Democratic Engagement	Diverse responses	High Expectations – 6 Effort & time required – 5 Appropriate Representation - 5 Good facilitation – 4 Ensure engagement - 4
Q8 Are Shared Mental Models Important and Why	Yes, shared mental models can be important to start or establish the process but otherwise divergence of mental models is almost equally important. Important in forming shared mental models sometimes but not necessary	Diverse responses on why: Need divergence – 9 Shared mental models imp.– 11
Q19 Foresight Evaluated? How? Improvement Needed?	Focus currently seems to be on client or end-user evaluations to determine the utility of foresight. Surveys seem to be used most frequently. Quantitative or detailed evaluations are really unnecessary	Foresight needs to be evaluated - 6, evaluation should be improved - 9 (no real agreement as to how or in what areas but agreement on the fact that it is not easy to improve).

[a]Percentage of those interviewed providing response or number of times comment made. [b]More than one response may be reported by one individual.

difficulties with foresight already identified in the previous sections of this chapter entitled Challenges and Opportunities in Achieving Value Through Foresight and Successes and Failures. It is important to note; however, challenges exist in all applied fields and they function

also as opportunities to better understand and advance elements of a continually developing practice.

When to invest in foresight?

So, when is it worth it or appropriate to make a significant investment into a foresight project? Based on the findings in phase 1, the return on investment can be significant when, for example, a successful plan is developed, thinking is changed, or a complex problem is addressed in some way and it means a substantial payoff if outcomes are ultimately improved, e.g., lives are saved. These are areas in which foresight delivers value. Of course, there are no certainties and causality is very difficult to measure. Foresight is typically beneficial for complex problems, which are especially hard to work with, and the process can be very subjective with many subtleties. There can be several incremental concrete benefits or outcomes both in process and product or very little value at all. Foresight exercises alone are sufficient for some purposes and could reduce the investment needed for a foresight project. Knowledge on, for instance, the main concepts; defining foresight, its uniqueness, elements of success, and challenges, facilitates the decision of how valuable the foresight practice can be for the particular project and whether the investment is worth undertaking. In addition, it is important to note that certain elements need to be at hand that may be out of the control of the project, such as: perceived legitimacy of process, power to implement actions based on process and even a well-managed delivery.

List of Canadian foresight projects.

The foresight projects, and exercises, that were identified through document searches, interviews and surveys are listed in Table 9. To keep the list somewhat current and manageable select projects are offered and the full list dating back to 2003 completion dates can be found in Appendix C. The sample of projects in Table 9 include those completed since 2015 and those referred to in this document. Foresight work in Canada began in the late 1960s (F. G. Thompson, 1992).

There are several reasons for providing these lists: to afford a greater appreciation of foresight by demonstrating the variety, number and types of projects completed; present the types of organizations sponsoring/organizing Canadian foresight projects; start the base of a

historical list of Canadian foresight work, describe typologies; and offer the reader the opportunity to find information on foresight projects/topics. Approximately 100 projects have been identified. As survey respondents were asked to identify projects directly working with societal or public sector complex problems, private sector or organization oriented projects were not actively offered by this group of participants. Mostly government, non-profit and consulting firms have undertaken the listed projects.

The information provided by participants is substantially kept intact, i.e., projects offered were not deleted due to a specific foresight definition. Whether the project was indicated as a success or failure has not been included as responses were rarely duplicated among the limited information provided. In many cases, only partial information was provided on a project and that is the way in which it is presented. Only projects listed with at least the title and one other completed field are included in the table. The reasons limited information is provided are perhaps due to recall challenges over long periods and minimal funding spent on promotion or communication of completed projects. As well, the information about a project may be confidential. Lack of accessible information for this research as well as the level of accuracy of the information available limits detailed study of foresight use and specifically, study of cases in Canada. However, the material identified is sufficient for a high-level assessment in this dissertation and the overall formulation of several insights.

The projects listed in Tables 10 are a sample of loosely defined foresight projects and exercises. This project list contributes to the potential development of a record of projects that may have had implications for Canadian society. Individuals can argue that a number of these projects listed are not foresight, for instance, due to certain methods being included or not included in the foresight process and timing of future under consideration being not far enough into the future. However, an inclusive list is provided so the reader can review the projects identified by the foresight professionals and the potential implications for ‘foresight’ use in the broad sense. The foresight listings below can be grouped according to different categories, for instance:

- topic - economics, health, finance, security, energy, HR and environment;
- group targeted - community, industry, organization;

- purpose - technology development, policy influence, preparation for crisis/disaster;
- size - per budget, individuals involved, phases; and
- methods used - visioning, horizon scanning and modelling.

As such, categories are not exclusive. To illustrate, foresight is often used in some form for community strategic planning and development, e.g., Vancouver's Greenest City 2020 visioning workshop event and Canmore's Mining the Future (further details on other exercises available in (Cameron & Potvin, 2016). Since providing groupings here could create more confusion, they are not offered.

Table 9. A sample of Canadian projects completed

Name of Project	**Completed**	**Sponsor and/or Organizer (organization(s))**	**Contact Name**
Chinese Legacy BC	Ongoing	B.C. provincial government	
Scenarios for Alberta's Energy Futures	Ongoing	CESAR, UCalgary	David Layzell
Energy Futures Laboratory	2017	Natural Step	Chad Park
Future of the Region Sustainability Dialogues	2012+	Metro Vancouver	
Strategic Plans	2017	Various Municipalities including BC	
Aging in Place – The Future of	2017	NRC	David Fraser/Brian Colton
Future of Advanced Manufacturing	2017	NRC	Michael Kilfoil/Brian Colton
The Future of Ground Transportation	2016	NRC	John Wood
2018 Security Outlook	2016	CSIS	
Bank of Canada Security Foresight Project	2016	Bank of Canada Security Risk Management Office	Victor Mitev
Big Earthquake	2016	CBC Radio	
Game-changing technologies initiative (http://canadamakes.ca/691/)	2016	National Research Council Canada	Dr. Carl Caron
InVEST Scenarios Case Study: Vancouver Island	2016	WCAM	
Using Strategic Foresight at	2016	Foresight Canada	Ruben Nelson

Work			
Lower Mainland Flood Management Strategy	2016	Fraser Basin Council	
New Mobility	2016	Metrolinx	WSP Group
Trottier Energy Futures Project	2016	CAE, Suzuki Foundation and TFF	Oskar Sigvaldson
Safety and Security Foresight Program	2015	NRC	
Canada in a Changing Global Energy Landscape	2015	Policy Horizons Canada	
Probable and Possible Health Systems Scenarios	2015	Canadian Alliance for Sustainable Healthcare	Jonathan Veale
Sustainable Canada Dialogues	2015	UNESCO and McGill	
The Future of the Canadian Oil Industry to 2030	2015	Scenarios to Strategy Inc.	Greg MacGillivray
Aging and IT	2015	NRC	David Fraser/Brian Colton
Monteregie Connection / connexion monteregie	2014	McGill University	Elena Bennett
The Future of Asia	2014	Policy Horizons Canada	
Great Lakes Futures Project	2013	Transborder Research University Network (TRUN) for Water Stewardship	Katrina L. Laurent
Agri-Foresight Initiative	2012	Agriculture & Agri-Food Canada (AAFC)	Dr. Judith Bosse
The Global North 2050 Project	2012	Alberta Innovated Technology Futures	Axel Meisen, Lois Macklin
Visualizing Climate Change	2012	CALP	Stephen Sheppard
Economic Futures for Ontario 2032	2012	OCAD	Greg Van Alstyne
2020 Media Futures	2011	OCAD	Greg Van Alstyne
Fore-CAN: Foresight for Canadian Animal Health	2011	Canadian Food Inspection Agency (CFIA) & Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) Research and Technology Initiative (CRTI)	Shane Renwick
Greenest City 2020 – city of Vancouver workshop	2011	One Earth	Nicole Anne Boyer
Developing a Sustainable Health System	2011	Health Canada and AITF	Leah Soroka, Lois Macklin
Agriculture Adaptation to Climate Change (within Agri-	2010	Canadian Agri-innovations (CGAI) Program	Leah Soroka, Lois Macklin

Foresight Initiative)			
Scenario-based Planning for a Changing Climate in the Bras d'Or Ecosystem	2010	International Institute for Sustainable development	Livia Bizikova, Bruce G. Hatcher
Outward Bound 2015	2009	OceansAdvance	
Vision for the Canadian Arctic Research Initiative	2008	Council of Canadian Academies	
Mining the Future	2006	Town Council of Canmore	Ruben Nelson
Georgia Basin Futures Project	2004	SSHRC	John Robinson

A discussion about typologies and guidelines.

In attempting to organize these lists the value of typologies, or descriptive categorical terms, and guidelines for foresight types became apparent. Although constructing typologies of the list of foresight projects are not provided, they can be valuable if used appropriately. Typologies are not applied to the project list because this list's primary purpose is to display the variety of projects undertaken rather than focus on specific groupings. This section demonstrates that even though there are some issues with using typologies, typologies as well as guidelines are important under certain circumstances, and their further development can be very valuable for the advancement of the foresight practice.

Typologies have been useful to categorize and improve understanding of concepts in several fields. They have been widely used in foresight, for example, strategic foresight, experiential foresight, corporate foresight and technology foresight, to describe different applications of or approaches to foresight. Identification of foresight types seem to have evolved from an individual who used a term(s) to refer to groups of categories or certain characteristics in a particular space and the foresight community's eventual adoption of the term(s) usually based on its utility. Individuals, for instance, may be more likely to recognize a type of foresight such as corporate foresight instantly as related to business or the corporate sector and then associate certain factors with the term without having the factors outlined.

Being more specific about foresight by using descriptive terms as typologies, e.g., policy, quantitative, and community foresight, can be clarifying but there can also be practical

disadvantages to their use. For instance, there can be overlap between types creating categorizing inconsistencies. One can, for instance, differentiate between public sector and corporate sector foresight but this can be limiting since public sector issues can be private sector issues as well and vice versa. Alternatively, certain traits of one category may become the focus when other traits may be more paramount to the analysis. For example, a foresight practitioner or client may instinctually become more interested in timeliness to influence public policy versus broadening participant diversity. The latter may be more critical to the research question being addressed. To put it another way, in practice versus in theory, the focus for a foresight project should not be on the sector or purpose but the topic or the methods used or vice versa. Projects are unique and generalizing based on a category without careful consideration can be detrimental.

Also, typologies are beneficial if there is a common understanding of the term(s), or the term(s) are very straightforward, which is not always the case. If term(s) are used inconsistently confusion can result. Yet, if typologies are well developed, and well used, and differences are apparent and noteworthy, the benefits can go beyond clarification to understanding and improving foresight. Furthermore, typologies can be utilized in other helpful ways.

Although a rational model, i.e., logic model, may not be a clear fit for an art form or a more creative process that practitioners often ascribe to foresight, the concept of describing a certain type of foresight and then including best practices or guidelines in terms of, e.g., inputs, activities and outputs or stages of the process, can also lead to improved appreciation of foresight and expectations around practices. Indeed, guidelines for a professional practice or its different services or for foresight are nothing new. Furthermore, evaluation of these practice descriptions can lead to learning as well as improvements in the practice. This also leads to more understanding of how foresight is used and the ways in which it can be valuable. It also allows for comparison and delineation of success factors for specific situations. Organizations have tailored their own foresight process and/or methods that work for their situations, like WWF, IISD, and Policy Horizons (further details available in current website pages). This is where foresight knowledge including use of appropriate methods and processes to reach objectives is very important.

Even though research exists concerning improving ‘types’ of foresight, more work in defining the types in greater detail and critical aspects of these types, especially based on case studies in the Canadian context, would be useful. To explain, foresight for a policy setting has certain restrictions, such as timing, available funding, and form of information delivery. It is critical to be familiar with the applicable restrictions to assist with tailoring foresight projects. Case studies can highlight ways in which restrictions have been successfully accommodated, for instance, in specific settings or with different subjects.

Another example of how greater detail regarding typologies is helpful is regarding the project’s objective(s). Projects can have multiple objectives, for example, conducting research and achieving societal change. This strains the potential to achieve even one objective well, especially if objectives conflict in some way. More so, management of expectations can be challenging. Information on how expectations are managed is useful. Within the policy setting (i) providing information, (ii) facilitating collaborative governance, and (iii) influencing policy are examples of three types of objectives. Several examples of projects with these objectives can be located on the list in Tables 10. Complex societal problems are commonly approached in the literature through influencing or informing policy (Könnölä et al., 2011; Lazarus, 2008; Riedy, 2009) but increasing needs for democratic/participatory engagement and collaborative governance can create a demand for the second ‘type’ of foresight. More practical research on the second ‘type’ would likely facilitate meeting the objective of facilitating collaborative governance.

Thus, the advancement of typologies and guidelines overall are important to foresight practice, even if some concerns exist with using typologies, such as when terms are already ambiguous and/or types are indiscriminately applied. Research on different categories of foresight, e.g., according to objectives or targeting certain audiences, can lead to development of guidelines or success factors which in turn facilitates understanding and improvement of the practice. This research would especially benefit from the review of Canadian case studies.

A closer examination of specific types of foresight projects.

The purpose of this section is to describe a sample of different types of Canadian projects, i.e., (i) projects working with a regionally focused research question, (ii) technology as a main component for delivering projects, and (iii) industry focused projects. The value of this is in facilitating greater appreciation of Canadian foresight projects as well as 'particular types' of foresight projects. These three types of project categorizations have been chosen for this sample based on the high frequency of their occurrence and to show the variety of foresight types. These types of groupings can then, for example, facilitate further comparison of projects, learnings, guidelines development and tailoring of future projects. Four projects from Table 9 are briefly explored. As is further apparent from this section, foresight is used for a range of different purposes and with several process-defining tools. Chapter 8 on case findings presents more examples in terms of cases researched and external cases reviewed.

A sample of a regional project is phase 1 of the Global North 2050 Project. It looked at the future of the region above the 60^{th} parallel until 2050. The main question put forth at the Jasper forum was "By 2050, what changes might occur in the Global North?" Two of the objectives of the main sponsor, Alberta Innovates - Technology Futures, were to look at opportunities for innovation and generating economic benefits for Alberta. The process was composed of a three-day forum held in 2011 with roughly 48 invited participants. Evaluation criteria were put forth at the beginning of the forum. Four scenarios were created during this event based on the extent of function or dysfunction of geo-economics and the rapid or gradual pace of climate change. Economic models were developed as part of the deliberation process. At the end of the forum recommended actions, such as meeting infrastructure needs and accountable governance, were developed with the principal sponsor to follow-up on some of them (Macklin & Meisen, 2011). Other examples of regional foresight projects include Great Lakes Futures and Vision for the Canadian Arctic.

Several projects use technology as a major component of the foresight project. This can include for instance, modelling, visualization, radio, video games, charrettes, and online dialogues. A sample of a project in which technology is prominent is Visualizing Climate Change (Sheppard, 2011). Another project is Monteregie connection / connexion monteregie

(Mitchell et al., 2015). Both projects dealt with complex subject matters that were difficult to appreciate without the aid of visual tools and modelling future scenarios. They also addressed the impacts of environmental change on a specific area and developed scenarios based on stakeholder input and empirical data. The information assisted understanding and was then used to facilitate vision development and decision-making.

Assisting various industries to expand, cope with change, and/or survive is a common type of Canadian foresight project, for instance, in the financial, media, and resource sectors, further details available in Table 9. Outward Bound 2015 is a strategic agenda based on a foresight process completed in 2009 in Newfoundland. The objective was to further the oceans technology industry in the region. OceansAdvance, an initiative promoting innovation and research in the sector, developed the agenda with over 100 diverse members of the sector over an 18 month period. The outcome of the foresight process was identification of three business markets as opportunities along with specific recommended actions (Calof & Smith, 2012).

Summary.

This chapter introduced a small Canadian foresight community and attempted to broadly address how foresight is practiced in Canada. The presented findings have provided descriptive information and foresight community members' views of a relatively new field that is difficult to comprehend and is composed of diverse perspectives. Concepts have been explored as well as the challenges, opportunities and value of foresight. For instance, important to foresight practice are skills and knowledge of foresight as well as a thoughtfully carried out process.

The potential exists for foresight to add significant and unique value in work with complex situations in which efforts today may only be seen as a luxury or perhaps as an invaluable necessity. As outlined, many Canadian foresight projects and exercises have been completed in a range of different areas and have been explored in this chapter. Information about basic foresight related concepts and the Canadian foresight community, including projects conducted, is essential to both foresight practice as well as determining the potential value of foresight for a specific use. This information would also facilitate a beneficial undertaking of further research into foresight types, characteristics and guidelines.

The next chapter will home-in further on specific dialogue-based participatory foresight projects, as defined in this document, which have been delivered in Canada. Through this case analysis, the findings in this chapter are further verified, challenged and developed. The perspective of participants and partners will be added to the data already presented in this chapter.

Chapter 8: What the Projects Reveal

The purpose of this chapter is to examine and assess various foresight projects from different perspectives to determine how foresight is applied to Canadian complex problems and the practice's contribution. This chapter describes four case studies in-depth and introduces two external case studies previously analyzed by other authors. Four of these case studies were chosen based on the findings of the first phase of research.

Each of the first four cases begins with contextual information on the case, then project information is provided and finally findings and discussion are presented. For instance, the first explored case of the foresight project Foresight for Canadian Animal Health (Fore-CAN), starts with a description of the complex problem of infectious diseases in animals and then outlines information about the project. This information has been primarily compiled from the documentation produced by the project partners, team members, participants and foresight consultants. In areas information has been extracted verbatim to accurately reflect the research participant's perspectives and the information that was utilized to produce the project outputs. Based on interviewees' responses, the case write-up concludes with findings, thematic analysis and discussion of these findings. The findings and discussion sections are grouped according to topics that describe relevant information, partially address research questions and allow for comparison across cases.

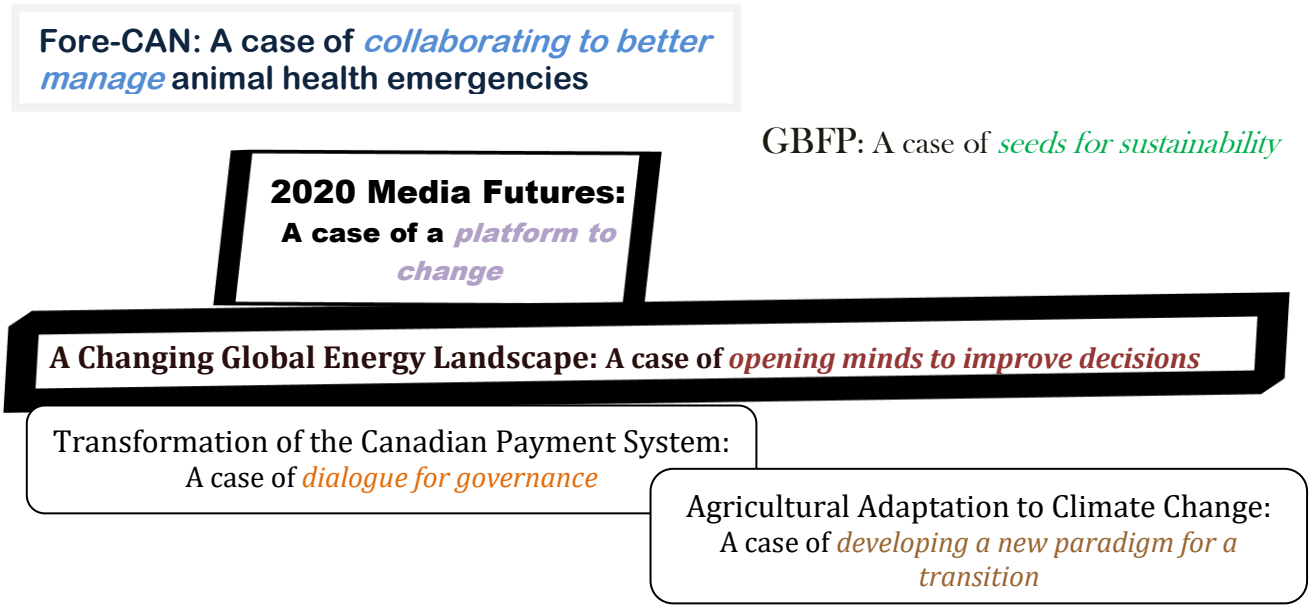
The three subsequently explored cases are: The Georgia Basin Futures project (GBFP), 2020 Media Futures, and Canada in a Changing Global Energy Landscape. In addition, the two external cases, Transformation of the Canadian Payment System and Agricultural Adaptation to Climate Change, are briefly reviewed. Figure 12 graphically differentiates these cases. Fifteen interviews were conducted for each of the two larger foresight projects: Fore-CAN and GBFP. Six interviews were conducted for 2020 Media Futures and three for Canada in a Changing Global Energy Landscape. For reference, interview questions for Fore-CAN and GBFP are included in Appendix B.

In addition to varying visual depictions in Figure 12, titles have also been given to describe each of the cases for ease of reading and identification of their key differences in

memorable terms. Interviews defined Fore-CAN primarily in terms of the need for and benefits of collaboration. GBFP resulted in the planting of many seeds for sustainability which contributed to the development of greater acceptance and application of the concept and related activities in the region. 2020 Media Futures provided a platform to address the impacts of rapid transformations in the industry. Opening minds to improve decisions is the continuing goal for the work of Policy Horizons and was the objective of the case A Changing Global Energy Landscape. Finally, Transformation of the Canadian Payment System: A case of dialogue for governance and Agricultural Adaptation to Climate Change: A case of developing a new paradigm for a transition were named similarly based on the primary methods (dialogue and developing a new paradigm) and purposes of the projects (to facilitate governance and preparation for a transition).

Upon a thematic analysis of each individual case, conclusions are: the foresight process is valuable overall but challenging to deliver and further impacted by many factors affecting the outcomes. Several institutional, contextual and project management issues are among these

Figure 12. Cases reviewed



factors. The problems being addressed are highly complex, including several diverse stakeholders and in most cases multiple objectives. However, benefits are recognized within each

project and objectives are commonly met, at least to some extent. Challenges are especially apparent in the back-end of the projects, e.g., the implementation of project outputs and the access to further financing. These challenges were cited as a reason for their lack of being entirely successful by the project leaders for GBFP and 2020 Media Futures.

Fore-CAN: A case of collaborating to better manage animal health emergencies.

Fore-CAN is a national government project that was completed between the years of 2007 and 2011 for multiple purposes. As outlined in the FTA (2011) document, main goals included achieving "consensus among diverse stakeholders on the required capabilities of the multi-jurisdictional Canadian Animal Health Emergency Management System of 2025; and to research and explore the use of foresight and future-visioning as a capability-based planning tool within the animal health emergency management field" (Renwick, Van der Linden, Dunlop, & Dubuc, 2011, p. 1). The Animal Health Emergency Management (AHEM) system in Canada, as defined in this project, is composed of the groups that are responsible for mitigating risks from threats associated with health in animals (especially livestock). The question addressed by this project was "how can Canada build a more effective and robust animal health emergency system for 2025 and beyond?" (Renwick, 2012, p. 7). The documentation stated that foresight was used because the AHEM system was seen as a critical piece of Canadian infrastructure that needed to be strengthened using a process which facilitated a strong multidisciplinary planning and priority setting structure in the context of a diverse group of stakeholders within a complex system and in terms of a future perspective. Furthermore, this process needed to be participatory, systematic and proactive (Renwick, 2012).

Fore-CAN, a success in many respects, took place at a time when there was an urgency and strong need to address emerging infectious diseases in Canadian animals. Stakeholders of this community identified collaboration, strengthening the system and integration as key elements to be improved in the overall system (the word strengthen can be interpreted along a continuum of minor to major adjustments to the system). These were also listed as outcomes of Fore-CAN and reasons for overall progress in addressing the complex problem. Unsurprisingly, the Fore-CAN process was seen as more valuable than the products. This project had met its goals and was seen by most of the participants as at least as valuable as the resources invested in

it. It was an extremely collaborative project that was gauged as a success by the majority of interviewees and the project leader. Over 70% of the participants followed-up in some way on the project or utilized its outputs post completion. Foresight itself was seen as a very valuable practice. There were, naturally, areas that could have been improved and various areas and suggestions were mentioned.

Contextual information for emerging infectious diseases in animals in Canada.

Problem definition.

Emerging infectious diseases among animals are increasingly a global public concern because of the cost to society and the environment as well as the risks to the health of human populations and food sources for human populations. Several recent outbreaks, such as the avian flu, H1N1, bovine spongiform encephalopathy (BSE) and foot-and-mouth disease are examples of these types of health events and their apparent increase in intensity and frequency. The factors causing these health events are numerous, including both environmental and human created. Identifying the occurrences of these types of diseases as a potentially critical problem to Canadians and to the relationship of Canada with other countries, Canada has decided there is a need to strengthen its AHEM system.

Background.

The information within this section briefly outlines the changes "over the past 10-15 years that have affected animal health emergency management in Canada (and globally)" (Scenarios to Strategy Inc., 2009a, p. 1) and a number of lessons from that period. Those lessons commonly mentioned in different forms are identified below. This section and several of the following sections directly utilize information provided by the participants, through interviews, and outlined in reports.

Past changes affecting animal health emergency management in Canada

- animal health concerning science, governance, infrastructure and veterinarians
- crises or emergency driven
- globalization regarding food people and trade
- spreading of diseases

- values and social expectations
- food practices and agriculture
- technology
- links to public health
- security concerns
- environment
- wildlife interaction
- attitudes towards risk
- global communications and global institutions

Lessons learned from past changes (examples)

Need for:

- stronger communication, e.g., across institutions
- broad cooperation among all stakeholders, e.g., different jurisdictions, sectors and humans and animals
- breaking down of barriers, i.e., jurisdictional, privacy, silos and bureaucracy
- more information in areas of animal welfare and aquatic animal challenges
- new perspectives on risk assessment for single events, resilience and prevention
- clear leadership required
- planning
- social values treated as important as economic (Scenarios to Strategy Inc., 2009a)

Current context.

Nine issues surrounding animal health as they relate to the current contextual environment in Canada were identified by the participants through an interview process.

Issues

- globalization of disease – global spread of infectious diseases due to trade, travel and climate change
- new pathogens – particularly those transferring from animals to humans

- social values – increasing public awareness of animal diseases and animal welfare
- collaboration – complexity increases and building an effective AHEM system is challenging with many barriers to sharing information and integrating
- convergence – of animal, human and environmental health
- farm operations – the front-line defense is farm operations and capacity is affected by large operations, fewer rural vets and economic pressures to cut costs
- emergencies, change in investment – times in between crisis, which tend to be long, decrease momentum resulting in decreasing investments
- political will and leadership – change is tightly linked to government leadership and animal health is not a high enough priority
- technology and R&D - technology drives change and the potential for new developments is significant (Scenarios to Strategy Inc., 2009b, n.d.)

In addition to the trends and drivers identified below, there was a general sense of urgency among the various stakeholders to act upon the public animal health events experienced, for example, the avian influenza outbreak and the BSE (Bovine Spongiform Encephalopathy) crises. Initiatives have already been undertaken around strengthening the system by the CRTI (CBRNE (Chemical, Biological, Radiological-Nuclear and Explosives) Research and Technology Initiative). Similar initiatives were underway in other countries under the Global Strategic Alliances for the Coordination of Research on the Major Infectious Diseases of Animals and Zoonoses and identified as priorities in the Global Forum on Agricultural Research (Renwick, 2012).

Future.

Trends and drivers, in terms of areas affecting the AHEM system, are listed below. Also identified were several barriers and challenges to change that need to be addressed for the system to operate well. Finally, the requirements for an ongoing well-functioning AHEM system were provided by the participants.

Future developments – Trends and driving forces affecting the future

- environmental stresses – e.g., pollution, depletion of wild fish stocks, lack of water

- spread of infectious diseases/pathogen evolution (voted as having the greatest uncertainty greatest potential for impact) – e.g., plant disease, increased number of diseases, pandemic human disease
- societal values (also voted as having the greatest uncertainty greatest potential for impact) – e.g., change in public perceptions, bioterrorism, civil unrest
- political governance – e.g., role of WTO, government oversight, international co-ordination
- technology – e.g., drug resistance, genetic modification, cheap surveillance systems
- fiction – i.e., extra-terrestrials, cross-species communication
- production system stresses – e.g., license to farm, alternative sources of protein, crop failure
- human resources/leadership – e.g., increased leadership capacity, need for good leadership
- global economics and trade – e.g., foreign ownership, increasing concentration of pharmaceutical companies, crop protection companies and farming, underground markets
- demographics and food demand – e.g., population growth, refugees, urbanization
- stakeholder influence – e.g., broader and increased stakeholder involvement, diversity of stakeholders, ability to collaborate
- media and communications – e.g., public acceptance of risk, media response, effective knowledge transfer (Scenarios to Strategy Inc., 2009c)

Barriers/challenges to change that need to be addressed for system improvement (examples)

- need to integrate sciences outside of the biomedical, i.e. social scientists, and human and animal health
- improve accountability and implementation of plans that have an outcome focus
- make animal health a political priority
- lack of time, money, capacity, understanding, people, integration of information, and information exchange, communication, collaboration, coordination
- high turnover in CFIA
- dual role of CFIA versus regulatory independence

- confidentiality and privacy
- retirement overall
- putting plans into action
- increasing complexity and change
- public perception
- industry economics and trade
- diversity of stakeholders
- maintaining vigilance and legal enforcement (Scenarios to Strategy Inc., 2009a)

System requirements

Overall requirements for the AHEM system are: awareness and respect for environmental protection, balanced approach to prevention and recovery, balancing short-term with long-term, and capacity to influence governments and policy.

Specifically, the top six system requirements are:

- informed and decisive leadership
- proactive, evidence-based open, transparent, timely collaborative communication
- multidisciplinary, transdisciplinary collaboration and partnerships
- science and R&D capacity
- a shared vision of outcomes
- science and society based decisions (*Foresight Outputs Synthesis Activity*, 2009; Scenarios to Strategy Inc., 2009b)

Stakeholder identification.

The stakeholders involved in this area are numerous and varied. The primary groups are identified below from which many individuals participated in the foresight exercises.

Academia-veterinary colleges and programs, a range of academics involved in animal health and human health studies

Federal government-Canadian Food Inspection Agency, Agriculture and Agri-Food Canada, Public Health Agency of Canada, Fisheries and Oceans Canada, Defence Research and Development Canada

Provincial government-a range of provincial departments across Canada in the area of agriculture, provincial laboratories, economics, and health

Industry-several producer and processor groups/associations as well as the Canadian Animal Health Coalition and the Canadian Animal Health Institute

Consumers-society welfare groups, media and individuals

Non-profits-the Canadian Veterinary Medical Association, animal welfare groups and organizations

Other-individuals representing animal welfare, farming, wildlife, organizations outside of Canada, and municipal governments

Options to tackle this complex problem

Although there are other options in addressing the problem of emerging infectious diseases in animals, such as focusing more on systemic causes and modelling, strengthening the Canadian AHEM system has been selected as a priority. For the purposes of this case study alternative options are not identified or evaluated in any detail as the impact of the foresight project on this problem can be assessed regardless. Other traditional options that may be typically pursued for such an initiative as strengthening the AHEM system are proceeding with research, consultation events and meetings, and strategic planning sessions without the use of foresight methodologies or future-oriented practices.

Fore-CAN project description.

There were three main objectives for Fore-CAN: learning about and using foresight; applying the insight gained from the use of foresight to assist in plans and investments made

regarding the "capabilities, capacities and competencies within the AHEM environment"; and utilize the knowledge from foresight to build on the AHEM system (Renwick, 2011, p. 5). Other objectives outlined in the literature were: identifying the priorities for the AHEM system; ensuring the AHEM system had the adequate capabilities to address future challenges by identifying what these future challenges may be and identifying strategic options to address these challenges; making certain that the AHEM system would align with the current initiatives underway and that there would be a merging of actions taken; working towards a shared vision for the AHEM system; and ensuring that the use of foresight would facilitate innovation, a supportive and knowledgeable culture, and inform as well as support decision-making (Renwick, 2011, 2012; Renwick et al., 2011; Vanderstichel, Van der Linden, Renwick, & Dubuc, 2010).

The partners engaged in Fore-CAN included:

- Canadian Food Inspection Agency
- Public Health Agency of Canada
- Agriculture and Agri-Food Canada
- Dairy Farmers of Canada
- Canada's Veterinary Colleges
- Alberta Agriculture and Rural Development
- TDV Global Inc.
- Ontario Ministry of Agriculture, Food and Rural Affairs
- Health Canada

In addition to Fore-CAN partners' in-kind contributions equivalent to approximately $2.5 million, this project was funded to the amount of $1.9 million by the Centre for Security Science within Defence Research and Development Canada (van der Linden, 2011).

Process.

The foresight process engaged various foresight methodologies used iteratively and over 300 diverse participants from 40 organizations situated within a variety of sectors and disciplines. The participants were reengaged for several exercises typically including 40 to 60 individuals each. The material described most of these participants as having little prior

experience with foresight. Several foresight experts and topic experts (including international contacts from the UK, US, and Australia) were also involved throughout the process (Renwick, 2010, 2012).

Methodologies included:

- "trends and drivers" analysis
- scenario development
- systems mapping
- scenario testing
- foresight integration
- causal layered analysis
- back-casting
- outputs synthesis
- outcomes-based Road mapping
- strategic development and alignment (Renwick et al., 2011)

Fore-CAN literature describes the process in slightly different ways; the process is outlined below as six steps. This process is reviewed in the final report (Renwick, 2011) and guides the description. The first step was the scanning process to identify trends and driving forces impacting upon the historical and future management of animal health emergencies. This began with a set of interviews that were conducted asking individuals to identify general information about the field. This information was then compiled and presented at a workshop in January 2009. At this event this information was elaborated upon and validated, with eventually groups of drivers emerging. The second step has been identified as scenario development and most of the work was conducted at a two-day workshop in April 2009. At this workshop, attendees identified two areas within the groups of drivers as high risk: "societal values and nature of infectious diseases" (Renwick, 2011, p. 12). These two areas became the foundation for the development of four different scenarios or plausible futures for the animal health emergency environment.

The third foresight step included systems mapping. This activity, held May 2009, was again completed in a two-day workshop format. The systems maps created were visual representations of key processes and relationships currently occurring within the four areas of the AHEM system: prevention, preparedness, response and recovery. The next foresight step integrated the information and processes that occurred to this point through a workshop in September 2009. The key objective in this phase was to start the generation of a new design for a new system that could address challenges put forth for the four different scenarios in the scenario development process. Four areas were identified in which the system needed to have the capability developed to address these challenges: communication, regulatory, education, and research and development. Identification of system requirements, use of leverage points (where change is possible) for the selection of design criteria (structural options), and prioritizing broad strategic options (or recommended changes) were the steps followed to generate a new design for the AHEM system.

The fifth step in the process was referred to as output synthesis (workshops held in November 2009, February 2010 and May 2010) and included a back-casting exercise, causal layered analysis and roadmap building to outline and validate the activities needed to develop those capabilities identified in the previous workshops. More detailed strategy work composed the sixth and final step in the process. In February 2011 a strategic alignment workshop was held to revise and validate work on the roadmap. A planning meeting was held in May 2011 and then a final workshop was held in September 2011 to facilitate the integration of the roadmap into strategic planning. The above is not a comprehensive summary of the meetings involved for this project but an idea of the timeline and key steps in the process.

Outputs and insights.

Fore-CAN generated several products. In addition to publications and promotional materials (including a website) for partners, the public, and scholars, the main products included: a shared vision and an integrated animal health risk management framework to achieve this shared vision, an animal health emergency management roadmap, a foresight guide and an assessment tool. The shared vision for Healthy Animals, Healthy Future 2025 is quoted as: “animal health will be recognized as a key pillar in the preservation and promotion of Canada’s

health and economic prosperity. In keeping with that perspective, Canada's animal health emergency management system will be anticipatory, adaptable, agile and seamlessly integrated with human, economic and environmental health systems"(Renwick, 2011, p. 22). The framework identifies five risk management action areas and five key capability areas with desired outcomes and characteristics (Renwick, 2011). The roadmap is an identification and alignment of initiatives with each other and with the framework, including outcomes identified for the short intermediate and long-term. The foresight guide and assessment tool are products which in the former facilitate the future use of foresight for other initiatives and in the latter, assist organizations in achieving the new shared vision through a systematic approach.

In addition to these products, the material on Fore-CAN had identified several process-based outputs and insights or lessons. The latter are particularly well-documented in the Fore-CAN report. Process based outputs were validated through a preliminary impact assessment conducted in 2011 (TFCI (Canada) Inc., 2011). Some of each is identified below.

Process-based outputs include:

- understanding of foresight as an effective tool;
- development of a stronger AHEM community; and
- as per the results of the impact assessment completed, awareness raising and informing are two of the highest rated overall impacts of the project. Some of the highest rated impacts of foresight include "enhancing intelligent systems and stimulating the exchange of information"; "communication and coordination"; "enhancing the environment for innovation", creativity and imagination; "developing connections and networks"; and "managing complexity, ambiguity and horizontal issues" (TFCI (Canada) Inc., 2011, pp. 6–7).

Project insights include the following.

- Foresight builds bridges and collaboration, supports system thinking, ownership of outcomes, shared understanding, encourages creative thinking and informs strategic planning and change management (Renwick, 2010, 2012).

- For foresight success it must be linked to planning or policy, communication is essential and champion from senior management is needed (Renwick, 2012). Helpful to have a core group of experienced participants (Renwick et al., 2011).
- Some of the challenges that have been encountered in the use of foresight in this project include the following. Foresight can be time intensive and difficult logistically. Working in-depth on an issue is difficult. Measuring impact and managing expectations are difficult (Renwick, 2010; Renwick et al., 2011).
- Two critical success factors for foresight, as indicated in the impact assessment completed, are to "integrate stakeholders into foresight programs" and "develop and employ methodologies and skills that are not always used in other departments" (TFCI (Canada) Inc., 2011, pp. 6–7).

Outcomes.

Potential outcomes, based on interviewee's responses, are presented below under Findings and Discussion. Also, a list of project benefits provided by interviewees is found in Chapter 9.

Findings and discussion.

The interviewees.

As an introduction to this section, some basic information about the interviewees is outlined. Fifteen participants in Fore-CAN were interviewed. The distribution of these participants was approximately equally divided between executives, academics, management and technical/consulting roles. Most of the individuals interviewed were from the public sector and most were located in central Canada. The second largest grouping was from the prairies. Overall, the types of positions held by the interviewees were roughly the same now, with the exception of changing organizations, as they were when they participated in the project. Of those interviewed only two individuals had minimal involvement in the project (half day or day participant in one session) and one individual was not a participant. One-third of those interviewed had participated in three or more different foresight projects/exercises.

Congruence among responses/corroboration.

One of the first categories of findings and discussion is the level of congruence and corroboration among the interviewees' responses. There was significant consensus among the respondents for several questions and nearly all responses to questions corroborate responses to other questions as well as the information provided in the project documentation, e.g., there is a very clear consensus as well as fit between the need and the strengths of Fore-CAN as outlined by the interviewees and the project documentation. In Table 10 question number 7, findings show that almost all respondents thought a strong AHEM system was critical to addressing the complex problem. In the same table under question number 4 all interviewees indicated critical action was needed in terms of strengthening the AHEM system. As another example, the three related questions regarding the problem, action needed, and importance of a strong AHEM system identify a focus around collaboration, planning and integration. Furthermore, in several of the other questions, such as project benefits and Fore-Can's role, responses indicate the achievement of those factors that strengthen the system, e.g., planning and collaboration. To illustrate, interview responses include:

> *Way of structured, organized forward thinking… Leads to tangible outputs that are usable, i.e., roadmaps, scenarios, etc.*

> *One health was a big theme – understanding of complicated issue, not just vets and wide number of stakeholders required to stage interventions*

> *Energy and attitudes changed that are benefiting antimicrobial resistance today*

> *Real push to anticipate what's coming next and how to deal with things didn't anticipate*

These achievements are corroborated by the process and product outputs identified in the information about the project. It was interesting to note that the identified next steps were around continued effort and refreshing foresight as well as developing an animal health strategy.

Impacts of the foresight project based on the external preliminary impact assessment and insights derived from other project documentation mostly corroborate the interview findings. As an example, one particular strong finding from the impact assessment is cognitive and social impacts of Fore-CAN which continue to be identified as prominent throughout dissertation interviews (TFCI (Canada) Inc., 2011). However, there seem to be minor discrepancies between these findings and interview results. Two factors likely have a significant role to play in these discrepancies. This is partially due to the instrument utilized: the impact assessment put forth detailed impact areas to be rated by the respondents in comparison to the current interviews which had required the identification of impacts. The other factor is likely partially due to the approximate five-year time lapse from when the impact assessment was conducted and now. Thus, respondents have the ability to make more judgements around longer-term impacts. For instance, an interviewee offered: "Fore-CAN success… since, more so than at the time… not really at the end of the project but in retrospect we did get there".

Project effects and factors affecting the project.

There are several noteworthy items around the category of elements that affected the project and the effects of Fore-CAN. These findings are especially interesting in a comparative analysis of the projects, which is conducted in the next chapter. One of these findings is the identification of the strongest areas in which participants were affected in terms of human dimensions and subject areas: cognitive, social, paradigm shift. These were then followed by personality, perception, problem-solving and creativity. The lowest affected areas were physical, emotional and then motivation, leadership, self-awareness, and spirituality.

Another finding is that process, context, resources and supporting tools have all been identified as factors strongly affecting the success of Fore-CAN. Each of them has received a response of yes from at minimum nine individuals. Alternative interventions as a factor received the lowest response of yes from only six individuals, as indicated in Table 10. Noteworthy is the impact of context as a strong driving force to work with this complex problem. The reasons for this project being undertaken at the time were strongly impacted by traumatic events, such as the SARS Virus Outbreak and BSE crises, that had occurred prior to this project and the sense these events were going to increase in frequency and potentially in the extent of damage. There was a

sense of urgency to improve responses to these events through preparation and collaboration rather than through reactionary measures. This driver was significant and a serious concern for all stakeholders involved. To illustrate, an interviewee provided a medium rating on the value of foresight and stated, “usually danger of threat mobilizes people”. Another interview referred to the complex problem as the “decade of animal health crises”.

Further, the research participants indicated the major impediments to addressing the complex problem in 2009 were mostly lack of integration and then intelligence gathering and money. Mostly two areas facilitated progress: negative experiences/critical need and various specific/interprovincial initiatives. However, progress itself has been made through increased collaboration, improved understanding and continued commitments to the area. Work is still needed, akin to the foresight project, as is ongoing funding to maintain this progress and keep ahead of future threats.

Table 10. Findings per question-project effects and factors affecting the project

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q3 Main problem in 2009	Mostly found problem with being reactionary and then focused on causation due to population growth.	No commitment to collaborate & react – 10, Population growth, environmental change & new diseases - 6
Q4 Critical action needed	All of the comments support a stronger AHEM system except those comments around foresight. However, the latter are also more in alignment with focusing on preparedness.	Collaboration & plan - 9, AHEM system - 6, Foresight okay – 4, info. surveillance - 4
Q6 Major impediments to management of problem	Diverse responses were provided.	Integration – 11, intelligence gathering – 4, money - 2
Aids to advancement	Many interviewees indicated that recent experience in the sector with emergencies has reinforced the need for action to be taken.	Bad experience and need – 7, Specific initiatives – 6, Interprovincial initiatives - 5
Q7 How important is a	Those who thought it was not really	Extremely Important – 13, Not

strong AHEM system	possible indicated that it is old paradigm thinking – we don't know the future.	really possible to prepare - 2
Q8 Problem well managed…or?	Particularly surveillance needs more work.	Needs work still – 7, Funding to maintain efforts - 5
Q14 Foresight affects	Data reinforces other question responses.	Cognitive/social – 6@[c] very strong; Personality – 10, Perception – 9, creativity/innovation – 8, Paradigm shift/Problem-solving – 7@ strongs
Q19 Process affect success	The first four variables had the most effect on the project's success.	Yes – 12, No response - 2
Context affect success		Yes – 11, No response - 4
Resources affect success		Yes – 10/11, No response – 4/5
Supporting tools affect success		Yes – 9, No response - 4
Alternative interventions affect success		No response – 7, Yes - 6
Q22 Signs of progress	Several different responses but answers confirm views from previous questions.	Collaboration/proactive & help others/commitment to AHEM/CEZD/hard to say - 3@
Reason	Most of these responses align with benefits of Fore-CAN, as is evident in the next question, but could have also been occurring regardless of the project.	Collaboration – 4, Understand importance – 3, More info. & tools/ongoing investment/realize can't do it alone – 2@
Q23 Needs to happen next	Diverse views offered but agreement that more work along the lines of Fore-CAN's work/progress achieved was necessary.	Continued effort – 4, Refresh foresight – 3, Animal health strategy - 2

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-6@" each comment separated by the slash symbol is offered six times

Successful/unsuccessful aspects.

The degree of value or success is a subjective determination and is also influenced by several factors, e.g., perspective of the stakeholder, relative benefits in comparison with other services, and extent of value versus resources expended. As such, information is provided so that an assessment of degree is open to the reader. Findings in terms of interviewees' perception of value and success are presented under this category, and as offered in Table 10.1. Examples of respondent's comments on the project's success are presented below.

> *Excellent tool created from project.*
>
> *Ongoing initiatives… they were happening but Fore-CAN help to put it into perspective into a pan-Canadian strategy.*
>
> *Really need people working together with common vision and can't underestimate the need of having people in the same room and talking same talk.*
>
> *That's why it's so important, because usually for strategic planning like-minded people plan together but, in this case, later I see the value of really different perspectives and I'm enjoying this.*

The data reveals Fore-CAN offered value and was perceived as successful. The two goals of the project, achieving consensus on required capabilities of the AHEM system and studying/applying foresight and the future were met. All interviewees thought Fore-CAN had a role in advancing the management of emerging infectious diseases but work still needed to be done and funding needed to be provided on an ongoing basis to maintain achievements. When asked specifically about the impact of the project, nine people thought Fore-CAN had a positive impact. In addition, 12 respondents thought Fore-CAN was successful at some level. A large list of concrete benefits, which substantiate the above claims, was compiled and is listed in Chapter 9. Nearly all interviewees said there was at least one benefit from the project. The benefits listed most often align with two of the strongest affected dimensions provided under the previous section: cognitive and social.

There were several other indicators Fore-CAN was valuable. For instance, five individuals (or one-third of those interviewed) thought Fore-CAN delivered more value than the value of invested resources. Four individuals indicated the investment was worth the money. Others said that they didn't know or it depended, but they did not say that the value was less than the resources invested. Furthermore, on average, almost two-thirds of the individuals interviewed thought Fore-CAN was very effective; approximately one-third thought it was efficient and almost two-thirds thought it was extremely collaborative. As well, seven individuals thought Fore-CAN was equal to or more valuable than other foresight projects. Finally, 73% of the interviewees followed-up with actions based on Fore-CAN. Most of these were concrete products/outputs in some form, e.g., creating or amending tools, and developing new processes.

The negative aspects of Fore-CAN were minimal and included the process being slow and tiring, not having enough action or outcomes, and an unclear direction early in the project. As well, numerous varied suggestions on how to improve the project/process were identified. These suggestions, for instance, conduct the process quicker, improve communication and follow-up, and engage more participants, align with the negative aspects offered. The negative aspects and suggestions to increase value also align with the findings in the previous chapter on difficulties with delivering foresight and the findings in the external impact assessment of this project. One research respondent observed "process very frustrating at times… lots of time talking with little action" and similarly another indicated "lack of action after to deal with the problem". Suggestions included "getting more people engaged in the complex problem", "need to sustain value… Maintain forward momentum" as well as "really needs to be part of senior executive process even if challenging".

Table 10.1. Findings per question-successful/unsuccessful aspects

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q6c Fore-CAN's role	Agreement that Fore-CAN has had some impact on change. Aligns with the major identified problem.	Networking & work together – 10, more appreciation/understanding/kn

		owledge – 8, integration - 6
Q9 Fore-CAN - success or failure	The majority think the project was a success.	Success – 9, Mixed success - 3, Can't judge - 2
Q10 Significant benefits	Many different benefits were offered; some of which were already mentioned under question 6	Anticipation & mind change – 13, collaboration – 7, tools & product outputs – 7, AHEM system advanced/risk mgmt. – 6, Networking – 5, Bring people together - 3, Advanced One Health - 3
Q12 Learned unexpectedly	Surprises were mostly around learning about foresight and value in looking at the future. There were various other surprises as well.	Foresight process & value therein – 7, different/changed thinking – 3, network & understand each other/tool – 2@[c]
Q13 Related follow-up	The majority followed up the project with practical work that resulted in creation or use of specific object or activity.	Diagrams/tools – 5, Established centre – 4, None – 4, New process/system – 3, spin-off projects/follow-up contacts – 2@
Q15d Value of Fore-CAN in comparison to others	Many were uncomfortable in directly assigning a value.	No response – 8, More valuable – 4, Equal value - 3
Q17 Value in terms of resources expended	Two-thirds thought the project was at least worth the resources expended with one-third thinking the project was more valuable.	Depends/Don't know – 6, More valuable – 5, Worth it - 4
Q18 Fore-CAN's effectiveness	In line with the responses from the previous question, nearly two-thirds found the project effective and a large number of these found it very effective.	Very effective – 6, Don't know/no response – 4, Effective+ – 3
Fore-CAN's efficiency	Interviewees felt the project was less efficient than effective, but more than one-third still found the project efficient.	No response – 6, Efficient+ - 4, Very efficient/limited efficiency – 2@
Fore-CAN's collaboration	Collaboration is the strongest value of the three with a majority indicating the project was extremely	Extremely collaborative – 9, No response – 4, Very collaborative - 2

	collaborative.	
Q18d How to increase value	Diverse responses with some congruence among responses.	Through more specific question/better follow-up/commit to do more quickly – 3@, Better prep, better communication/more engagement/use more regularly – 2@
Q19f Valuable element	Although in combination scenarios and the process were most valued, a number of individuals found the result of transitioning from diversity to consensus most valuable.	Diversity & consensus – 6, Scenarios – 5, Process - 4
Q19g Negative aspects	A few responses were offered.	None – 5, Unclear direction at beginning/lack of outcomes or action/slow & tiring – 2@
Q22c Fore-CAN's impact	Although one-third think the project had a very strong impact almost an equal amount think the impact was limited, i.e., comments: this question is difficult to reflect on when one does not see the whole picture or the counterfactual. Further, causation is difficult to establish.	Very strong – 5, No response – 5, Limited - 4

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-2@" each comment separated by the slash symbol is offered two times

Process/product.

This section is devoted to exploring the value of product outputs versus process outputs. It was interesting to see that the benefits listed were balanced between product and process, with process being stronger. This reflects how interviewees overall considered the importance of process and product. The findings indicate both are important, but the process was undoubtedly primary. Particularly valuable within Fore-CAN were the scenario work and the process in general that achieved collaboration and consensus amid significant diversity. Progress for the complex problem is also defined mostly in terms of process factors, for example, collaboration,

becoming more proactive and stronger commitment (as per Table 10.1.) The reason for the progress, as outlined in Table 10.2, was also mostly due to process factors, such as, collaboration, understanding and then information/tools, investment. Furthermore, required next steps are more of what has been done in the recent past, examples of comments from interviewees include: "need to relook at Fore-CAN findings and look at aligning strategies across a wide range of stakeholder groups", "maintain collaboration and ensure integrated system-wide approach" and "resourcing is a continuous process… how do we measure this where measurement is so critical to resourcing". Hence, a large majority of interviewees think that the process was the greatest output as well as had the greatest impact on the complex problem.

Table 10.2. Findings per question-process/product

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q20 Process>product outputs	Process received the most support for affecting/producing outputs and outcomes.	Process – 12, No response - 2
Process or product impact on outcome of problem		Process – 11, No response - 3
Q22b Reason	Most of these responses align with benefits of Fore-CAN but could have also been occurring regardless of the project.	Collaboration – 4, Understand importance – 3, More info. & tools/ongoing investment/realize can't do it alone – 2@[c]
Q23 Needs to happen next	Diverse views offered but agreement that more work along the lines of Fore-CAN's work/progress achieved was necessary.	Continued effort – 4, Refresh foresight – 3, Animal health strategy - 2

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-2@" each comment separated by the slash symbol is offered two times

Improvement possibilities.

This category addresses the question of how one could improve or increase the value of the project. One question was asked on this topic. The responders indicated the value of this type of foresight could be increased through attending to a range of process related factors. These predominantly included: more follow-up, faster delivery of project, be more specific research question and a less often mentioned miscellaneous list of other areas such as engaging more outsiders, regular use of foresight, improve preparation, and improve communication around what foresight delivers and the actual resulting outputs of the process. Responses on the projects' negative aspects, displayed in Table 10.3, validated this finding by identifying related items, like the process was slow and tiring.

Table 10.3. Findings per question-improvement possibilities

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q18d How to increase value	Diverse responses with some congruence among responses.	Through more specific question/better follow-up/commit to do more quickly – 3@[c], Better prep, better communication/more engagement/use more regularly – 2@

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-3@" each comment separated by the slash symbol is offered three times

Value of foresight.

The value of foresight grouping addresses the interviewees' perception of foresight in general. Naturally, this perception has been formed by the interviewee's exposure to foresight, for example, through documentation, media and feedback from others as well as may include only experience with participating in this one project or many other projects. Regardless, this section explores the general impression individuals have about foresight's value and not how this impression was formed.

Most interviewees judged foresight to be very valuable. As can be seen from the responses in Table 10.4, ten individuals identified foresight as very valuable (five had no response or were not asked the question due to time constraints). In addition, the extra unexpected learnings from Table 10.1 were regarding foresight and the value of the future. Besides that, six people thought foresight was more valuable than traditional methods and six of the other individuals interviewed thought that foresight was either equal value to other traditional methods or value depended on circumstances. Potentially attributable to these views, most of the interviewees have used foresight in some form since Fore-CAN.

Table 10.4. Findings per question-value of foresight

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q11 Expectations met	Most expectations were met. Some individuals didn't have any expectations.	Met – 7, Had none – 4, Not fully met – 1
Q15c Value of foresight generally	Majority think foresight is valuable with one-third seeing it as at least very valuable.	No response – 5, Valuable – 3, Extremely valuable – 3, Valuable (if done well) - 2, Very valuable – 2
Q16 Value in comparison to traditional	Half of those who had responded thought foresight is more valuable than traditional methods. No one thought foresight was less valuable.	More valuable – 6, Depends/Equal/No response – 3@[c]
Q21 Used foresight since	The majority have used foresight in some form since.	Yes – 6, In some form/No response/No – 3@

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-3@" each comment separated by the slash symbol is offered three times

Summary.

In 2011, there was a significant and immediate concern about emerging animal infectious diseases in Canada and the strength of the AHEM system. Fore-CAN provided value and was seen as successful by interviewees. Five years ago, an external preliminary impact assessment also highlighted the positive impacts. In addition, foresight was perceived by research

participants as a very valuable practice. Although negative experiences were minor and corresponded largely with the findings of the previous chapter on challenges with foresight, such as implementation of results, takes a long time to deliver process and communication issues, there was certainly room for improvement. Suggestions were various and mostly process related. Along these lines, process-based outputs and impacts on the complex problem were seen as paramount in comparison to product-based. Interviewees' responses were mostly consistent as well as internally corroborated among the questions and by the project documentation.

GBFP: A case of seeds for sustainability.

Work on this project began in 1999 and continued until 2004 and was led by Dr. John Robinson from the University of British Columbia Sustainable Development Research Institute. Although plans entailed a second part to the project which would focus on more practical outcomes, funding from the Social Sciences and Humanities Research Council was not realized (J. Robinson, personal communication, December 8, 2016). The Institute managed this project along with GBFP research being conducted by 20 coinvestigators and collaborators, three postdoctoral fellows, three research staff, administrative staff and approximately 18 Graduate Research Assistants. GBFP was considered an integrated assessment futures project that was collaborative, interdisciplinary and participatory. Primarily funding was provided by the Social Sciences and Humanities Research Council ($2.4 million over five years). In addition to in-kind support worth approximately $1.6 million, additional funding of $2 million was secured from 16 other partners, such as Georgia Basin's regional districts and the Ministry of Municipal Affairs, as well as UBC and SFU. The broad research question addressed by this study is "how can we reconcile ecological limits with increasing human welfare?" (Sustainable Development Research Institute, UBC, 1999, p. 4). Participants were invited to consider their region's future 40 years hence, 1990-2030 (J. Robinson, 1998).

GBFP, primarily a research project, was considered on average a success by the interviewees. Most of these participants would fund a similar project today. Both the process and products were seen as valuable. The project was also seen as highly collaborative by this group. However, the ongoing activities towards achieving sustainability in the Georgia Basin region, as well as GBFP, amounted to slow and incremental progress overall. Barriers such as governance,

lack of appreciation of the issues, and difficulties for society and individuals in engaging in activities that reduced a level of comfort or income hindered progress overall towards achieving sustainability. Advancements in general over the past 15 years, as defined by the interviewees, have mostly entailed the internalization of sustainability and its concepts as well as achieving some specific benefits in a particular area, like recycling. GBFP had facilitated discussions and awareness around both the topic of sustainability and of the importance of sustainability to the region's future. Many additional benefits were also identified as a result of the project.

Contextual information for Georgia Basin region sustainability.

Problem definition.

The Georgia Basin region (currently referred to as the Salish Sea ecosystem and illustrated in Figure 13) was experiencing significant ecosystem damage and had the potential to suffer great loss in terms of its health if the area is not managed for long-term sustainability (Rana, 2001). The threats to this region were multiple and included the growth of the human population, urban sprawl and changes to the environment including climate change. Sustainability and sustainable development are used interchangeably throughout this document to refer to economic, environmental, and social aspects of the term.

Background.

GBFP addressed the Georgia Basin region, the term used in this dissertation, which is the area surrounding the Georgia strait, Puget Sound and the Strait of Juan de Fuca. This area is a vital resource ecologically, economically, culturally and historically for local, national and international populations. This is a transboundary area that includes areas of British Columbia Canada and Washington State USA.

Governance of this area transcends several political jurisdictions from municipal, provincial/state, national to international considerations. A diverse and large number of species as well as sensitive habitats are housed within the Georgia Basin. Almost 7 million people live in the Puget Sound – Georgia Basin region as of 2000, fostering a diverse culture and strong economic area which includes coastal access to the Pacific Rim (J. Robinson, Rothman, Tansey,

VanWynesberghe, & Carmichael, 2001, p. 53). Several indigenous groups call this area their ancestral home, particularly the Coast Salish people.

Figure 13. Georgia Basin

This figure illustrates the map of the Georgia Basin ecosystem on the west coast of Canada and the USA as illustrated in The Georgia Basin Action Plan on Environment and Climate Change Canada's website (http://www.ec.gc.ca/pabg-gbap).

Issues.

There are numerous issues confronting the Georgia Basin that are attributable to a conflict between the human population and environmental health. The impact of population growth in the area has endangered many species, resulted in land and water contamination, and increased air pollution while reducing the size of natural habitats. As Fraser et al. (2006) delineate the concerns are not only regarding the population growth but also urban sprawl. Urban sprawl impacts land and water resources in the area which in turn affects social, economic and cultural costs. Urban sprawl can be better controlled through appropriate planning. In many cases, this implies a common understanding of the needs of the region both in terms of the communities, the indigenous population, scientists, politicians and community planners.

These issues have been addressed in different ways: through trans-boundary governmental initiatives, collaboration of scientists to provide the means in which to facilitate

progress for all stakeholders, conferences and other events. Regulations have been put in place by several jurisdictions to protect the ecosystem, for example, the Regional Growth Strategies legislation in BC. The Georgia Basin Ecosystem Initiative, a joint initiative by the federal government and the BC government, was in place between 1998 and 2003. The Canada – United States Joint Statement of Cooperation on the Georgia Basin – Puget Sound Ecosystem is another example of trans-boundary cooperation to address the concerns for the region (Fraser et al., 2006). Through including scientists in initiatives and increasing funding for research, scientists continued to find ways to improve the region and address continuing sustainability concerns in a collaborative manner. Several conferences were also instrumental in facilitating collaboration for addressing issues confronting the Georgia Basin, such as the 2003 Georgia Basin/Puget Sound research conference. These events were critical in recognizing the importance of the issues facing the region and the need for continued efforts to collaborate among a diverse group of stakeholders. Although significant work had been completed over the past four decades the problems were complex and their effects on the environment were accumulating.

STEEP drivers and trends.

The trends for the area seem to indicate the problems facing the region were growing. Demographically the population is expected to exceed nine million people by 2020 in the Puget Sound – Georgia Basin area. The environmental indicators had identified significant losses of natural habitats including at minimum: a loss of 99% of the wet meadow areas, a loss of 98% of marsh habitat, and 80% of tidal areas in the "Sound's major river deltas" (Fraser et al., 2006, p. 52). At minimum 60 species have experienced significant losses and this has resulted in serious concern. Even though fishing limits have been imposed for different species they continue to decline in significant numbers and invasive species proliferate. Oil discharges in marine areas have been on the rise and air quality continues to degrade.

On a more general scale many other trends and overall changes were taking place during the context of GBFP: increasing globalization, significant progress in new technological developments as well as the burst of the.com bubble, increasing focus on the health of the environment, and identification of an increased need to engage communities in activities and decisions that are related to their well-being. International events prior to and in the early 2000's

included the signing of the Kyoto Accord, the terrorist attacks on September 11, the preparation for the Y2K/coming of the year 2000 and its effects on computers, and impending concern for climate change. Other issues primarily prevalent in the early 2000's and relating to Canada specifically were increased attention on the Canadian health care system, the E. coli contamination of water supplies in Walkerton, a fairly strong economy, Statistics Canada reporting the richest 20% of the population increasing its wealth by 39% while the 20% poorest staying at the same level of income, various free trade negotiations taking place, the Canadian Alliance being formed, a greater interest in municipal governance, and advocacy for international human security issues (Mutimer, 2006, 2007).

As concerns around globalization and sustainability were prominent at the time, several projects related to GBFP were being completed. These included projects that related to, for example, sustainability, integrated assessment, climate change and software modelling development. For instance, ULYSSES, a project in the European Union, looked at sustainability and climate change and a panel was held on global climate change in July 1999 in BC (Sustainable Development Research Institute, UBC, 1999). The Basin Network committee was formed, Bombardier donated funds for a UBC Chair in Sustainable Urban Transportation, and a project to develop the Georgia Basin Institute, a university body to conduct research in the area, was initiated to advance environmental interests in the region but results did not ultimately materialize.

Stakeholder identification.

There are numerous and varied stakeholders involved in this complex problem area.

Academia - primary stakeholders are principally academics in BC involved in sustainability. The field of sustainability intersects with many other academic areas, such as, health promotion, economics, planning and business. National as well as international academics were also undoubtedly interested in the sustainability practices of an area such as the Georgia Basin

Federal - those departments involved in natural resources and the environment as well as aboriginal affairs and intergovernmental cooperation with the US, such as, Fisheries and Oceans

Canada, Environment Canada and International Affairs. As well, departments involved in areas related to social and economic sustainability considerations

Provincial government - a range of provincial departments within BC, such as, economic development, aboriginal affairs, municipal affairs, and environment

Municipal governments - those governments located in the Georgia Basin area and secondarily in the Puget Sound area

Industry - industry members primarily in the resource sector and the use of information technology and visualization software

Public - all members of the communities in the Georgia Basin area primarily as well as in broader British Columbia and Puget Sound

Non-profits - engaged in the environmental area/sustainability as well as in scientific research and the use of tools/technology for larger communities to improve sustainability and the well-being of communities involved – these non-profits range from those specific to the region as well as international organizations

Other - media

Options to tackle this complex problem.

There are undoubtedly numerous ways in which sustainability has been approached and continues to be approached in communities worldwide. Through research and technology, this project was a unique way in which to try to address a complex problem that has had significant importance yet very little traction in efforts towards its realization. The project is well-founded in terms of the scholarly literature, application of technology available and increasing practices to engage the public as well as key stakeholders attempting to collaboratively address sustainability.

GBFP description.

This project built on the tradition of participatory integrated assessment, work in the fields of future studies, sustainable development, and sustainability science. Resulting from the work carried out in GBFP several articles were published, thus, furthering knowledge in these fields (some of the futures related articles published included (J. Robinson, 2003, 2003; J. Robinson et al., 2011; Swart, Raskin, & Robinson, 2004). Of particular note, these areas reflect a strongly identified need by scholars to take an interactive approach to social research and complex problems that combines knowledge of systems and inter-and transdisciplinary knowledge with practicality or useful purposes through working with a diverse range of stakeholders, further discussed in and advanced by articles published as per GBFP (Carmichael, Tansey, & Robinson, 2004; J. Robinson et al., 2001; J. Robinson & Tansey, 2006; Tansey, Carmichael, VanWynsberghe, & Robinson, 2002; Wiek et al., 2014). Three other areas were key in terms of providing a foundation for this project and they included the technology available to develop the software, the research available on engagement of stakeholders and the recognition of the importance of visualization as a tool for complex problems.

Based on the combination of the need for both research and practical work to be undertaken in this region and the background in the related fields, a proposal was put forth to the Social Sciences for Humanities Research Council for funding. This project was unusual in the level of involvement of a diverse group of stakeholders that encompass both industry, government, community members, non-profits and international collaborators. Also, the project was unusual in that it combined scholarly research and associated funding with in-depth public engagement and public/industry financial support to meet an urgent need for progress. Furthermore, the interdisciplinary project focused on the use of software and foresight-based principles (J. Robinson, 1998).

The project had two main goals. The first goal was to use scenarios to develop a better understanding of the interrelated dynamics of the different social, ecological and economic systems within the Georgia Basin and based on this understanding identify those policy interventions that could reduce the negative environmental effects of human actions while enhancing the well-being of humans. The second goal was to evaluate game–like simulation

tools in their role of increasing public understanding of the systems identified in goal one and the trade-offs that need to occur regarding sustainability (J. Robinson et al., 2001). Based on these two goals four objectives were identified: (i) focus on the future by creating and analyzing differing scenarios for the Georgia Basin for the upcoming 40 years, (ii) engage the public and decision-makers in a dialogue to build the scenarios and to next engage them in assessing the game–like models, (iii) develop interactive software tools, and (iv) lastly work with other researchers in different jurisdictions to create similar case studies to GBFP project internationally.

Additionally, there were some key principles involved in the development of this project which have been outlined in several of the project documents. The use of backcasting, a "design approach to modelling" and an "interactive social science approach" are three key foundations of this project. Backcasting is based on defining preferred future outcomes and identifying the elements needed to achieve those outcomes. The second of the foundations refers to "the physical flows of matter and energy through the economic system" (Sustainable Development Research Institute, UBC, 1999, p. 6) to address what is both feasible and desirable. Finally, the last of the foundations refers to the incorporation of values of the user communities in the project.

The partners for this project included both those who had formal agreements in place as well as those with informal agreements. The list below includes those who had formal agreements in place.

- BC Hydro
- BC Institute of Technology
- BC Ministry of Environment, Lands and Parks
- BC Ministry of Municipal Affairs
- David Suzuki Foundation
- Environment Canada
- Environmental Adaptation Research Group
- Envision Sustainability Tools, Inc.
- Fraser Basin Council

- Greater Vancouver Regional District
- The National Research Council Innovation Centre
- Open Learning Agency
- Science World
- Shell Foundation
- Tellus/Stockholm Environment Institute (Boston)
- The Vancouver Sun
- West Coast Energy

In addition to the stakeholders outlined earlier for this particular complex problem and as partially represented by the formal and informal partners (formal listed above), the research and management team including research collaborators, co–investigators, graduate students and managers working on the project are also considered stakeholders. To clarify, this latter group represents members of academia and the non-profit sectors (J. Robinson et al., 2001). This is important for this dissertation because participants are difficult to identify, access and then reliably assess their viewpoints after a long time since project completion.

Process.

One of the objectives of this project was to further develop an interactive software modelling tool: Quest. Through its use it engaged the members of the communities in a learning process while gathering information on the concept of sustainability and community members' interests and values around the trade-offs associated with sustainable practices. Quest was like a computer game that provides the users with the opportunity to learn science-based practical knowledge about their region and the impacts of their decisions.

This project was divided into six research components: policy analysis, model development, community engagement, scenarios, strategies, and model evaluation. Each are comprised of subcomponents, but this information is not examined in-depth here; it can be accessed through publications on the project. The first three components feed into the scenarios and then the strategies components. Policy analysis is concerned with developing a better understanding of the conflicts and concepts around sustainable development and then defining

sustainability strategies for the Georgia Basin region. Model development focuses on developing the models that comprise the Quest software modelling system. Community engagement incorporates public views into Quest by connecting with the public through a range of events and public interactions. The scenarios component develops and refines future preferred scenarios for the Georgia Basin area through economic, social and environmental trade-offs made by the user of Quest. The strategies component then takes the information from the scenarios stage and upon its evaluation provides implications for policies and strategies for each resulting scenario. The final component determines the usefulness of quest in changing views of the public and improving their understanding of sustainability in the region (J. Robinson et al., 2001).

Outputs.

A significant amount of research and community events took place during the term of this project. To illustrate, 170 participants were engaged in 15 Quest workshops, three local case studies were developed, curriculum guides and resource packages were developed, and roughly 18,000 people used a version of Quest at Science World. The Georgia Basin Digital Library was an associated research project that created online place-based tools to support knowledge exploration and storytelling about the sustainability of the Georgia Basin region (S. Talwar et al., 2003; Sonia Talwar, n.d.). The development of Quest internationally, e.g., Mexico, Malaysia, New Zealand, was an ongoing effort as well as associated studies (Journeay et al., 2000; J. Robinson et al., 2001; Sustainable Development Research Institute, UBC, 1999).

The Georgia Basin Quest software tool was one of the products of GBFP. Other products included the refinement of a “personal Climate Change Calculator and a Sustainability Tools and Resources website”. The Georgia Basin Digital Library project provided a prototype of the web-based digital library for the Georgia Basin area that was based on sustainability concepts integrating information on natural resources with “Geographic Information System maps, images, and text” (Robinson, Carmichael, VanWynsberghe, Journeay, & Rogers, 2006, p. 171). Augmentations to Science World’s technical features, like the carbonator and voting buttons, and design of the Decision Theater in CIRS, were additional outputs of GBFP as well as input into the emergence of two companies, Offsetters and Metroquest which are in business today (J. Robinson, personal communication, August 2, 2018).

Outcomes and insights.

Robinson et al. (2006) identify the key outcomes of the project as grouped into nine areas and discuss them in-depth. The identification of these areas is excerpted from the text and listed below.

- scenario generation models
- definition and exploration of sustainable futures
- use of GBFP team models in participatory processes and involvement of stakeholders and partners in these processes
- three urban-scale case studies
- cognitive and behavioural effects
- use of tools and processes in classrooms
- value of the processes used in the project for policy analysis
- development and use of digital library tools
- challenges of managing the research and partnerships in the project

Several lessons are learned from this project and they are identified in some detail within the discussion of each key outcome in Sustainability as a Problem of Design (2006). As a sample, some of these lessons are outlined below.

- Participants were interested in futures of the Georgia Basin, but it was a difficult/complex process to work with due to the spatial scale of the region. Additionally, the information about making trade-offs was critical and the tool used was helpful for communities (less so for policy at regional levels and for experts).
- A key element to the workshop process was that scenarios were created by users not experts.
- Processes had some impact on the mental models and attitudes of participants.
- Use of technology had an important role in providing a basis for stimulating informed discussion of deep questions.
- Further detail on lessons learned from the exercises conducted for scenario development is available in the publication “Towards Community Engagement: Six steps to expert

learning for future scenario development" (VanWynsberghe, Moore, Tansey, & Carmichael, 2003).

Several other lessons and/or issues were drawn from the publications based on GBFP.

- The barriers to interactive sustainability research are primarily organizational and institutional not technical (Sonia Talwar, Wiek, & Robinson, 2011).
- The process is as important as the tools developed and the process also includes the follow-up that had occurred after the development of the tools. Partner organizations in the community are critical to the process in that they facilitate learning and provide knowledge as well as resources (J. Robinson, 2003).
- Project management was a complex exercise partly due to the academic culture in relation to the type of exercise undertaken and partly due to the complexity and size of exercise. There was a disjuncture between the core research team and the expectations of partners especially in relating to the controlling of the agenda. Questions were raised as to whether the project should focus on exploring issues on sustainability or educating participants about sustainability. Issues arose, such that the tools used would not be for targeting everyone equally by the nature of their design, i.e. software. Conducting interactive sustainability research well is difficult due to at least three factors: divergence between 'fun to use' versus 'true to life', interdisciplinary nature of research and divergence between academic versus practicality (Robinson & Tansey, 2006).
- Evaluation of a participatory process can be difficult due to various reasons: getting buy-in from project leaders, tracking down project participants, incentivizing participation in the evaluation and mitigating the effects of memory distortion (Wiek et al., 2014).

Longer-term outcomes.

Potential outcomes, based on interviewee's responses, are presented below under Findings and Discussion. Also, project benefits as identified by interviewees are listed in Chapter 9.

Findings and discussion.

The interviewees.

Fifteen participants in GBFP were interviewed. Most of the individuals interviewed were academics and males. The types of positions held by the interviewees were roughly the same now as they were when they participated in the project. Members of partnering organizations were also interviewed but they were not as familiar with the project. One-third of the individuals are experienced in foresight, but most have limited to no experience. Most people had at least minimal exposure to Quest or the events with one-third who had strong exposure as presented in Table 11.

Congruence among responses/corroboration.

Although there was congruence among some responses in this case, the congruence is not as strong as in Fore-CAN. For instance, some members of the partnering organizations had a very different perspective of the project and did not remember the project as clearly as individuals who were directly working with the project. This is understandable, since members were focused on progress on sustainability in the region and were not involved in-depth with the project so would not remember the details as well. The other area that reflected increased incongruence is the diversity of responses provided for more of the questions. For instance, in the previous case for some questions similar responses were mentioned by eleven of the interviewees, while in this case it was difficult to find congruence at that level. However, agreement among six individuals is common.

Many responses were corroborated by more than one question and by the documentation for the project. As per Table 11, comments regarding what was needed to address sustainability included increased understanding, integration and collaboration. Related in the following question on impediments to change, governance and understanding were mentioned. To illustrate further, in question 14 interviewees were asked if we are closer to sustainability and in question 24 what needs to happen next. Responses to both questions referred to needing an integrated plan. Another example, interviewees had indicated under question 5 that it is difficult to change as a society and make progress. Signs of progress in question 23 have been limited to internalization of the concept of sustainability. The reasons for progress or lack thereof were

again slow effort and hard to change. These responses corroborated each other. Unexpected learnings, GBFP's role and valuable elements also have similar responses around learning, collaboration and integration (Table 11.1). Several outcomes listed for the project by Robinson (2006) and several lessons learned and documented by many other publications, as listed above, also corroborated the interviewees' responses, e.g., processes impacted upon mental models, project management can be difficult in a project like GBFP and use of technology was important.

Project effects and factors affecting the project.

Two elements of significance in this category are the extent to which the individuals were affected by the project as well as identifying variables impacting the project's success. The strongest human dimensions and subject categories that were affected were: cognitive, social, perception, decision-making and creativity. Paradigm shift, leadership and problem solving followed. The lowest areas affected were identified as emotional, self-awareness, motivation, culture. In question 20 of Table 11, all variables but alternative interventions were described as having a strong impact on the project's success.

As such, an important area is context of the project; a few highlights follow. Efforts have continued for several decades to address the sustainability problems in the region with limited success. However, it is important to note the goals of the project and for which funding was received were specifically to increase understanding around sustainability dynamics for policy interventions and evaluating game-like simulation tools. This was primarily a research project. To illustrate, one of the interviewees commented "to the extent that an academic research project is able to advance these things with external engagement… a participatory discussion did have a helpful impact".

GBFP began among what was still a smattering of projects and initiatives in the region but with growing interest in the environment and sustainability. There was a sense of urgency to work toward sustainability, but immediate driving forces were not as apparent as, for example, in Fore-CAN. Most of the interviewees felt the critical actions needed at the time to address the complex problem were general collaboration, education, action and integration of efforts, (Table 11, Q4), for instance, "education and broaden people's basic understanding", "collaboration

among various interests" and "failure to appreciate extent and urgency of problem needing response". These desired outputs are not surprising for an area in which initiatives have just started to take place relatively recently and progress was slow. The goals of GBFP were somewhat aligned with the critical actions needed as identified by interviewees.

To end this category of themes, attention is directed at the current situation. Most of the interviewees don't think the region is getting closer to sustainability but it would be okay if it at least had an overall plan which integrated stakeholders, included social aspects, and enabled the region to continue to move ahead (Table 11, Q14 & Q24). Elements of this were originally the intention for the next phase of GBFP (J. Robinson, personal communication, December 8, 2015). This current requirement is similar to what interviewees mentioned as important when GBFP began except for now there is a stronger focus on implementation. For instance, examples of comments on what is needed include "now no unifying objective for the region", "an overall plan/strategy for sustainability for three levels of government, across the border and indigenous" and "more integration, clear roles of different organizations contributing to sustainable region".

The responses around impediments to advances in this area almost 20 years ago are similar to current reasons for lack of progress: difficult problem with slow progress. Yet, progress has been seen to occur in terms of internationalization of sustainability and several different activities/changes (Table 11, Q5 & Q23). One interviewee stated "discourse around sustainability advanced, much richer and normalized" and another offered "more use in our language – it's acceptable". GBFP could reasonably have contributed to this progress but it would be very difficult to measure the level of this impact (Table 11, Q23c). Most people interviewed have hope for some level of progress in the future. Table 11 explores this category.

Table 11. Findings per question-project effects and factors affecting the project

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q4 Critical action needed	More than half of the interviewees focused on collaboration, understanding, education and the rest focused on listing specific	Collaboration/understanding & integrating views & evidence – 3@[c], Ecosystem collapse/educate people – 2@,

	issues	Miscellaneous listing of issues such as planning, transportation, climate change – 5
Q5 Major impediments to management	The impediments were mostly around governance/jurisdiction/connectedness/sectors but there are a range of other responses of which included a predominant area around the comfort and a difficulty for a society to change from the consumption society to something else	Governance – 6, Difficult & Comfort/failure to appreciate/lack of info & incentives/not enough resources/seen as luxury & competing demands/specific reasons (e.g., pop growth) – 2@
Aids to advancement	A variety of responses were offered, but most responses represented a growing interest in sustainability - specifically the environmental component through 'a smattering' of activities.	Numerous miscellaneous items mentioned once each
Q12 Foresight affects	The weakest were emotional, self-awareness, motivation, culture. Some of this can be explained in that the individuals said they were motivated prior to the start of the project.	Social – 6, creativity & innovation/cognitive – 4@, Perception – 3 (Very Strong); Leadership – 9, Decision-making/problem-solving/paradigm shift/physical/personality – 8@ (strong)
Q14 Closer to achieving sustainability	We would be closer to achieving sustainability if there was a stronger focus on social aspects, and an overall plan and integration with all the stakeholders moving ahead.	No - 8, Yes – 6
Q15 Who to target	Many first say both and then identify the primary.	Key leaders (specific ones listed) - 9, Bottom-up or everyone - 5
Q20 Process affect success	The first four were the most affective in terms of success.	Yes – 9, No response - 6
Context affect success		Yes – 10, No response – 5
Resources affect success		Yes - ~8, No response – 6
Supporting tools affect success		Yes – 8, No response – 7
Alternative interventions affect success		No response – 8, Yes – 4, No - 3
Q23 Signs of progress	The common response is internalization validated by different specific things, shows how the type	Internalization of sustainable development – 7, Lots of different things - 7

	of project could have had an indirect but important impact.	
Reason	Responses also related to the system as a source for lack of progress, e.g., capitalism, government, lifestyle.	Slow sustained effort – 5, Hard to change – 4 (lack of progress), Problem is more critical - 3
Q24 Needs to happen next	Many miscellaneous items mentioned once each.	Collective regional plan – 4, Convince big corporations - 2
Q25 Georgia Basin in 25 years	The interviewees are generally positive but then they say they need to be.	Incremental progress or hope for it – 11, Going down - 3

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-3@" each comment separated by the slash symbol is offered three times

Successful/unsuccessful aspects.

As per the findings of this research, the GBFP project team overall met their main two goals for the project: using scenarios to improve appreciation of the dynamics in the region and then identify appropriate policy interventions and evaluate game-like simulation tools. Furthermore, GBFP had a positive impact on progress for regional sustainability. Although the project was not completed in its originally anticipated and extended form, several specific and general benefits can also be (potentially) attributed to it, like "Quest software", "the term Salish Sea and recognition of the indigenous peoples", "the need for an aspiration/vision and a plan" and "the CIRS building". Even though the project was not necessarily the only factor in these activities, there is a likelihood that of the large number of benefits listed GBFP had an impact on the general steps achieved. Accordingly, one-third of the interviewees indicated GBFP likely had an impact on progress. This again aligns with the fact that it is hard to change society and individuals especially when comfort and system level factors are holding back change. Even so, GBFP brought attention to the problem and facilitated communication around it.

The project was seen on average as successful. Success for the project was rated at average but nine individuals had indicated at least limited success was achieved. The misconception/lack of recollection of the project among some partnering organization representatives decreased the number of interviewees who responded to this question. Most

interviewees thought this project was on average effective and efficient. However, it provided very good to excellent value in terms of collaboration.

Regardless of it being a slow effort and a growing complex problem with limited impact from GBFP and its average success, the interviewees thought the project's value was equal to or higher than the value of resources invested. Most would fund a similar project again. Key unexpected benefits were divided mostly among learning something and diversity and transdisciplinary being important. Similarly, valuable elements included transdisciplinary and cross-sectoral communication then impact on young people and development of Quest. Some examples of interviewee's responses on valuable elements include the following:

Quest, its presence

Diversity of research team

Degree with which students doing modelling or other assessments on the project were forced to learn about other areas as relating to their area of expertise

As student training vehicle, in terms of faculty getting together to think in common terms it was a success

Decision to have community engagement really important/powerful

Most interviewees continue to work in the area with a large number who used the project outcomes for academic work. The potential impact from the project, as per GBFP's role, benefits, unexpected benefits and valuable elements listed, matched the identified objectives in terms of research and building understanding as indicated by the majority interviewed.

There is a diverse but limited array of negative elements listed for the project: mostly around the lack of providing long-lasting on the ground impact/strategy/engagement of stakeholders. A few interviewees find the project having equal to or less value in comparison to

other foresight projects, but most individuals did not have a response for this question. Table 11.1 identifies details for this category.

Table 11.1. Findings per question-successful/unsuccessful aspects

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q5c GBFP's role	Most of the impact was around facilitating discussions and awareness, bringing people together, and somewhat gathering knowledge and learning.	Facilitate discussions – 3, Bring people together/importance of region – 2@[c]
Q6 How successful for sustainability	The majority felt some level of success was attributable to the project.	No response – 6, Successful+ – 4, Very successful – 3, Limited success+ - 2
Q7 Significant benefits	These are listed in the comparative analysis section of Chapter 9.	Numerous miscellaneous items mentioned once each
Q9 Learned unexpectedly	Many miscellaneous items mentioned once each but there seem to be a focus on learning something plus diversity, and transdisciplinary was mentioned as important.	General learning/no – 3@
Q10 Related follow-up	General responses were mostly provided.	Continue to work in the area – ~8, Used for academic work - ~5, No response/no – 3@
Q13 Did participants change	This was a difficult question –to gauge effects on others. Mostly, no responses provided because interviewees did not feel they could pass judgment. Individuals also mentioned impacts were not likely to be long-lasting.	No response – 7, Yes - 6
Did organizations involved change		No response – 9, Yes - 4
Q16c Value of GBFP in relation to other projects	Difficult to rate/compare.	No response – 10, Equal/less – 2@
Q18 Value in terms of resources expended	The value was equal to or more than resources expended for the majority – especially as a research project.	More – 5, Equal/no response – 4@
Would you do it again	The majority would fund a similar project today.	Yes (something similar) – 9, Not really - 2
Q19 GBFP's effectiveness	A third thought the project had a low level of effectiveness.	No response – 6, Somewhat Effective - ~5, Very effective - 3

GBFP's efficiency	Efficiency rated average.	No response – 7, Efficient+ - 6,
GBFP's collaboration	Collaboration received the highest rating.	No response – 6, Extremely collaborative/Very collaborative – 4@
Valuable element	These comments align with learning and understanding, integration, & collaboration.	Transdisciplinary & cross-sectoral work – 4, Quest/Young people – 2@
Q20g Negative aspects	Some miscellaneous items mentioned once each.	No - 3
Q23c GBFP's impact	A third of those interviewed indicated the project had impacted progress but it is hard to identify causation.	No response – 8, Impact occurred – 3, Limited impact - ~3

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-2@" each comment separated by the slash symbol is offered two times

Process/product.

Process outputs are identified as critical for impacting upon the complex problem, but an accompanying strong product was necessary. This was corroborated by the question in which events/facilitated workshops in conjunction with the product were identified as more valuable than just the product used by one person alone, as per Table 11.2. Furthermore, one of the lessons found within one of the publications on the project is the process used is as vital as the tools developed (J. Robinson, 2003). The findings here would suggest the process is even more important. For instance, one interviewee said, "software use alone no–didn't mean anything to people… Application of product more important", another one stated "process greater benefits in lasting way–learning/networking" and a third interviewee offered "need both–can't have one without the other… Sometimes process more important".

Table 11.2. Findings per question-process/product

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q11 Participant in any events or used Quest	Overall the majority was a participant or used Quest.	Strong use/Minimal - ~6@
Q21 Process>product	It seemed as though there was	Process – 10, No response - 4

outputs	confusion around whether this question related to outcome.	
Process or product impact on outcome of problem	Although process was identified, product was also mentioned as key.	Process – 8, No response - 5
Workshops or software use alone	The last 2 parts of Q21 reaffirms process is seen as more valuable.	Workshop/facilitation – 9, No response - 5

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-6@" each comment separated by the slash symbol is offered six times

Improvement possibilities.

As can be seen in Table 11.3, the interviewees offered only a few diverse responses on both how to increase value as well as identification of negative elements, each response within each area is nearly always unique. Examples of diverse suggestions provided by the interviewees are:

Ways of bringing it closer to decision points, e.g., co-Lab at MIT

Building a computer resource simulation – lots of resources not necessary… Could of used paper/pen

Engage institutions more heavily and carefully

Toolbox is integral for decision support in government decision-making

If created receptor sites for new professionals that that would be self-perpetuating

Table 11.3. Findings per question-improvement possibilities

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q19d How to increase value	Limited items mentioned once each.	Embed in decision-making – 2
Q20g Negative aspects	Some miscellaneous items	No - 3

	mentioned once each.

[a]Number of times comment made. [b]More than one response may be reported by one individual.

Value of foresight.

Overall, the interviewees for GBFP think highly of foresight's value. This is indicated by responses to at least three questions that are offered in Table 11.4. Most think that foresight is very valuable and have used it since. Furthermore, the majority designated foresight as more valuable than traditional methods.

Table 11.4. Findings per question-value of foresight

Questions in abbreviated form	**Overall finding/comments**	**Most common responses and rate[ab]**
Q8 Expectations met	Most were satisfied	Yes – 8, Some - 2
Q16b Value of foresight generally	The majority felt foresight is very valuable	Very valuable – 9, No response - 5
Q17 Value in comparison to traditional	Foresight in general is more valuable than traditional methods	More value – 10, Equal/no response – 2@[c]
Q22 Used foresight since	The majority have used foresight since	Yes – 10, No response - 3

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-2@" each comment separated by the slash symbol is offered two times

Summary.

Granted numerous efforts have been targeted at sustainability in the Georgia Basin ecosystem, progress has been very slow and incremental. Currently, many interviewees would be satisfied with an integrated and inclusive strategy that allowed for advancement. For a project identified as unsuccessful by the project leader due to lack of further financing, GBFP participants interviewed perceived the project to have delivered value and achieve an average rating of success at its completion in 2004. In addition, the participants thought foresight is highly valuable. Actual impact of the project on sustainability was rated overall as small but numerous benefits from the project were identified. An important caveat for these research findings is the project goals were primarily research-based. However, the interview questions also judged outcomes against practical advances in sustainability. In terms of negative aspects

and how to improve the project, comments are varied but limited. On another note, process-based outputs had been seen as having a more important role of impacting upon sustainability than product-based outputs. Finally, congruence among responses is evident and several responses were corroborated by other questions as well as project documentation.

2020 Media Futures: A case of a platform to change.

OCAD University has a special interest in the creative sector. Through its work and provision of education in this sector and in strategic foresight it could connect these two areas to deliver 2020 Media Futures in 2011. This initial foresight project for OCAD began in 2010 and took roughly one year to complete. The project was led by OCAD's Strategic Innovation Lab (sLab) and sLab's Director Greg Van Alstyne. In addition to the seven senior team members composed of faculty and consultants and led by Greg, five graduate research assistants worked on the project.

The goal of sLab for 2020 Media Futures was to help creative professionals –"the book, magazine, music, film, television and interactive digital media industries" (Strategic Innovation Lab (sLab), OCAD University, 2011, p. 6) prepare for the future using strategic foresight methods that aid in the development of partnerships and strategic plans in emerging areas. This goal included helping professionals in their organizations identify new opportunities as well as challenges, create new initiatives, compete globally and become more innovative (AchillesMedia, 11:21:07 UTC). In addition to the goal of the project outlined above, this project was completed to facilitate learning for its "Strategic Foresight and Innovation masters degree students and faculty", provide a foundation for sLab's future work, advance foresight literacy, as well as to use the results to aid in leveraging and directing "future discoveries in several of OCAD University's laboratories" (G. Van Alstyne, personal communication, August 15, 2018, Strategic Innovation Lab (sLab), OCAD University, 2011, p. 6)

This case is similar to yet different from the other cases examined in this dissertation. It is smaller in scope than the other two presented. It is also different in that the project was directed at addressing rapid change, which was being addressed with minimal success by the stakeholders

previously and post project completion. However, it is not different from some of the other cases in that it was seen to have mixed success by both the participants and the project leader.

The project provided internal benefits to sLab and OCAD University, for instance, two of the senior team members commented “through our interactions together we gained experiential learning about the needs of these industries”(Van Alstyne & Ashby, n.d.) and provided external benefits to the creative industries. Approximately half of those interviewed indicated the project had some success and value. Foresight practice as a whole was also seen as having value. The project was highly collaborative and other benefits were listed. Some suggestions were offered to improve the process: engage a greater variety of people, follow-up and show a path forward with the results.

Contextual information for changes in media.

Problem definition.

“2020 media futures is an ambitious, multi-industry strategic foresight project designed to understand and envision what media may look like in the year 2020; what kind of cross – platform Internet environment may shape our media and entertainment in the coming decade; and how our firms and organizations can take action today toward capturing and maintaining positions of national and international leadership.” (Van Alstyne & Ashby, n.d.)

In this project the problem is specifically defined per the concerns and contributions of the media industry in Ontario and these concerns are related towards the success of businesses in this sector. In terms of a complex societal problem, this project is primarily of economic concern but can be easily related to the level of influence of this sector towards the maintenance of a national culture, communication, and identity in a highly influential competitive international environment that is quickly shedding any physical or technical boundaries.

Although economic development and economic problems are not necessarily historically seen as complex as defined by this document, they are becoming increasingly so due to complexity and the complex problem faced by the economic system, e.g., its sustainability, inequality, and global connectedness. Even though the problem the media industry is facing is

not targeting the complex problem of the economic system, the concerns are also situated within this complex problem.

Background.

Technology is evolving at a rapid rate especially first in media and later in social media. The Internet became widely used by households in early the 2000s and social media use with the advent of Facebook and other applications grew significantly a few years after. To prepare for and keep pace with these technological changes it has been critical for organizations to identify and anticipate how these changes may evolve and how these changes then will interact with and affect the industry including the consumers. This is of importance for the success of businesses but also for non-profits and government organizations alike.

Issues.

There are several issues surrounding the media and its future. For instance, technological developments worldwide have increased accessibility to several different forms of media. As a result, creative professionals, such as writers and film producers, are having to address copyright issues. Media campaigns used for political purposes such as persuasion of the public has been strengthened with a strong recent example being the importance of the use of the media for influencing the results of the US election (Findlay, 2017). Criminal activities and morally questionable activities have also grown significantly through the use of media for such purposes, examples being ISIS and child pornography.

The development of technology has given rise to other issues as well. The technology has allowed for spreading information and disinformation globally, in many cases distinguishing the two has been difficult. These issues have affects on the public's perception of the creative music industries as well as the conduct of these industries regarding "fake news" or criminal uses of media. Furthermore, the technology has infiltrated daily life by, for example, bringing to the forefront questions around privacy protection, how daily business and personal activities are conducted and how social interactions take place. Another example of an issue is discussions around potential regulations needed due to increasing accessibility to media. These discussions have a new urgency and level of importance across a diverse field of topics.

Issues around democracy and engagement have been given new meaning in the ability of individuals to become involved in their communities and the political process. This area has grown significantly since the development of social media. Questions surrounding national culture and identity have renewed importance with global media influences. The ability to use media to conduct business daily is paramount to all sectors. Correspondingly, the just use of such media is important to consumers. Due to all the above, the technological infrastructure to provide access to various forms of media has become primary. To be able to understand all these different issues, their interaction and their impacts as well as secondary impacts is critical. Of course, media continues to quickly evolve and thus this understanding needs to be dynamic and anticipatory.

STEEP drivers and trends.

Of the several drivers of change that exist in this area five have been selected as primary by industry representatives: "social connectivity, democratization of tools, evolving business models, innovation/commercialization, and government subsidies" (Strategic Innovation Lab (sLab), OCAD University, 2011, p. 34). As these are self-explanatory further detail is not provided. In addition to these five drivers several trends have been identified within each area of the STEEP format as well as in an additional area: values. A couple of trends in each area are provided as examples. To illustrate, two trends in the social area due to recently developed technologies are recombination of creative works and the transformation of the classroom. In technological hybrid technologies, a combination of two or more technologies/media, portability and mobility are two identified trends.

For the ecological area trends are: increasing health issues from technology and environmental pressures from the consumption of digital devices. The economic area identifies two of the trends as the opportunity for independent producers and creators to use the Internet for distribution and the ability for non-professionals to create content. Political trends include challenges with intellectual property and surveillance. Finally, two sample trends from values include the blurring of life and work and generational differences (Super Ordinary Lab and Changeist, 2010).

Several critical uncertainties, or those areas where change is unknown and yet the area is of crucial importance, were identified through the process. The top three excerpted were: "bandwidth's role in regional/global competitiveness, bandwidth demand may exceed capacity and talent preparation" (Strategic Innovation Lab (sLab), OCAD University, 2011, p. 37).

Stakeholder identification.

There are numerous and varied stakeholders involved in this complex problem area.

Academia - academics primarily working either in some aspect related directly to media such as technology development, production, and marketing, as well as academics in a diverse range of topics who have a secondary interest in media, e.g., from philosophy to public administration.

Federal, provincial and municipal governments - primarily those departments involved in public/media relations, regulations, human resources/internal communication, innovation, culture and heritage, and public engagement

Industry and Non-profits - primarily members of the media industry and secondarily those members of other industries who work with media and related technologies

Public - all members of the public

Options to tackle this complex problem.

Traditional planning efforts involve scanning of trends and collection of other marketing information, attending conferences and other events, as well as strategy development processes. These have been and continue to be used for addressing these problems.

2020 Media Futures project description.

In total, with in-kind contributions of time, the project was valued at $226,500. The open – source strategic foresight project was sponsored by three organizations and had 19 additional project partners. Primarily, the funding was provided by Ontario Media Development

Corporation to the approximate amount of $132,500. The two other sponsors included KPMG and Next Media (Interviewee, personal communication, December 15, 2016). Four key principles underlay the work completed on 2020 Media Futures: (i) integrating practices from the creative industry by using media throughout the process, (ii) making the project relevant to the creative industry, (iii) being inclusive and independent in terms of a platform, and (iv) using design thinking as well as creativity in the foresight process ("2020 Media Futures : Motivation," n.d.; Strategic Innovation Lab (sLab), OCAD University, 2011; AchillesMedia, 11:21:07 UTC).

In addition to sLab and OCAD University, the partners for this project included:

- Achilles Media
- Association of Canadian Publishers (ACP)
- Breakthrough New Media
- Canadian Broadcasting Corporation (CBC)
- Canadian Media Production Association (CMPA)
- Canadian Radio and Television Commission (CRTC)
- Corus Entertainment
- GestureTek
- GlassBOX Television
- Maple Leaf Sports and Entertainment Ltd. (MLSE)
- Marblemedia
- National Film Board of Canada (NFB)
- Nordicity
- OCAD University
- Ontario Centres of Excellence (OCE)
- Screen Industries Research and Training Centre (SIRT), Sheridan Institute
- St. Joseph Media
- Universal Music Canada
- York University

("2020 Media Futures : Partners," n.d.)

Process.

2020 Media Futures used a participatory process structured in terms of four parts: project framing, horizon scanning, foresight scenarios, and visualization and dissemination. The first part defined the process and its elements. The second part was an in-depth exercise in identifying trends and change drivers, some of which were to come about within the next five years, and then creating patterns from the two elements. Through the collection and sorting of emerging signals possible trends and drivers emerged. At two separate industry roundtable sessions, with ~50 participants in total, drivers were identified based on the trends that had already been developed. These possible trends and drivers were then submitted to a wide range of experts in the industry through an online questionnaire for feedback using the Delphi survey method, 100 responded. The next step utilized a two round Delphi survey method, ~125 responses, to identify and rank critical uncertainties in terms of importance and the degree of the unknown (Nordicity, 2011).

The third part, foresight scenarios, was seen as the most important and included the development of four scenarios. This occurred based on a two-day intensive workshop session with leaders in the sector (25 participants in total). The scenarios were developed on a 2 x 2 matrix between the extremes of the rate of diffusion of innovation (measured or rapid) and whether value generation was commercial or socially driven. The scenarios were presented at a one-day event entitled ‘Implications for Action’. At this event strategies for success for each scenario were discussed and video interviews were conducted regarding implications of the scenarios. Five questions were asked from each of several industry experts. The next part of 2020 Media Futures included the write-up of the scenarios with illustrations, preparation and graphic design of the final report, making available all reports on the website, and conducting presentations for the public (Strategic Innovation Lab (sLab), OCAD University, 2011).

Outputs.

Three reports were developed based on the 2020 Media Futures process: A Trends Package, a Delphi Survey Report for the two-round Delphi process, and a final report. The final report identifies: a number of patterns that arose throughout the project, a list of black swans (low probability but high impact disruptions) and questions to help guide thinking around media

futures (Strategic Innovation Lab (sLab), OCAD University, 2011). Slightly more elaborate reports were also provided to the sponsors.

In addition to the availability of the online reports, the website lists trends and signals that are identified based on different platforms, e.g., books, and per STEEP analysis, e.g., social. The signals appear as lists of websites in three areas: platforms, STEEP analysis, and in certain topical areas, such as foresight and cloud computing. The videos of the industry interviews are also available online. The information has been made publicly available to build foresight literacy and provide information to the broader creative cultural industry (G. Van Alstyne, personal communication, August 15, 2018).

Outcomes.

Originally, the intention of 2020 Media Futures was to have a second phase to this project that would build on the scenarios developed in the first phase by creating and immersing participants in a tangible experiential future. However, the second phase was not carried out due to lack of funding. Alternatively, sLab was able to build on its work in 2020 Media Futures in the project Economic Futures for Ontario 2032 (more information is available at https://slab.ocadu.ca/project/economic-futures-for-ontario-2032).

There were no evaluations or articles published in peer-reviewed journals that assessed outcomes or formulated lessons learned throughout this project (Interviewee, personal communication, December 15, 2016). However, dissemination of learnings from the media project were provided to industry members through presentations at events, such as the peer-reviewed session in World Futures Society's annual conference in Toronto 2012, as these were seen to be more effective dissemination venues (G. Van Alstyne, personal communication, August 28, 2018). Also, a list of benefits provided by the interviewees is in Chapter 9.

Findings and discussion.

The interviewees.

Findings and case observations are based on data collected from a very small sample size: six individuals were interviewed. Half were from the public sector and the other half from the

private sector and most had limited time to complete the interview. Two of the six individuals interviewed were from the organizing team. Approximately half of the interviewees had more intensive experience with this project than the other half who had only participated in one or two sessions. Most of those interviewed have not participated in a foresight project. Half of those interviewed have used some form of foresight internally. From the limited information collected several patterns emerged. To facilitate confidentiality the breakdown of questions and answers is not provided. The questions are like the other two cases discussed previously with some questions removed and others adapted due to limited time considerations of interviewees and the different type of case.

Congruence among responses/corroboration.

Although many of the responses to the questions are split in half, half of the responses are in relative agreement with each other and the other half is also in relative agreement with each other, there is no specific grouping of participants that accounts for the split, e.g., per level of attendance, role in project or experience with foresight. As such, there is congruence, however, most of the time they are not the same half of individuals that agree. To illustrate, half of the individuals thought the project impacted on their business decisions and the other half did not. Further, in terms of met expectations, three individuals had their expectations met or exceeded while two individuals did not have expectations. The individuals in agreement in both examples are not the same groups.

There is some corroboration of findings within the responses, but due to the limited timing available of the participants and the limited number of participants for the interview process the corroboration is not as extensive as within the other projects. Corroboration is evident, for example, in terms of a mid-scale rating of success and value produced by 2020 Media Futures. A mid-level impact is assigned to the project and this is substantiated by judgement of the project as mid-scale on effectiveness and efficiency. There is also corroboration in terms of the benefits identified and the participants' affected dimensions/subject areas: primarily social and perception related. Examples of benefits are bringing people together and providing alternate perspectives.

Project effects and factors affecting the project.

Only half of the interviewees responded to or were asked the question on the project's effects on human dimensions and subject areas as well as variables impacting on the project's success. The strongest elements were social, perception and then paradigm shift, attitudes, and problem solving. In the question related to variables impacting upon the project's success: process, context, resources and tools had impact and alternative interventions had no impact.

Although all cases examined in this dissertation are addressing some form of change as an issue, in 2020 Media Futures the objective of the project was seen to be preparing for change itself, i.e., foresight being used for examining future directions and implications to address the upcoming challenges and opportunities with the right steps. The drivers for the other two cases were seen as addressing a more immediate and significant risk or using research to confront a highly plausible challenging future. In this case, the context was quite different. The project was being conducted in an area that had been undergoing continuous and rapid change for at least the last decade. Industry members, who have been in some form addressing these changes, were the target audience. Although the complex problem is linked to societal needs, a quarter of the respondents said there's not much society can do as a whole: Individuals can do more. For example, one participant responded, "society and individuals need to seek out uncomfortable and differing opinions to decide which one is right not just what is comfortable for them" and another said, "this is always a level of concern and discourse around our culture".

Progress in the area had been defined as a list of different miscellaneous items, e.g. broadband and collaboration. However, most think there's been a lack of progress for several different reasons, for example, interviewees offered: "don't want to admit weakness or don't understand how business is changing", "no progress just change", "regulations holdback accessibility" and "difficult to keep up with technology". A respondent indicated that the project has had some impact on progress in the area, others were either not asked the question or did not provide a response.

Successful/unsuccessful aspects.

As can be seen through most of the interviewees' responses to the related questions, half of the individuals thought the project achieved some success and some value. To illustrate, half of the interviewees indicated that the project had impact on their business decisions and the other half indicated there was little to no impact. For instance, one participant said, "helped to reposition thinking… and asking the right questions" and another stated "helps to hear other people that may confirm or make you think differently". For another question, half indicated unexpected learning took place around, for example, the foresight process or tacit learning, the other half of the comments signified the respondents did not learn anything different from what they anticipated. Furthermore, out of the four responses provided half thought the value was equal to or more than the invested resources. Overall, the project was somewhat effective to effective, efficient, and very collaborative.

Despite half of the interviewees responding positively, in terms of their own follow-up steps most of the respondents' comments indicated there were none or they were minimal. One comment indicated that follow-up occurred with new contacts. Also, half of the interviewees, those who were asked or responded to this question, thought the project was either equal to or less value than other foresight projects. Alternatively, a few different benefits in the project were offered and valuable elements noted, e.g., "coming up with drivers/visions/scenarios" and "follow-up presentation for the whole thing", each without internal duplication.

Finally, the main goal of the project, to assist industry professionals to anticipate and work with the future, seems to have been partially met. Additional goals of sLab: building capacity, offering learning opportunities for students, developing a practical base from which to draw material, providing information to the broader creative industry and forming external relationships had been met. For instance, an interviewee commented "sLab had biggest benefit from gaining exposure in the industry" and another comment included "access to OCAD and Sara Diamond was an advantage".

Process/product.

Most interviewees thought that the process had more impact on the complex problem than the products, as per one comment “the process of asking questions is more important than the answer”. Only half of the individuals interviewed were asked or responded to the question regarding level of product/process outputs and indicated they were equal.

Improvement possibilities.

Suggestions were provided concerning improving either the project or foresight in general. Those mentioned twice included suggestions to follow-up and increase the variety of people in attendance. Next steps in the context of using foresight for this type of project included involving the right participants, conducting foresight continuously, giving participants a path forward and addressing a more specific research question. Thus, this project faced challenges, such as: being on the “bleeding edge” of rapidly changing information, bringing together “the right” diverse individuals and providing more specific steps/suggestions in the back-end of the project without trying to provide “a fix” for all participants.

Value of foresight.

The interviewees rated the value of foresight as mid to high. Most think foresight has equal value to other traditional efforts. Approximately a quarter of the individuals interviewed have used foresight in some form since the completion of the project.

Summary.

2020 Media Futures is slightly different than the other cases in its overarching goal of preparing for rapidly occurring substantial changes worldwide. Progress in working with these changes and keeping up with them has been limited prior to the project and up to the present. This demonstrates that 2020 Media Futures had a difficult backdrop in which to succeed. However, half of the six individuals interviewed saw success and value in the project and value in foresight. The process was seen as having more impact than the products. Indeed, several benefits from the processes and some from the products accrued to sLab and its community and thus aided in its building of a successful research and innovation centre. This case has provided

an opportunity for assessing another difficult project which regardless of the challenges it encountered had achieved successes.

Canada in a Changing Global Energy Landscape: A case of opening minds to improve decisions.

This case is different than the others in that it briefly presents two complex problems and data collection was limited to three participants. It is a particularly valuable case in that foresight is mostly used by governments (Popper, R., & Directorate General for Research, 2009) for complex problems and the challenges the foresight field faces in working with policy that are revealed in this case are quite common.

Contextual information for Policy Work and Canada in a Changing Global Energy Landscape.

Problem definition.

Policy Horizons addresses many complex problems through its foresight process primarily by gathering information, working with this information in different rigorous and systematic ways, and producing reports for policymakers. Through this process Policy Horizons informs and takes apart, examines and re-creates mental models to enable policymakers to be better prepared for addressing opportunities and challenges of the future. Thus, policymakers are better able to develop policy as well as handle issues as they arise. For this particular case study the complex problem is not only examined as a specific complex problem, Canada in a Changing Global Energy Landscape, as much as overall in how to assist policymakers to address a number of complex problems with the aid of foresight and within the multiple facets of complexity, e.g., a rapidly changing global environment, ambiguity, multiple stakeholders and conflicting values, interaction of problems and decisions within and across systems, and the constant barrage of a huge volume of information and data.

Background.

Policy Horizons Canada is a federal organization that provides foresight to help "the federal public service anticipate emerging challenges and opportunities for Canada in a rapidly changing and complex world" ("Who we are | Policy Horizons Canada," n.d.). It is critical to

note that the work of Policy Horizons is directed at a policy environment, to inform policymakers and assist them in developing policies and strategies by scanning for changes and exploring the potential effects of these changes over the long term and in a holistic manner. Policy Horizons also aims to be multidisciplinary and experiment with various methods and tools to innovate and enhance learning.

Foresight is seen by Policy Horizons as an academic discipline, it is not about prediction or an expected future but the exploration of a range of plausible futures. This organization focuses on people's mental models and the system; use of graphics and a structured process; identification and testing of assumptions and working with participants. The steps identified in the method used by Policy Horizons are framing, assumptions, scanning, system mapping, change drivers, scenarios and products/results. The key products that Policy Horizons focuses on are: clarifying assumptions, "identifying emerging policy challenges and opportunities, developing more robust policy and strategy, helping individuals and organizations prepare and rehearse for change" (Padbury, 2016, p. 7). Participants are selected carefully and those who are not included in the process are engaged by other means. In general, the foresight process takes 2 to 12 months for a project (Padbury, 2016; "Scanning and Foresight | Policy Horizons Canada," n.d.).

Issues.

There are many issues that groups like Policy Horizons can be expected to face in their work, for example: access to and time limitations of key policymakers, competing information to policymakers, variations in both policymakers' mental models and their flexibility, time required to complete Policy Horizon's process, rapidly changing information, fit of work completed by Policy Horizons within the policy cycle and competing stakeholder interests within and external to government departments. Furthermore, Policy Horizons is subject to a short-term political cycle, ideologies, fierce competition for resources, and variations in the definition, experiences and understanding surrounding foresight and its value (Asselt, Veenman, Faas, & Molen, 2010; Dreyer & Stang, 2013; Homer-Dixon, 2010; Jones, 2017; Kuosa, 2012; Macklin, 2010; Riedy, 2009; Soroka, 2016; Wait, 2016). For example, in many situations the policy maker, executive or other public administrator is not familiar with foresight at all or has misconceptions of the

practice. As such, receiving a foresight product is equally judged against other products. Other foresight teams within government departments or organizations at various levels in Canada and abroad face a similar mix of daunting issues (Da Costa et al., 2008; Kunseler, Tuinstra, Vasileiadou, & Petersen, 2015; Rijkens Klomp & Van Der Duin, 2014; M. A. van der Steen & van Twist, 2013).

STEEP drivers and trends.

For this case a Steep Drivers and Trends section is not included as some of this is reflected in the literature review surrounding drivers and trends for foresight in general and this case study does not focus entirely on one specific complex problem, as outlined above.

Stakeholder identification.

The primary stakeholders for Policy Horizons are the federal public service. Within this large group, the primary targets are the deputy ministers and chairs of cabinet committees. Other stakeholders include federal public-sector employees, the public who accesses the organization's website and information, individuals who are accessed for their expertise during the foresight process, and the individuals who are part of the foresight team (anonymous, personal communication, 2016).

Options to tackle this complex problem.

Even though there are options, they are difficult to implement. Public administration and policy-making are both academic fields that address the subject of providing input into policy formulation. However, the context of complexity, developments in technology, the increased value of public engagement and the nature of complex problems are just some of the factors rapidly altering the political landscape. The resulting challenges in informing policy remain very difficult to manoeuvre and adapt to. Organizations and experts are working to address these challenges, but it takes time both to advance along a learning curve that is often in flux and in the meantime affect individual, system and cultural changes. Nevertheless, these fields are abundant in literature that can be related to addressing the potential of foresight in the public sphere (Blank & Gattinger, 2018; Conteh, 2014; Ouimet, Jette, Fonda, Jacob, & Bédard, 2017; Young, 2017).

Challenges foresight departments in government or external to government face when targeting policymakers are common. To elaborate further, many decision-makers do not understand the value of the foresight product or how to productively make use of the product. Regarding the energy project, there is an expansive array of expertise in this area and publications providing detailed quantitative forecasting and associated rigorous rationale. Even though the purpose of Policy Horizons is different from the purpose of this information, an interviewee commented that both are sources of information that compete for the limited time and attention of decision-makers who are used to more information being substantiated by specific quantitative data. There are several recommendations provided by international foresight literature regarding the creation of foresight for policymakers (Calof & Smith, 2010; Da Costa et al., 2008; Kunseler et al., 2015; Macklin, 2010; Rijkens Klomp & Van Der Duin, 2014; Slaughter, 2009; van Dorsser et al., 2018).

Canada in a Changing Global Energy Landscape project description.

The project that is used as a sample for this case is "Canada in a Changing Global Energy Landscape". This project was completed in 2015 and is a further development of some of the pertinent results of a larger Policy Horizons project, *MetaScan 4 - the future of Asia* (Policy Horizons Canada, 2015). The energy industry has been changing at a rapid rate worldwide. Some of the reasons for this are new technological developments, changing cost structure, energy management, energy security and environmental effects such as climate change. As such, these developments and their interaction significantly impact policy considerations in many areas (Horizons de politiques Canada, 2016). This project describes those insights, challenges, opportunities and implications garnered by Policy Horizons from its examination/scanning of the changes in the energy industry that are potentially highly disruptive and/or have significant policy implications. Focus was placed on electricity and fossil fuels (especially oil). Furthermore, this project developed two scenarios based on this information: "resisting and reacting to change" and "embracing and leading change". The implications of these scenarios are then presented. Project assumptions are outlined in the Annex of the report *Canada in a Changing Global Energy Landscape*. The approximate cost for this project was ~$250,000 (anonymous, personal communication, 2016, (Horizons de politiques Canada, 2016).

Due to the depth and breadth of this industry and the number of rapidly changing factors influencing it, the dynamics are incredibly complex. There are many international and national stakeholders in this area. The industry is broad as well as powerful. Several consulting groups, academics, as well as others provide extensive and detailed expertise to it on a regular basis.

Process.

The process used for this project built upon work completed which entailed several consultations in addition to research and in-depth analysis. For this report, the process specific to the work that built on the *MetaScan 4 - the future of Asia* is outlined. However, this is not to diminish the scale of efforts put into the entire process to both develop a product as well as achieve process-based impacts.

The Policy Horizons foresight process is an iterative process that in this particular case was composed of interviews and group sessions with internal and external experts, approximately 75 in total for this project and *MetaScan 4*, as well as short papers contracted out to provide further information and expertise. The process identified weak signals, addressed assumptions, looked at plausible outcomes and a cross-impact analysis with other systems, developed scenarios, and looked at their implications.

As outlined in the background section, the foresight process is conducted by Policy Horizons with several objectives. These objectives or potential benefits were also targeted for this specific project. Potential benefits of this process, also elaborated upon by interviewees, are seen as: reviewing and challenging decisions; presenting plausible alternative futures; assisting decision-makers with coming up with more robust ideas; increasing foresight capacity and literacy including the viewing of decisions within a longer time horizon; providing an understanding of cross-system impacts, interactions and drivers; and increasing the political receptivity of different options and mental models.

Outputs.

The product based output for this project is a 20+ page report which has been made available on Policy Horizon's website as well as distributed to key policymakers.

Outcomes.

The project outcomes for the energy study are very difficult to identify as the objective of the project was, for example, to inform and question assumptions, and the depth of information was not available to garner significant findings in this regard. However, greater interest in the material in general and an increase of the likelihood of one of the plausible options occurring since the report was released was offered by an interviewee as a positive indicator of success. Also, a list of benefits provided by interviewees can be found in Chapter 9.

Findings and discussion.

The interviewees.

Case observations and further analysis is based on data collected from a very small sample size. To minimize disturbance of government executives Policy Horizons and the researcher agreed to limit the number of interviews to three. One of these individuals was a staff member with Policy Horizons. The names of two other interviewees were provided by Policy Horizons. The users interviewed were not regular participants in foresight and only one had participated in the process for Canada in a Changing Global Energy Landscape. As for 2020 Media Futures, to facilitate confidentiality the breakdown of questions and responses is not provided and in this case neither are quotes as they have been in the first two cases. The questions are similar to the other cases discussed previously with some questions removed and others adapted due to limited time considerations of interviewees and the different type of case.

Project effects and factors affecting the project.

The choice of topic and the context in which an organization such as Policy Horizons conducts a foresight project can be very important in the policy arena because variables such as urgency, political circumstances, and extent of competing information available can either facilitate or hinder a project, especially when the product rather than the process is the primary output. For example, it may be easier for policy advisors of foresight to achieve their goals if the subject matter is not well developed/analyzed/informed. However, the goal of foresight policy advisors is usually to provide a different perspective than is commonly available and as such the choice of topic necessitates it to be one that may challenge the conventional wisdom in a "policy

shop" dedicated to the topic. Mainstream energy topics are very well analyzed by numerous sophisticated experts and organizations in the industry and thus it can be difficult to challenge broad common assumptions in such an area in which mostly details are being debated, e.g., timing, and degree of impact. Furthermore, there are also significant, but not necessarily many, competing political and business interests in this area.

Successful/unsuccessful aspects.

A couple of the interviewees provided mid to low scores on influence and value of this project. Yet, Canada in a Changing Global Energy Landscape challenged assumptions or at least made individuals take a second look at the topic and their policy decisions. The project also identified emerging opportunities and challenges. Thus, the project had met two of its objectives to some extent. However, the degree of the target audience's receptivity to foresight, the report and the challenges it puts forth may affect how thoroughly the further examination into the topic occurs. This may affect the extent to which the project meets all its objectives, including the two other objectives: creating robust decisions and assisting in the preparation for change. In this circumstance, participation in the process can become of utmost value as the decision-makers become a part of the report's development and may take greater ownership of the report's content.

There were several comments around value. One of the interviewees referred to involvement in the process as a spa day for mental health. It facilitated out-of-the-box thinking and stretching of knowledge and thoughts into areas without as many boundaries and in a safe "future" space. Further, it was also an opportunity to be creative and think about transformative technology and its implications. Finally, it provided the value of being exposed to different conflicting perspectives they may not have been exposed to otherwise.

Process/product.

Interviewees thought the process would be more valuable than the product. For instance, with the involvement of the decision-makers there is an opportunity for them to question other experts and facilitators with the ongoing development of the final product, learn about foresight and develop greater ownership of the outputs. The difficulty, however, in influencing key

decision-makers is that many of them do not have the time to be involved in the process in any depth and so it becomes more difficult to challenge their ways of thinking and assumptions with minimal involvement or just the provision/presentation of the document alone. Literature supports decision-maker involvement but in practice it is difficult to involve busy decision-makers.

The process can also be somewhat easier, more substantiated, and better formulated by consultation/facilitation with a variety of external experts who are in the field rather than staff attempting to become experts in the area or providing too much guidance/decision-making. However, difficulties in using a variety of external experts, for example, is their availability to participate in processes as well as resource constraints in involving them, e.g., time to engage in-depth with each expert.

Improvement possibilities.

Some suggestions were provided by the interviewees. They thought there was a greater need to push the information provided by the foresight process into the policy realm, for example, what you do with the information and how do you connect it to real policy. One suggested option was to make foresight a continuous process and culture. A few additional options for pushing the information was to create an information pull by making more information publicly available, working more closely with the departments that may benefit from the material, and engaging thought leaders. Other challenges included the transference of all the information provided in workshops, which is a common problem in a variety of facilitated sessions that derive themes. In addition, a question came up about whether the problem set forth or objective was too abstract.

Finally, a difficulty with qualitative information seen as a direct challenge to quantitative information is the former is less widely accepted as counter evidence in making decisions. As is observed in the academic community as well as in policy sectors, quantitatively based information or advice is often seen as more rigorous than qualitatively based material regardless of the value of the information. However, if foresight is seen as a direct challenge to the quantitative information the purpose of foresight is not appreciated. Foresight is not meant to

know the future or predict more accurately, but to open minds to the unknowns and create robust strategies that can improve the likelihood of adapting to those unknowns.

Value of foresight.

Comments were provided regarding timing and the duration of foresight work. Value of foresight is seen to diminish if the information provided is already being entertained by many individuals. Yet, quality foresight work can take a significant amount of time to produce.

Summary.

This is a different case than the other three that have been examined as only three interviews were conducted and two problems were presented, i.e., in general assisting policymakers to address complex problems and specifically as a sample of the problems, the changing energy landscape. Some of the insights and suggestions included: timing and the duration of foresight work can be critical; process rather than product would likely have more impact; diverse external experts and decision-makers involved throughout the project in more extensive roles can facilitate a strong and influential process; and choice of foresight topic and awareness of competing sources of information can be very important. Also, reviewing challenges organizations and particularly foresight professionals face in working with policy is an important benefit from this case. Many of the challenges and related comments put forth in this case have been provided or encountered in other cases in this dissertation as well.

External cases.

Two external cases have been selected for review: Agricultural Adaptation to Climate Change and Transformation of the Canadian Payments System. These cases will be briefly reviewed to present parallels and differences with the cases that have been studied for this dissertation. The reason these cases have been selected is to augment the cases analysis through primary research with external analysis that has been provided for other cases. These two external cases are presented because these two are the ones that have been completed within the timeframe of the research, are Canadian-based, use participatory dialogue-based foresight as defined in this dissertation, information is available and there is significant analysis completed on these projects. Upon reviewing these external cases, the findings reveal significant parallels

exist between the external cases and the cases presented earlier in this chapter. The comparison between all six cases is laid out in the next chapter that provides an in-depth analysis. The following paragraphs provide case descriptions including findings and lessons learned as described by the authors.

Transformation of the Canadian Payment System: A case of dialogue for governance.

This project began in 2010 through the direction of Jim Flaherty the then Federal finance minister who also implemented recommendations put forth in the Task Force Report approximately two years later. Five million dollars of initial funding was provided to a task force with the mandate to review the payments system, assess if businesses and consumers are served well by the system, determine if it allows for competition and innovation, and decide if current oversight instruments are still appropriate for the system (Meredith et al., 2016, p. 23). A dialogue-based participatory foresight process was used to envision and lead change through a new form of governance, titled by the authors as "catalytic governance". This was a complex issue with many diverse stakeholders involved. The information on this case is based on the book *Catalytic Governance: Leading Change in the Information Age* (2016) authored by three individuals who were involved in designing and implementing the project and are experts in the field. This book outlines in detail the project and lessons learned.

The process utilized for the project paid particular emphasis to stakeholder engagement. It incorporated a broad range of diverse stakeholders through a process that heavily emphasized the importance of dialogue. Careful selection of the stakeholders was paramount. The next step in the process included the development and publication of reports and the conduct of key interviews with stakeholder members. Results were discussed at the initial workshop. Three additional workshops followed. In between these workshops work was completed by both the Task Force, individuals, and working as well as advisory groups. Extensive consultations were held throughout the process with over 1,000 contributors and over 60,000 individuals exposed to the materials and conferences.

Another area receiving significant attention was the backend of the project: strategy and implementation plan development as well as action and follow-through. This is of significant

interest as most foresight projects seem to be challenged in this area. Stakeholder engagement was heavily utilized in this phase as well. Possibly as a result of this, significant progress occurred in the implementation of recommendations in several important areas. Although detailed plans were developed and accepted by stakeholders broadly, the implementation of the plans did not transpire in enough depth and promptness to keep pace with the rapid changes in the industry. Specifically, the recommendations the self-governing organization working group put forth were highlighted as an area that could have been better addressed. Additional lessons were learned from the process and were outlined by the authors.

Five of these lessons are especially pertinent to this dissertation. First, senior decision makers need to be a part of the full process to understand the need and circumstances for implementation of the strategy and recommendations that are developed during the process. Second, the catalytic governance process needs to be a continuous process in which collaboration needs to be ongoing in strategy development and implementation for a rapidly changing environment. Third, more engagement using social media and online tools needs to occur. Fourth, the process developed needs to be followed throughout the project duration. Fifth, leadership and governance need to be less from the top. More flexibility needs to be provided, entailing appropriate boundaries, for similar types of projects that should be undertaken through this type of process rather than through traditional mechanisms.

In addition, several benefits of this type of process were outlined as well as recommendations as to when this process should be utilized. Main benefits described include: dialogue and learning, exploring alternative perspectives with current practical knowledge, finding common ground among stakeholders through challenging assumptions and envisioning a common future, action learning and facilitating development of a strategy and implementation steps, and engaging stakeholders and thus encouraging action through an iterative process to co-create the future. Catalytic governance has been outlined as a useful practice in complex situations where there are multiple diverse stakeholders with different perspectives on a problem for which there is no accepted definition or simple solution and new solutions are necessary that can work across a number of boundaries (Meredith et al., 2016).

Agricultural Adaptation to Climate Change: A case of developing a new paradigm for a transition.

This project began in 2009 and was conducted within approximately nine months. Funding was provided in the order of $6.5 million by the federal government within the Canadian Agri-Innovations (CGAI) program (Fortin, 2010). The funding was for the study of different future scenarios of climate change as they relate to the agricultural sector and utilization of the resulting information to: assist in designing policy in this area, guide in the funding of research, assist with monitoring changes to act upon as potential futures unfold, as well to generally test foresight methods. This project was set in the current context of the federal government testing foresight as an approach to complex problems and attempting to address issues developing around climate change, but the government was not in general a strong advocate for actions to mitigate climate change.

The material for this case is drawn from two PhD dissertations that assessed the Agricultural Adaptation to Climate Change Initiative in-depth: "Case Study Analysis of the Efficacy of Scenario-Based Planning as a Public Policy Formulation Tool" (Macklin, 2010) and "Can Foresight Processes Operationalize the Notion of Sustainability" (Soroka, 2016). Both researchers were involved in the project. Soroka conducted 16 interviews with participants after the completion of the project and Macklin completed 120 questionnaires and two interviews after the workshops as well as used the direct observation method to collect data. While Soroka was particularly interested in the project in the context of its effect on sustainability, Macklin utilized the project to understand the extent to which scenario development processes make an impact on public policy. As a part of Soroka's dissertation another case was studied: Developing a Sustainable Health System. This case is not elaborated upon here.

The foresight process used in the Agricultural Adaptation to Climate Change Initiative involved delineating trends and drivers, developing four scenarios, working with the scenarios and their implications, systems mapping, development of innovations, and a synthesis event with recommendations for a new paradigm. 120 to 135 diverse participants were involved in five workshops for the project that built on a participatory dialogue-based foresight approach. Both authors noted that the process was constructive and had many benefits.

Although several benefits were attributed to the project, the initiative faced significant barriers in fully realizing these benefits. Benefits were especially noticeable in areas such as providing clarification and understanding around complexity/assumptions/uncertainty, learning, addressing problems holistically, exploration and testing of possibilities, innovation, devising markers for change, and being exposed to diverse perspectives. These benefits practically resulted in increased adaptive capacity and social learning of the attendees which allowed for the formation of new mental models. In addition, the process assisted with problem definition and laying out outcomes as well as goals and policy instruments for the policy formulation process (Macklin, 2010).

The researchers agreed utilization of the outcomes of the foresight process was limited and offered suggestions. Reasons for limitations primarily included bureaucratic and system level barriers, such as not being open to change and the political electoral cycle. Other challenges included those within the management of the project, contextual variables and institutional complications. Suggestions were provided by the authors to address the primary barriers. Soroka focused on the need for transformational leaders and Macklin suggested ways to build institutional capacity to use scenario-based planning. Other points included the need for ongoing foresight work to address complex problems on an ongoing basis, the value of foresight in managing the transition from the present to the future, and the incorporation of time for changes to occur and action take place. Learnings for the agricultural sector in addressing potential effects of climate change included the importance of flexible policy frameworks, integrated governance, holistic thinking, and diversity.

Summary.

This chapter is a voyage of discovery through six different dialogue-based participatory foresight projects. The reader can explore how foresight has been used for different Canadian complex problems and the complex context with which the projects interact. Access to information on these projects has been challenging at times but critical and this work is possible through the support of the foresight project leaders/clients/professionals and interviewees. Preliminary findings indicate participants were not necessarily clear in what to expect from the

projects and managing expectations has also been a common challenge for the project leaders/foresight professionals. Foresight practice has proven to face other similar challenges as outlined in the previous chapter, yet, it has also proven at times to be very valuable. Of special interest is that value is found in all the cases whether assessed successful or unsuccessful. Other findings would also indicate that due to complexity and the art/science qualities of foresight practice, different types of foresight face different unique challenges in addition to foresight's more common difficulties, such as foresight can be expensive, resource intensive and hard to do well. Furthermore, it seems foresight works well with other areas, like strategic planning, research, governance, tools and digital technologies. The externally reviewed cases corroborate and build on these findings. An in-depth analysis follows in the next section.

Section 3 In-Depth Analysis and Dissertation Review

Through this voyage into complexity and foresight the language, environment, culture and practices of the members of the relevant foresighting population have been explored. The ways this has been done is through reviewing literature (in general) on these topics, seeking the views and projects of the Canadian foresight community and examining specific Canadian dialogue-based participatory foresight cases (projects conducted to interact with complex problems). The next stop advances this dissertation into a deeper analysis of the discoveries made thus far. The two chapters in this section bring a greater appreciation of the foresight community's work, what is important in their practice and an examination of their accomplishments. This will be done by comparing and taking apart the foresight projects; looking for patterns, explanations and theories; reviewing multiple perspectives related to the findings; and addressing the questions and expectations outlined at the beginning of this voyage.

This section covers two chapters: Towards a Contribution Analysis and Review of Results. These chapters are important because they: (i) address the propositions and research questions formulated in the introduction; (ii) provide a deeper analysis to confirm and build on findings as well as begin the development of preliminary insights; and (iii) address issues of validity, reliability, and causation. The first chapter uses comparative analysis, pattern matching, rival explanations, chronological sequences/conceptual framework review and a contribution analysis as its analytical tools. The second chapter provides an overview of the research results. Through a multi-perspective analysis, it also examines the contribution of integrating multiple perspectives into the research and whether any specific perspectives as a group impacted upon the findings.

Chapter 9 begins with comparative analysis of the findings and discussion from the case studies. This is followed up with the presentation of the predicted pattern for the foresight cases as per the propositions outlined in the introductory chapter and then an outline of the actual findings. Taking into consideration discrepancies the actual pattern is then delineated. Next four groups of rival explanations are provided and countered. Chronological sequences with the use

of the conceptual framework, presented earlier in the document, is then employed to strengthen the intact pattern of findings. To conclude the chapter, a basic change theory is proposed to improve the link between foresight and the observed outcomes and what conditions are important for similar outcomes to occur in the future use of foresight. This forms the basis of the contribution analysis.

Chapter 10 briefly reviews multiple perspectives and their integration throughout this dissertation. It highlights the importance of these perspectives to both the validity and comprehensiveness of this research. This chapter also concludes this section with an overview of the dissertation and six key groups of dissertation findings.

Chapter 9: Towards a Contribution Analysis for Dialogue-based Foresight

This chapter is an in-depth case study analysis supplemented by results of the initial examination of the data collected on the foresight community. The primary purpose is to perform a thorough analysis of the findings from the previous two chapters and build on these findings. Also, objectives are to relate the results to the research question and propositions outlined in the beginning of the dissertation, strengthen rigour and robustness of the research, and address causation.

The thematic analysis in the previous two chapters present findings according to groups of ideas offered within the data collected. The analysis in this chapter moves these themes to a broader level to determine whether replication of findings occurs across cases and whether the results of the replication analysis confirm propositions set out in Chapter 5. Potential explanations for the results are also provided. Finally, in lieu of strictly determining cause and effect through causal attribution, the contribution of dialogue-based foresight to the case outcomes is examined through a contribution analysis process developed by Mayne (2001). This process is explained in the associated section.

To progress on this expedition different analytical tools are engaged (Yin, 2009). The thematic analysis is furthered in this chapter with a comparative review of the case findings from the six cases. This allows for identifying replication of findings and discrepancies among cases. The next form of analysis, pattern matching, looks for broader patterns across the findings in terms of whether actual findings reinforce the theoretical patterns outlined prior to the research being conducted. To strengthen the results of the pattern matching analysis rival explanations that may offer different but equally sound explanations for the identified pattern are proposed and discussed. Two additional analyses are performed: chronological sequence as per the conceptual framework and contribution analysis. As the former analysis is informative but inconclusive in some regards, the contribution analysis attempts to address this limitation by offering a theory of change with supporting evidence and an explanation of dialogue-based foresight's contribution to outcomes.

The cases reinforced Chapter 7's findings on foresight community members' perspectives on the practice. Both Chapter 7's and Chapter 8's findings supported the propositions set out in the fifth chapter. This chapter concludes there is value in the foresight process, in some circumstances more than others. For instance, each foresight project and/or exercise is likely to have some commonalities within a group/type, but they also exist in unique surroundings as defined by complex situations. In general, a foresight project is expensive, resource intensive and difficult to deliver with a variety of nuances. Foresight has proven to work well and especially with other tools, services and functions, like research and governance. It has also proven to be unique and have both artistic as well as logical elements. In addition, there are several areas in which foresight could potentially be strengthened. In this chapter, guidelines as extrapolated from this research are offered within a proposed change theory for foresight. Areas for improvement are integrated into these guidelines. The chapter concludes with a determination on the contribution of dialogue-based foresight to outcomes.

Comparative review.

Based on the groupings of findings and discussion used for each case in Chapter 8, eight areas have been selected for consideration in an extensive comparative assessment: project effects/affected by, benefits, how outputs used from project, challenges, success, product/process, improve and value of foresight. A general heading of participants, projects and cases leads the assessment. This category is a combination of three general areas and based on the document review not responses to interview questions. Thus, it is not included in the table related to this topic: Table 12. For deeper analysis, the successful/unsuccessful category has been split into four areas: benefits, how outputs are used, challenges and successes. The rest of the categories are the same as they were per individual cases in Chapter 8.

Table 12 presents a list of questions used to gather data for each of the following eight categories. For reference, each of the groupings will identify a shortened description of the questions under consideration within each section. Similar questions have been used for 2020 Media Futures and Canada in a Changing Global Energy Landscape but are not outlined here because the interviews were less structured and value added is minimal. The external cases are compared as information is available.

Table 12. Questions used for comparison categories based on interview questions

Comparison Categories	**Fore-CAN Question # ('s)**	**GBFP Question # ('s)**
Project Effects/Affected by	3, 4, 6ab, 7, 8, 14, 19a-e, 22ab, 23	4, 5ab, 12, 14, 15, 20a-e, 23ab, 24, 25
Benefits	6c, 10, 12, 19f	5c, 7, 9, 20F
How Outputs Used from Project	13	10
Challenges	19g	20g
Success	6c, 9, 15d, 17, 18abc, 22c	5c, 6, 13, 16c, 18ab, 19abc, 23c
Process/Product	20, 22b, 23	21, 23b, 24
Improvement possibilities	18d	19d
Value of foresight	15c, 16, 21	16c, 17, 22

Participants, projects and cases.

Several initial observations have been made regarding the participants, projects and case studies. First, the greatest number of interviewees are in Fore-CAN and GBFP at 15 each. 2020 Media Futures and Canada in a Changing Global Energy Landscape offer much smaller sample sizes at six individuals and three individuals respectively. Second, the interviewees for the first two cases are more experienced with foresight than the interviewees for the last two cases. Even so, only one third of the individuals in the first two cases indicated they had participated in several foresight projects. Third, although congruence exists in all cases, case one has the most congruence among the interviewees. Congruence across the cases also exists and is presented in each section below. Fourth, interview findings from each of the four in-depth cases is corroborated by the project literature and internally by different interview questions. Less corroboration exists in 2020 Media Futures and Canada in a Changing Global Energy Landscape. A noteworthy area includes differences between what foresight professionals see as the strongest benefit of foresight, i.e., decision-making, and what case interviewees have identified as strongest benefits, i.e., working together-social, mind change-cognitive/paradigm/perception, and creativity.

In examining the six projects, as per Table 13, most of the projects had multimillion dollar budgets, took a year or more to complete, began in the last 10 years and had over 100

participants. Also, projects differ in their goals to prepare for a future. It is interesting to note most of the goals are aligned with reviewing and strengthening/reforming current systems. Although most of the projects have similar processes, as outlined in the chapter on cases, GBFP and Canada in a Changing Global Energy Landscape are the most different from the other projects. As well, four projects differ from 2020 Media Futures and Canada in a Changing Global Energy Landscape in terms of offering more concrete outputs and recommendations. Transformation of the Canadian Payments System had the most extensive consultations with stakeholders in terms of time, number of people involved and level of involvement, and the greatest focus on concrete outputs, recommendations and their implementation.

The comparison in Table 13 also presents overall resources used by a project. If interested, this allows for the reader to conduct a preliminary comparison of resources expended ($, time, people) per project and a rough approximation of value gained (as per benefits section and general outcomes presented in this chapter).

Table 13. Comparison of basic parameters for all cases

	Fore-CAN	**GBFP**	**2020 Media Futures**	**Changing Global Energy**	**Transform Canadian Payments**	**Agricultural Adaptation**
Budget	$4.4 Mil	$6 Mil	$226,500	$250,000	$5 Mil to start	$6.5 Mil
# of Participants	>300	Thousands	~120	<75	>1,000	120-135
When started	2007	1999	2010	~2014	2010	2009
Duration	~ 5 years	~ 5 years	~ 1 year	~ 1 year*	~ 2 years	~ 9 months
Goal(s)	Build a more effective and robust AHEM system	Use scenarios to develop a better understanding of system dynamics & evaluate game – like simulation tools	Help creative professionals prepare for the future	Identify plausible futures for energy systems globally & implications for Canada	Review the Canadian payments system	Study different future scenarios of climate change

*Post work on the Asia Meta-Scan

Project effects/affected by.

Items from the following questions, outlined in Table 12, have been compared for this area.

Fore-CAN Questions:	GBFP Questions:
Q3 Main problem in 2009	
Q4 Critical action needed	Q4 Critical action needed
Q6a Major impediments to management of problem	Q5a Major impediments to management of problem
Q6b Aids to advancement	Q5b Aids to advancement
Q7 How important is a strong AHEM	Q12 Foresight affects
Q8 Problem well managed…or?	Q14 Closer to achieving sustainability
Q14 Foresight affects	Q15 Who to target
Q19a Process affect success	Q20a Process affect success
Q19b Context affect success	Q20b Context affect success
Q19c Resources affect success	Q20c Resources affect success
Q19d Supporting tools affect success	Q20d Supporting tools affect success
Q19e Alternative interventions affect success	Q20e Alternative interventions affect success
Q22a Signs of progress	Q23a Signs of progress
Q22b Reason	Q23b Reason
Q23 Needs to happen next	Q24 Needs to happen next
	Q25 Georgia Basin in 25 years

In addition to similarities across both project and case studies, the context and framing for each of the six projects provides other parallel effects. For instance, all of the projects reviewed in this dissertation work with complex issues that involve diverse stakeholders, some form of issues with or impact on governance, and some inherent conflict. Also, all of the projects have broad research questions and both Fore-CAN and GBFP participants are looking for similar benefits, like integration, education, collaboration and action. Yet, the projects' primary objectives are different, for example, conducting research and testing foresight methods.

Naturally, there are some areas in which the context of the six cases differ. The interviewees for Fore-CAN noted the most progress has occurred in the context of the complex problem. It appears Transformation of the Canadian Payments System is the second case with the most progress. Reasons being offered among all the interviewees for progress in general with the complex problem include collaboration, slow sustained effort, and greater understanding of the critical problem. Reasons for lack of progress include it's difficult to change or a lack of understanding. It appears there is a stronger urgency for addressing the complex problem in Fore-CAN than in the other cases. as well, the perceived needs are more aligned with outcomes. The desired next steps for GBFP focuses more on implementation, i.e., stronger on action plan, whereas Fore-CAN focuses on continued effort and refreshing foresight. A sample of comments from interviewees are provided in Table 14.

Table 14. Sample of comments provided by interviewees

	GBFP Comments	**Fore-CAN Comments**
Signs of progress	• "Sustainability positions and business plans of companies. People and companies talking about sustainability." • "It is in the field of education.' • "Internalization of sustainability as a lifestyle objective." • "Not ideological anymore as to whether the risks are real and whether we need to do something." • "Upgrades in sewage treatment mainland."	• "We are getting better at surveillance and intelligence. Strong emphasis on being more proactive and informed." • "The most improvement is working better with partners – it's a template for the future." • "Better collaboration/coordination between industry and government and different levels of government and other stakeholders – before were sometimes unaware of others." • "More integrated planning and better problem identification."
Reasons	• "Better knowledge, more people taking responsibility, more interest, i.e., in electric vehicles, more awareness, want to contribute." • "Slow sustained efforts to get the message through and a growing appreciation of the field of ecology, climate change and associated sciences. Also, the recognition	• "More networks, surveillance systems, aware of consequences of lack of preparedness." • "There is a greater willingness for stakeholders to be more collaborative and engage and see problem as ours."

	and awareness of humans changing the nature of Earth systems." • "The lack of progress resulted due to the fact that it's hard to change and need fundamental change in our lifestyle." • "Lack of progress is due to the difficulty of doing this and that not everybody agrees about the problems or the solutions – different worldviews."	
Need next	• "Collectively sit around and have discussions that are less ideology and jurisdiction drivers and more as to what we want this region to look like, decide, plan to do it, fund it and do it properly." • "Need massive inter-institutional collaboration." • "All policymaking bodies need to take seriously consequences of what they're doing and switch to an economy where feedback loops are real and relevant. " • "Get better understanding of how systems work and do micro-experiments in policy and take advantage of data everywhere to design experimental social policy."	• "Greater leadership, defined strategy and policies in the area of animal health in general – don't know what the concrete next steps are." • "We need to re-look at Fore-CAN roadmap in terms of a risk management system and look at aligning strategies across a wide range of stakeholder groups so that we don't leave gaps or duplicate efforts in the system. " • "It's time to re-engage." • "Needs continued sustained commitment and funding."

The two other areas that are discussed under this category in the case findings chapter are the variables that have a strong effect on the success of the foresight process and the dimensions/subject areas that are the most affected by the project. The cognitive and social dimensions are the strongest areas affected by the project for both Fore-CAN and GBFP. Perception, paradigm, and creativity are also mentioned in both case studies as strongly affected areas. Emotional, self-awareness and motivation are among the lowest affected dimensions. It was interesting to note that social, perception and paradigm were listed in all three research cases as strongly affected areas (question was not asked of the Changing Global Energy Landscape interviewees). The first four factors resources, context, tools and processes have a strong effect in Fore-CAN and GBFP cases. Alternative interventions receives the lowest number of yeas at approximately one-third of the interviewees.

Benefits.

Items from the following questions, outlined in Table 12, have been compared for this area.

Fore-CAN Questions:	GBFP Questions:
Q6c Fore-CAN's role	Q5e GBFP's role
Q10 Significant benefits	Q7 Significant benefits
Q12 Learned unexpectedly	Q9 Learned unexpectedly
Q19f Valuable element	Q20f Valuable element

Each benefit offered by interviewees are listed in Table 15 in no specific order of importance. Some similar benefits have been grouped to increase readability.

Table 15. Benefits offered per project

2020 Media Futures	**Canada in a Changing Global Energy Landscape**	**GBFP**	**Fore-CAN**
Ability to prepare for change	Think about transformative technologies and implications	Building a foundation, CIRS building, False Creek, Olympics related, Science World's programming	Networking, working together, brought people together, collaboration, discussions
Access to people, make new contacts	Out-of-the-box thinking to explore plausible alternative futures	Now termed 'Salish Sea' indigenous	More appreciation, awareness, understanding, knowledge, integration
Agreement from diverse group	'Safe' space to think in – the future	Tools	Anticipation & mind change, a way of thinking, changed approach to problem
Brought people together & conversations	Question the narrative/test assumptions	Publications, research papers, knowledge	Tools and product outputs, reports, documents
High-level guidance on foresight to newbies	Creative thinking through workshop	Student training, integrated learning	Advancing One Health
Process and learn	Exposed to	Appreciation of problem,	Diversity & then

how to run a foresight process	different conflicting perspectives not likely otherwise	understanding issues in a holistic way	consensus
Recommendations	Information	Explore issues	Foresight: learning about process, systems mapping, scenarios, group future discussions, exercise with Inayatullah
Tacit learning		Relationships, networks, conversations, discussions	Advance risk management with AHEM (combo elements of system), understanding & designing a better system, clarify roles
Provide alternative perspectives		Critical mass with more action than other research projects	Shared vision
Pull together a range of different ideas in a disciplined way for an action plan		Frees people's thinking & creativity	Strategic plan
New way of thinking		Advanced modelling, Quest	Answered questions
Drivers		Sense of trade-offs in public policy re: sustainability	Defines next steps
Planning		Involves many students/researchers	Identifies issues
Built capacity and a foundation for sLab		Student follow-up achievements & impact	Met objectives
		Facilitate interdisciplinary faculty's common thinking	More comprehensive
		Expose ideas to wider community & learning, community engagement	Continues to be used
		Brought attention to the Georgia Basin	Investment
		Government aligned activities per the geographic area	Build capacity
		Informs everyone as to what is going on, brought people together	Creative

		Envision and Metroquest	Holism/multidisciplinary, big picture thinking
		New ideas/angles to approach problem	Senior people involved
		Hope and can study this & understand it	Timing to address need
		Academics working with externals was key	Pan-Canadian
		Participatory engagement & forms of it	Learn about moderating/organizing large groups
		Diversity, transdisciplinary, cross-sector, broad range of viewpoints/interests	Change in regulations
		Clarification	International impact
		Decision-making	Preparation by industry
		Look for surprises	Ownership and trust
		Introduces different situations & prepares you with tools for them	Councils
		The research is practical & identifiable	A new awareness of other big issues
		Delivered on objectives	
		Increases knowledge & awareness among audience for sustainability	
		Different mechanisms/impacts/uncertainties/contingencies/holistic	
		Demonstrated the need for an aspiration/vision & a plan	
		Parameters are on what to expect, manage & then how to get there	
		How I advance as part of the future not external to it (policy)	
		Unconventional collaborations & partnerships	
		What might be-not one future	

Numerous benefits are listed, primarily for GBFP and Fore-CAN projects. This is not surprising as those two case studies have the most interviewees and are the largest projects. The benefits are diverse and range from the conceptual such as learning about the process itself and

creative thinking; to the practical, for example, new tools and furthering new ideas and strategic plans; to the social, such as networking and collaboration. Many of the items in the list are not surprising and are documented in the literature in terms of potential benefits from foresight work as well as concrete benefits from case studies. Among the four cases being studied in this dissertation there is a combination of conceptual, social and practical benefits. Alternative perspectives, creative thinking, and learning are mentioned as benefits by interviewees from all four cases. For GBFP four benefits are mentioned repeatedly throughout: learning something, diversity/transdisciplinary/cross-sectoral work, benefits to young people, Quest. In the Fore-CAN case study the most commonly mentioned benefits combined from a few of the different questions are anticipation and mind change, collaboration, tools and product-based outputs, and more appreciation/understanding/knowledge and integration.

There are many similar benefits across the cases. For instance, GBFP and Fore-CAN both perform roles that facilitate more awareness of the problem, change in perception, discussions among various stakeholders and learning. More focus on anticipation is apparent in Fore-CAN. Although less benefits and valuable elements are listed for the other two research projects, they mostly match those listed for GBFP and Fore-CAN. The external cases generally seem to match the other four except benefits are more policy specific for Agricultural Adaptation. Transformation of the Canadian Payments System is much more detailed and action-oriented towards system-level change. Unexpected learnings and valuable elements such as around the foresight process and diverse perspectives, identified in the previous chapter, are also similar across the three cases with some minor differences perhaps attributable to project objectives: Fore-CAN and 2020 Media Futures being more focused on the foresight process and the future, and GBFP more focused on diversity/transdisciplinary/cross-sectoral work.

How results from projects are used.

Items from the following questions, outlined in Table 12, have been compared for this area.
Fore-CAN Question: Q13 Related follow-up GBFP Question: Q10 Related follow-up

The results from the projects are used differently across the different cases. Whereas the follow-up for Fore-CAN is more practical and specific to use or creation of a product output,

e.g., use of a diagram or development of a process, for GBFP the follow-up is more general, i.e., continue to work in the area or use material for academic work. Canada in a Changing Global Energy Landscape, to a limited extent, challenges assumptions and fosters a second look at the topic. 2020 Media Futures proponents use the material to advance foresight literacy, build capacity and relationships.

Transformation of the Canadian Payments System and Fore-CAN had the strongest political uptake of the project outputs. Even so, the uptake could have been stronger for both and was a critical factor in the level of impact of the former case (Meredith et al., 2016).
Both projects had instrumental rather than informational objectives and a high level of urgency/political drive. Agricultural Adaptation had some impact on policy but was hindered by the political context. The three remaining projects seemed to have the least impact on policy, likely on the account of informational objectives, limited engagement of key decision-makers in the process, political culture/context, and less political urgency. An important finding is context of the project plays a key role in political uptake. Furthermore, policy-makers need to be involved throughout the process, or flexibility and decision-making authority needs to be provided to the foresight process, as suggested by Meredith, Rosell, and Davis (2016).

Challenges.

Items from the following questions, outlined in Table 12, have been compared for this area.
Fore-CAN Question: 19g Negative aspects GBFP Question: Q20g Negative aspects

Challenges are especially noted for the larger projects, but they are relatively minor. The number of challenges is not a surprise as these case studies have the most interviewees and are the largest projects of the four researched. The more commonly listed challenges for Fore-CAN include people changing jobs, understanding foresight, needing executive leadership/support which is bound by a four-year cycle in popularity, lots of work and time consuming, unclear direction early on, slow and tiring and lack of action in terms of outcomes. The challenges are similar to the suggestions for improvements. Although the challenges identified are diverse, most of those offered for GBFP surrounded lack of significant strategy development and implementation or in other words lack of practical action/outcomes on the ground. However,

these challenges are not mentioned often and are also qualified by the fact that it is very difficult to make substantial changes for such a complex problem and that this is not the primary objective for the project. In terms of the two other in-depth case studies? Challenges are similar but more of: so, what do the findings mean, is the process rigorous enough, can the foresight team create a stronger market demand/drive and does the team need to engage more or different types of participants.

Success.

Items from the following questions, outlined in Table 12, have been compared for this area.

Fore-CAN Questions:	GBFP Questions:
Q6c Fore-CAN's role	Q5c GBFP`s role
Q9 Fore-CAN - success or failure	Q6 How successful for sustainability
Q15d Value of Fore-CAN	Q16c Value of GBFP
Q17 Value in terms of resources expended	Q18a Value in terms of resources expended
Q18 Fore-CAN's effectiveness efficiency collaboration	Q18b Would you do it again
Q22c Fore-CAN's impact	Q19 GBFP's effectiveness efficiency collaboration
	Q23c GBFP's impact

There are several elements involved in the comparison of successful factors. Again, it is important to note less interviewees or shorter interviews have been conducted for 2020 Media Futures and Canada in a Changing Global Energy Landscape. Also, the external cases are judged only from information in a few select documents. First, most participants for Fore-CAN and GBFP are satisfied with the outcomes and indicate some level of success has been achieved. Fore-CAN is seen as more successful and valuable than the other three foresight projects. Success is also evident in Transforming Canadian Payments but not as much in Agricultural Adaptation. Proponents of 2020 Media Futures and Canada in a Changing Global Energy Landscape have identified other successes from the project not directly experienced by or primarily observable by the interviewees. Second, goals and objectives have been met for both Fore-CAN and GBFP and to some extent the other projects. For instance, the potential impact

from the project (as per GBFP's role, benefits, unexpected benefits and valuable elements listed) matches the identified objectives in terms of research and building understanding as indicated by the majority interviewed. Perhaps, the delineating factor is to what extent objectives have been met or how well they have been met. This is difficult to determine from the data available and to some extent it is also a subjective determination.

Third, most respondents from Fore-CAN, GBFP and 2020 Media Futures think that the value of the projects is the same or greater than the investment. Fourth, collaboration is very strong to excellent in all cases. However, efficiency and effectiveness are around average in the three cases. Whereas, Fore-CAN had slightly stronger results especially for effectiveness versus efficiency, 2020 Media Futures and GBFP rate lower than average on effectiveness and efficiency rates higher. Fifth, the level of impact is almost double for Fore-CAN and the reason may be that the goals for the project and what needs to be done as defined by the participants lines up well with what is seen as progress in the area, like collaboration. This is not the case for GBFP which strives for objectives such as furthering of knowledge and understanding, very important aims, that do not easily or visibly transfer to concrete outcomes in improving sustainability.

Sixth, although 2020 Media Futures and Canada in a Changing Global Energy Landscape seem to have less observable value/impact/benefits to interviewees, there are several factors that may have had an affect on these findings, for instance, few individuals interviewed, interviewees less familiar with other values/benefits, context and drivers different for these projects, much smaller budgets available, topics well addressed by others, and participants having minimal experience and knowledge of foresight. Overall, Fore-CAN and GBFP have ratings from slightly above mid-valuable to very valuable. Alternatively, the two smaller projects fit within the less valuable to mid-valuable range. Finally, follow-up and outcomes are important in all cases even if it was not an action outcome, e.g., what does all this mean and what do we do with the outputs are resonating questions.

Process/product.

Interview responses to the following questions, as outlined in Table 12, have been compared for this area.

Fore-CAN Questions:	GBFP Questions:
Q20a Product or process outputs greater	Q21a Product or process outputs greater
Q20b Which greater impact on problem	Q21b Which greater impact on problem
Q22b Main reason(s) for progress or lack of	Q21c More effect: product use alone or facilitated sessions
Q23 Necessary next steps	Q23b Main reason(s) for progress or lack of
	Q24 Necessary next steps

Process and product outputs are important for all cases but especially so for GBFP in which the product is seen as a critical part of the process. Furthermore, in all researched cases process outputs rather than product outputs are seen as having the greatest impact on the complex problem being addressed. Process output's level of impact is similar across cases but seen as stronger for Fore-CAN. This is likely due to most participants regarding process change as indicative of progress, which is fitting as Fore-CAN targets collaboration. This is not the case for GBFP in which the project targeted research. Next steps are similar across GBFP and Fore-CAN in that more of what is identified as required at the start of the projects is still needed today, focus on process elements, with greater emphasis on practically-oriented implementation, i.e., whereas GBFP stronger on action plan, Fore-CAN focused on continued effort and refreshing foresight.

Improvement possibilities.

Items from the following questions, outlined in Table 12, have been compared for this area.

Fore-CAN Question: Q18d How to increase value	GBFP Question: Q19d How to increase value

Many suggestions for improving foresight in each of the four cases are alike and common to suggestions provided by the foresight literature, such as the research questions are too broad. Interestingly the challenges and/or lessons described in the external cases are similar to the other

four cases. There is, however, variety in the most frequently mentioned suggestions offered by interviewees as indicated below per project.

- Fore-CAN: follow-up, start with more specific questions, have a stronger commitment to complete the process faster, communicate more about foresight and the outputs
- GBFP: embed in decision-making processes and support the government at all levels in planning (examples listed as no consensus on how to increase value)
- 2020 Media Futures: use foresight regularly, involve the right people, follow-up, address a more specific question and give people a path forward.
- Canada in a Changing Global Energy Landscape: push it into policy so that it can be used as a policy analysis tool, provide a recommended course of action preferably with probabilities and risk assessments

Value of foresight.

Items from the following questions outlined in Table 12 have been compared for this area.

Fore-CAN Questions:	GBFP Questions:
Q15c Value of Foresight	Q16c Value of Foresight
Q16 Value in comparison to traditional	Q17 Value in comparison to traditional
Q21 Used Foresight since	Q22 Used Foresight since

Overall the interviewees view foresight positively. At least one-third of each of Fore-CAN and GBFP interviewees indicate foresight is very valuable and two-thirds of the respondents for each project have used it since as well as would fund the project again. Foresight is indicated as valuable in the feedback from the other two cases, but it has not been used much by the interviewees since the project's completion. For the majority of the research participants in Fore-CAN, GBFP and 2020 Media Futures foresight is at least equal to or more valuable than traditional methods. It is noteworthy that the value of foresight in all four cases is affected by either or both of: project duration and timing of project delivery.

Summary.

To summarize, the results from each of the six cases does vary somewhat but the broad findings are consistent with each other. Furthermore, the findings are corroborated in almost all

cases. For instance, although the context in each case was different, context proved to be a very important factor for all cases. In addition, in three of the researched cases foresight strongly affected social, perception and paradigm dimensions in interviewees and resources, context, tools and processes all strongly affected the success of the foresight projects. In terms of benefits, similarities occurred across all six cases. Alternative perspectives, creative thinking, and learning were mentioned as benefits by interviewees from all four in-depth case studies.

Pursuing this theme further, although process and product outputs are important for all six cases, process all around is seen to have the greatest impact on the complex problems. Besides that, many suggestions for improving foresight, e.g., follow-up on project, improve communication, address implications, and embed continuously in decision-making, in each of the four cases were alike. As a final example, most research participants view foresight favourably. To be sure, there were some areas in which differences seem to be stronger. Various challenges or issues were identified across each project, additional diverse benefits were listed and the project outputs were applied differently. Yet, all the diverging responses match similar types of findings from studies in the foresight literature.

Successes as a category is more complicated and thus has been left intact and summed up last. To some extent all the six projects had met their objectives. The extent to which this occurred is open for determination. Fore-CAN is seen to be the most valuable, have the greatest impact and identified as most successful of the four in-depth projects. Transformation of Canadian Payments seems to also have had a significant level of success as an external project. In terms of value, Fore-CAN and GBFP rated between mid-valuable and very valuable. Canada in a Changing Global Energy Landscape and 2020 Media Futures seem to have a lower level of impact and value for a variety of potential reasons such as being primarily informational and not addressing “so, what do I do with this”, issues around engagement, and competing sources of information. Interestingly, success as defined by the foresight community members was achieved for all cases in terms of information/learning taking place, influence/ impact occurring and quality of foresight delivery. There are three further findings of particular interest. The first is most interviewees within Fore-CAN, GBFP and 2020 Media Futures either equated the value of the project to the investment incurred or thought the value was greater. The second is that

collaboration ranked very strong to excellent in all in-depth case studies. The third, and perhaps unsurprisingly, follow-up and practical implementation of the results from the process are seen as very important for all cases.

Pattern matching.

The synthesis above presents several persistent findings. This next form of analysis builds on them. Pattern matching is a method used for case study analysis and is defined by Yin (2009, p.143) as "compares an empirically based pattern –that is, one based on the findings from your case study-with a predicted one made before you collected your data (or with several alternate predictions)". This section will begin by restating the propositions, the predicted pattern of theory-based outcomes, outlined in the introduction for this dissertation. Then, the actual pattern and discrepancies will be noted.

Predicted pattern.

The following propositions are being tested:

1. Most of the major findings from the research on the perspectives of the Canadian foresight community confirm findings found in the foresight literature (as findings are appropriate and available).
2. Dialogue-based foresight projects have significantly changed/assisted individuals and groups of people. The changes/outputs have had a positive impact on the management of complex problems in Canada.
3. Dialogue-based foresight is widely and incrementally effective with numerous impacts in several different areas. The value of dialogue-based foresight is worth the resources invested. The degree of this effectiveness, the related mechanisms and the specific benefits of dialogue-based foresight per project have been studied per the cases in this dissertation.
4. Process, context, tools and alternative interventions have a significant effect on the success of dialogue-based foresight.
5. Process outputs are greater than product-based outputs for dialogue-based foresight. Process outputs have a greater impact on complex problems than product outputs.

6. Dialogue-based foresight provides product outputs and they further outcomes.
7. Inclusion and engagement of a wide range of stakeholders has a positive impact on outcomes.
8. Outcomes related to complex problem management have improved if dialogue-based foresight was used. This improvement is likely due to the use of dialogue-based foresight.
9. Dialogue-based foresight has played an important role in creating effective, efficient and/or collaborative ways to alleviate complex and/or urgent complex problems and their effects.
10. There are at least eight ways to increase effectiveness, efficiency and/or collaboration in foresight and thus improve outputs, these are: broad implementation factors, suitability of approach, new technology, sharpening toolset, research, linking to other practices, tailoring and democratic engagement (as per Chapter 4).
11. Dialogue-based foresight has been used to address Canadian complex problems and can play a unique and valuable role in continuing to work with these types of problems. This is much more likely to occur: within certain parameters such as appropriate use of foresight and well conducted foresight, with the advancement of foresight research and practice and with attention to multi-level organizational and system issues.

Actual pattern.

This section identifies the actual pattern that occurred based on the data collected about the foresight community and the researched cases as well as the two external cases.

Table 16. Propositions and actual findings

Propositions	**Actual Findings**	**Discrepancies**
1.Major findings on Canadian foresight community confirm literature (as available) Prep→P&A P&A→Outputs	Foresight community has limited Canadian presence No central resource for information & difficult to access information on projects and community members Lack strong consensus on concepts Difficult practice to do well Works well with other	No

	tools/approaches Works well if used appropriately and applied well Value, challenges, opportunities & uses of foresight Expensive & resource intensive Typologies & guidelines helpful Strengthen practice information, guidelines and typologies	
2. Dialogue-based (Db) foresight project significantly changed/assisted individuals/groups – changes/outputs have had a positive impact on outcomes P&A→Outputs	Based on individual perceptions, most interviewees across Fore-CAN and GBFP cases have indicated they have been affected by a Db foresight project. These affects have been mostly listed as benefits. Inconclusive for externals & Canada in a Changing Global Energy Landscape (or Energy project).	Less interviewees impacted, but other value gained in 2020 Media Futures. Cannot make definitive conclusion outputs have impacted outcomes and thus, may not have a significant positive impact on outcomes for all cases
3. Db foresight widely and incrementally effective with numerous impacts. Value of Db foresight is worth invested resources. – degree, mechanisms, benefits studied per cases P&A→Outputs	Yes, effective with impacts for all cases except. Phase 1 findings agree. Inconclusive for Energy project. Yes, worth investment per Fore-CAN, GBFP and 2020 Media Futures, and phase 1. Inconclusive for the rest of the cases.	No but not definitive
4. Process, context, tools and alternative interventions have significant effect on success of Db foresight P&A→Outputs External→Outputs	Yes, per three cases (Inconclusive for Energy project and external cases). Phase 1 findings agree.	Alternative interventions not as significant effect on success
5. Process outputs greater than product – process greater impact on complex problems Outputs→Outcomes	Yes, for Fore-CAN but not definitive for the others. Yes, per four cases (inconclusive for externals).	No but not definitive, and No
6. Db foresight provides product outputs that further outcomes Outputs→Outcomes	Yes, per Fore-CAN, GBFP, & Transition of Canadian Payments if assuming link. Inconclusive for Agricultural Adaptation, 2020 Media Futures & Energy project.	No but not definitive
7. Broad inclusion and engagement have a positive impact on outcomes	Yes, very important if assuming link but depends (as per phase 1 & 2 findings).	Broad but selective and depends on project parameters

Prep→Outcomes		
8. Outcomes improved – likely due to use of Db foresight P&A→Outcomes	Yes, likely. Inconclusive for externals & Energy project.	Link is weak to outcomes
9. Db foresight has played an important role with complex problems P&A→Outputs	Yes, but not necessarily urgent or transformative (as per phase 1 & 2 findings).	No
10. There are at least eight ways to improve foresight outputs External/Prep/P&A→Outputs	Yes (as per phase 1 & 2 findings).	No
11. Db foresight is used for complex problems and can continue to be unique and valuable in its role – there are conditions under which this is much more likely to occur P&A→Outputs/Outcomes P&A→Outputs→Outcomes	Yes to all	No

Table 16 outlines the propositions offered in Chapter 5 of this dissertation, the actual findings and the discrepancies. Below each proposition are notations that apply to the conceptual framework analysis conducted later in the chapter. The propositions have been confirmed. The degree of confirmation varies as to how many cases substantiate the proposition and to what extent. Discrepancies identify qualifications and weaker findings. The overall pattern demonstrates: (i) foresight literature findings are validated with practical evidence in a Canadian setting; (ii) dialogue-based foresight is effective, worth the investment and significantly changes people; (iii) dialogue-based foresight has played and can continue to play a unique and valuable role with complex problems likely advancing outcomes; (iv) process, context, tools, products, broad inclusion and engagement are all important to success; and (v) foresight outputs can be improved in several ways, such as through using new technologies and applying as well as conducting research.

Discrepancies.

Even though there is a significant match between most of the proposed and actual findings, some qualifications and inconclusive results are also apparent. The findings from the external cases and Canada in a Changing Global Energy Landscape are unfortunately not comprehensive enough to make judgments on some of the propositions. Furthermore, qualifications are necessary in terms of the extent of and refinements to the proposed findings. This is not surprising in a practice that is relatively new and complex with limited accessible documentation on projects and a dissertation assessing project effects over the medium to long-term. However, other analysis methods can be attempted to strengthen the pattern identified. Noteworthy is the alignment between the four areas: the findings on the Canadian foresight community, the literature on foresight, the findings overall across the cases as well as generally within each specific case.

Rival explanations.

Rival explanations is another analysis method suggested for case studies (Campbell et al., 2002; Yin, 2009). This method helps rule out other potential alternative explanations for the pattern and links that have been identified above. Four potential categories of rival explanations are offered: (i) the pattern would have occurred without any type of process, (ii) the pattern would have occurred with another process not foresight, (iii) the pattern has occurred but the extent of the effects is limited and inconclusive as well as unconnected or barely connected to outcomes that it is not relevant and (iv) the pattern did not actually occur due to flaws in the research process. Each of these group of rival explanations is addressed below.

The pattern would have occurred without any type of process - Need drives results.

Need drives results especially in a crisis, but it does not dictate what the results are and how they are achieved. In other words, even though need can energize results it does not explain the actual pattern that has been identified in this dissertation. A crisis cannot wait for progress from foresight and progress will likely occur without foresight. Yet, being prepared is very important as to how a crisis is handled should it occur. Need may drive action and affect the process, e.g., a strong driver has been demonstrated to be an important factor affecting foresight, but it does not dictate the process chosen to facilitate action or whether the best decisions are

made as to what or how actions should be taken. On the other hand, the activities, their expediency, the way they are delivered and what is delivered can have tremendous impact on how well a predicament is managed. Furthermore, necessity can enhance certain elements of crisis management, like engagement and commitment, but it does not necessarily do so. On the contrary, necessity can negatively impact the handling of a crisis, e.g., panic, mistrust and inappropriate shortcuts.

Although difficult to test the counterfactual, it is possible to compare how crises are managed and whether different forms of crisis preparation are helpful and to what extent. Alternatively, it may be fruitful to look at the ways in which industries or problems using foresight and experience a crisis then manage it compared to other industries or problems that have not used foresight and go through similar events, such as infectious crops versus infectious animal diseases as the topic for Fore-CAN. In the dissertation cases, perception of the participants and clients on whether their problems were a new and urgent crisis that heavily relied upon the foresight process may have played a role. If competing avenues to addressing the crisis were available, the problem wasn't seen as urgent by the client, or the issue was already being managed in other ways this may have reduced the impact of the foresight process. Thus, this is not a simple question of need driving results.

Process other than foresight could have produced similar results.

Could another process other than foresight be utilized to either address the complex problem directly or derive similar outputs? Yes, to an extent, but foresight is unique. There are several different processes employed in addressing complex problems. Most prominently, the political process puts forth ideologically-based and potentially evidence-informed solutions to address complex problems. These are debated among the public as well as political representatives, and influenced by policy advocates and the media. In some cases, dialogue-based group events, like conferences, strategic planning sessions, focus groups, and workshops are utilized within this process. Other courses of action may be more technical such as the development of reports compiled by experts. Furthermore, top-down driven consultations may be utilized, e.g., task forces or special commissions. Efforts in addition to the political process are,

of course, ongoing. These may be driven by the private, non-profit or social enterprise sectors and can include a variety of similar or different elements then listed above.

There are similarities between the foresight process and other processes, but foresight has unique features and benefits which are particularly suited to complex problems. In phase 1 of this research, these unique features and benefits were delineated and will not be duplicated here. In phase 2 of the research, the cases verified these unique features and benefits. For example, the combination of changes in individuals' paradigms and perception, working with the future, conflict resolution and collaboration. The other processes identified above do not provide a substitute for these unique features and benefits. Furthermore, foresight has certain advantages in working within a democratic society mired in complexity while building on the strengths of humans. People are fundamentally social beings who at this point are very interconnected, look for knowledge and answers, have a drive to improve their condition and need to connect with each other. Dialogue-based foresight as a participatory and holistic process does not currently have an equal in its replacement.

Effects are minimal, inconclusive and not strongly linked to outcomes.

Another rival explanation could be case findings are not always strong, with some cases being inconclusive and a weak link existing to outcomes; as such, the research results are not relevant. This is a strong argument and although solid evidence has already been presented to refute it, further evidence will be used to demonstrate it is not ultimately accurate. Perhaps this rival explanation would have more strength if the evidence available to refute it is drawn exclusively from the four in-depth dissertation case findings. However, the pattern from the findings matches the observations in the literature, where available, in addition to the phase 1 findings, and are mostly corroborated by the external cases. Where corroboration is missing in the external cases the effects can be reasonably assumed to be likely. This combination of evidence for the actual pattern identified cannot be denied. Furthermore, the weak link will be strengthened using two forms of analytical methods following this section. In addition, the relevance of the findings will be established. Further evidence from more case studies, naturally, would strengthen these results and research along these lines is encouraged.

Results of dissertation are inaccurate.

The last category negates the pattern by questioning the research process itself. As in all research studies, arguments could be put forth to challenge the validity of the results. In Chapter 6 on research design these potential challenges were anticipated and addressed. For instance, one may argue that interviewees have a vested interest in their responses or the findings are mostly based on perception not hard proof. For the former, a majority of those interviewed, for example, for GBFP were academic and male because this group was primarily involved with the project. The project was primarily a research project and it is difficult to have people remember over long time periods so therefore those individuals who had more exposure to the project were more likely to remember it. Regardless, a diverse sample of the research population has been targeted. To establish rigour, the responses have been tested for any significant biases according to interviewee membership in a group, such as per sector, relationship to project and gender (this is outlined in Chapter 10 on multi-perspective analysis). Positive and negative comments were put forth by individuals regardless of their relationship to the project. In addition, both type of comments match the literature and phase 1 findings.

Regarding the issue that findings are based on perception not hard proof, triangulation, robustness and rigour have been used to strengthen findings where possible. Despite this, some findings could be stronger. However, this is challenging. To illustrate, it is hard to validate findings with other forms of data, e.g., to measure paradigm changes one could use pre-and post-test data but even so acquiring objective data directly linked to many foresight effects/outputs is very difficult. As such, internal congruence among findings and corroboration among: external assessments with similar findings (as available), additional cases studied and reviewed, and findings within the foresight literature, have strengthened the results of this dissertation.

At this point the dissertation proceeds to the first of the two remaining analytical methods: chronological sequences/conceptual framework review. The pattern identified from the actual findings regarding the 11 propositions put forth will be strengthened overall and the weakest links, process/activities to outcomes and outputs to outcomes, will become more solid.

Chronological sequences/conceptual framework review.

This section uses the conceptual framework described in Chapter 5 to strengthen the pattern above and determine if the link between outputs and outcomes and process/activities to outcomes can be strengthened. It does this by proposing a preliminary explanatory theory for the pattern identified, relating the effects of different elements external and internal to the foresight process, based on a chronological sequence of events. Before this analysis proceeds it is important to note that foresight in its art form and iterative practice does not necessarily follow a logical or rational linear set of events. Yet, in its broader description a foresight project has a very general pattern that can be delineated by considering the preparation for and start of the project, foresight process/activities, and end-project phases, i.e., outputs/outcomes.

Chronological sequences is a form of time–series analysis described by Yin (2009). "The analytical goal is to compare the chronology with that predicted by some explanatory theory" (p. 154). Yin lays out four conditions for the theory of which at least one must be met. Of these conditions three are met in this research: (i) chronology must occur among certain events because a reverse sequence is not possible, (ii) the events must occur chronologically but on a contingency basis and finally, (iii) certain time periods are defined by a certain group of events that are different from those that occur in other time periods. Based on the actual pattern delineated above and the use of the conceptual framework a preliminary explanatory theory is outlined.

The foresight process typically follows an iterative process widely described in the literature. The process begins with a preparatory phase that includes allocation of resources, and development of and agreement upon on various project factors such as approach, process, goals and timelines. The next distinctively foresight phases described in this document include scanning, scenarios, strategies and outputs. Essentially, the scanning, scenarios and strategies phases are likely to have the greatest variance with a variety of tools and methods available. Delivery of outputs are essential and completion of this includes evaluation, follow-up items and translation/improvement of outputs into outcomes. Iteration can take place throughout.

The conceptual framework, as depicted in Figure 14, provides a general reference for the chronological sequences that occur overall in the cases examined. The core of the framework is outlined by three groups of processes/activities: Types of Dialogue-based Foresight, Approach/Phases/Methods/Implementation and Extras. Foresight activities and processes are based on its type and associated parameters, elements of the practice and augmented by extras as appropriate to achieve outputs/outcomes. The rest of the elements outside of the core include external factors, preparation, outputs and outcomes.

Three conditions met.

Yin's first condition is a necessity of a chronology of some of the events with them being irreversible in sequence. Resources and the preparatory phase must occur prior to any activities and related outputs and/or outcomes occurring. This particular link cannot be reversed. In other words, logically, activities cannot occur before some time, individuals and thought are expended. The other sequence is between activities and outputs. Without some form of the foresight practice or exercise being conducted an output or outcome cannot be achieved. An output or outcome such as collaboration, a report or a change in perception cannot be produced without some act however small that may be. The second condition relates to events occurring chronologically but on a contingency basis. This rule applies to the explanation described for the first condition. In each instance, the secondary elements can only occur if the primary elements take place. This is the contingency. Reasoning this through, in both situations outlined the secondary elements can sequence back to the primary elements but, as can be seen, only if the first sequence has occurred at least once.

The remaining condition refers to a group of certain types of events that may take place in certain time periods. Usually, but not always, foresight practices and activities involve certain types of events during a particular time period that are different than what happens at the output/ outcome phase or what happens in the preparatory phase. The preparatory phase includes events related to acquiring resources and structuring them, planning and setting up the project. This phase involves different or more people and different types of activities than delivering the foresight activities. The outputs/outcome phase is likely to be again a different set of actions

related primarily to assessment, follow-through and following up with perhaps a slightly different group of people.

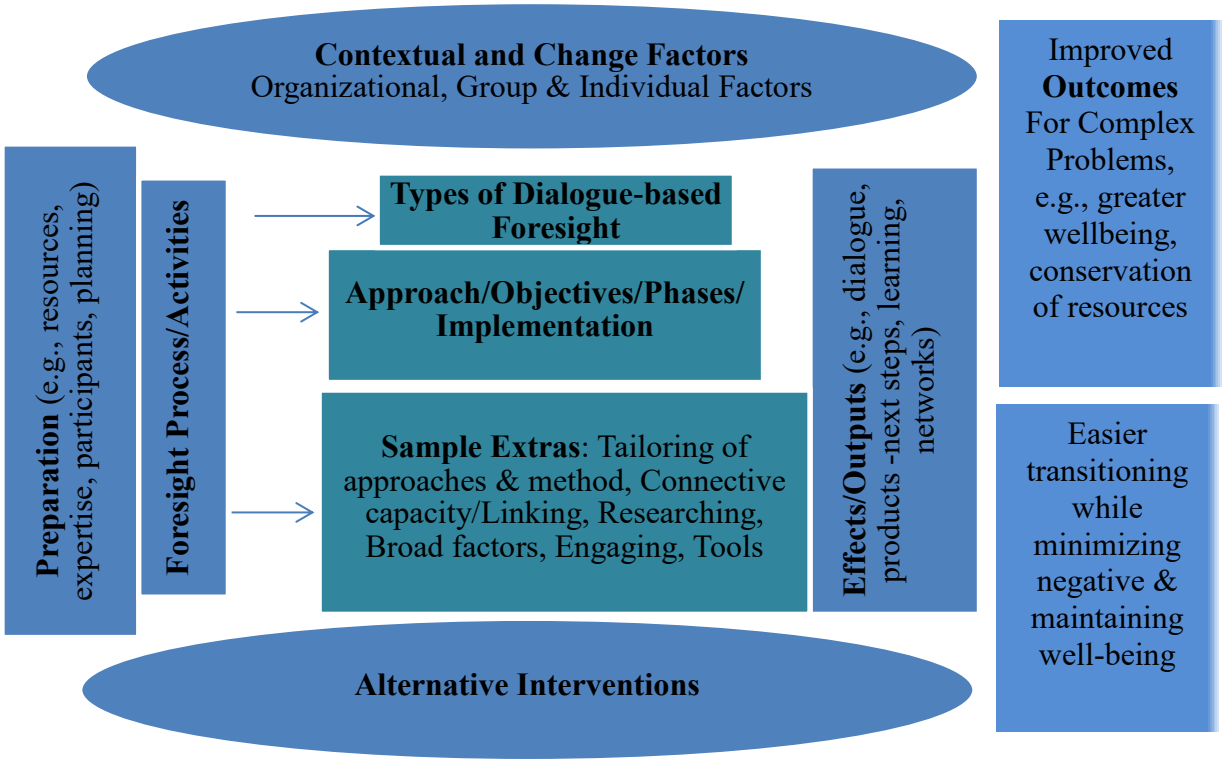
The links confirmed in the pattern above are used to move from the theoretical conditions described to their empirical substantiation. Each group of elements is presented below.

- External factors: Factors such as contextual, change and alternative interventions (less so) exist for all projects and have been tested and confirmed with interviewees and document sources to have an effect throughout the projects.
- Preparation: Preparation and resources are necessary for all projects prior to most of the work being completed. Their importance and initial phase has been confirmed as well.
- Foresight process/activities: Outputs generally are not produced without some form of process that creates them. It is unlikely that you would have an agreement in a complex problem without any dialogue. It is also unlikely that you can develop changes in mental models or plans to address potential future events without some baseline and time spent working in this area. Process and tools have been validated to have a strong effect. There is the possibility that context has played a critical role in the success of these foresight projects but some form of process or tools has been needed to facilitate the outputs and outcomes. Context alone has not been enough and neither has been preparation. Usually outcomes will not happen without something to facilitate them either but there is minimal validation of this link.
- Outputs: Change in individuals has occurred and numerous outputs have been produced. Both have been attributed to the process. Outputs are generated throughout the process but most of them are finalized after some time has passed and activities of some form have been engaged.
- Outcomes: Outcomes can occur throughout the process but are most likely apparent near the end of the project once outputs are realized.

The chronology of the elements substantiates most of the links formulated in pattern matching. Generally, all the cases in this research followed the chronology outlined. It does not mean that the phases or one group of elements were completed prior to the other group starting

or were not revisited. For instance, Fore-CAN started with preparation before it proceeded with process/activities, but there was preparation that was ongoing in some sense throughout the entire chronology. Similarly, outputs such as collaboration started to be delivered before the entire process was completed. And finally, within the process iteration is common, e.g., a scanning report may have been drafted at some point in the process that was revisited during the development of a strategy. Although the activities varied in the core of the framework and certain elements continued or were revisited, the preparation→process/activities→outputs/outcomes chronology in essence remained.

Figure 14. Conceptual framework (as per Figure 10)



Compare chronology with that predicted by explanatory theory.

A weak link remains between activities/process and outcomes and between outputs and outcomes. However, where outputs can be considered as very near achieving outcomes and reasonably related to outcomes the link becomes stronger. As such, outlined below are some of the preferred outcomes for the cases reviewed and these are compared to the outputs generated.

The first two cases on the list are more thorough than the others so as to minimize significant duplication. Many of the ultimate preferred outcomes, e.g., improved well-being, sustainability, security, risk management, economics, transitioning and preparedness, are similar across cases. Furthermore, examples of by-products or outputs, such as understanding, knowledge, collaboration, tools and foresight literacy are also similar.

What may be the ultimate preferred outcomes for the cases?

- Fore-CAN: Risk management, easier transition to accommodate rapidly changing external forces, safer food sources, more insulated and competitive industry - economy, safer livestock, livestock saved, greater peace of mind, strong and secure international reputation, increased health security and awareness. Examples of potential by-products of achieving outcomes or outputs to facilitate outcomes: collaboration, stronger AHEM system, information sharing, increased surveillance, greater knowledge, greater foresight literacy.
- GBFP: Increased sustainability or overall sustainability achieved in the region, smaller ecological footprint, improved well-being of the population, easier transitioning and accommodation of external changes, risk management. Examples of potential by-products of achieving outcomes or outputs to facilitate outcomes: specific initiatives, regional plan, increased sense of security, and understanding of dynamics of trade-offs
- 2020 Media Futures: Risk management, economic/industry development and competitiveness, democratic access to media, improved communication using media, protected national heritage, improvement on how society and its members interact/operate/get information and its increased quality/impact
- Changing Global Energy: Full and broad impact on the development of strong and robust policy decisions related to energy, best prepared for global changes, risk management
- Transform Canadian Payments: Very competitive and prepared globally and nationally in financial matters, information exchange and digital technologies
- Agricultural Adaptation: Policymakers have addressed and adapted to all potential changes brought forth by climate change, e.g., food security, economics, risk management

The outputs or by-products are steps toward the outcomes. For instance, increased peace of mind, security and risk management can be described as due to improved coordination and collaboration. Thus, many individuals may see the outputs as ends in themselves. Indeed, risk management or ease of transitioning/preparedness can be both outputs and outcomes. The level of output realized may be differentiation between an ultimate preferred outcome or a partial outcome. Agricultural adaptation likely assisted policymakers and possibly the sector to adapt to climate change, but the extent of this assistance is important in terms of making progress in working with the complex problem or achieving a preferred outcome. To summarize, in several circumstances outcomes and outputs are very close to each other. The key factor presents as the degree to which the ultimate preferred outcome is achieved or the complex problem negotiated.

Accordingly, activities can lead to some outcomes if activities are very similar to outputs and as such outputs would naturally be very strongly linked or related to outcomes. For instance, developing a stronger AHEM system is strongly related to risk management. The remaining issues are the extent to which the outcome has been achieved and, thus, in those cases in which the outcome is clearly more significant than an output. If outcomes are much more substantial than outputs, then the links between process/activities and outcomes, and outputs and outcomes still need to be strengthened.

The determination of causal linkages to outcomes is likely to be inconclusive and subjective, e.g., how much impact a certain level of collaboration can have on a complex problem in an environment defined by complexity is unpredictable. Primary features of complexity include uncertainty and emergence (Homer-Dixon, 2010, p.; Urry, 2005). Although planning and intention formulates the process, several unintended consequences occur. As Mintzberg (1985) noted, the realized strategy of a strategic process is composed of an emergent strategy. In addition, it is important to recall progress addressing complex problems generally is hard to define and constitutes an overall slow process as well as being very difficult to achieve. These cases are no different. However, the preliminary explanatory theory developed in this section is not unproven.

Earlier in this dissertation, causal attribution is discussed as nearly impossible to achieve because case analysis does not lend itself easily to determination of a causal link (Campbell et al., 2002). Further, with the subjective nature of the foresight practice in the context of complexity causal attribution is even more challenging to demonstrate than in other case studies. Especially so in a study in which years have passed and several confounding variables are in play. So, this dissertation will not continue in attempting the near impossible, determine causation, but proceed with attempting to understand the contribution of foresight process/activities to outcomes and outputs to outcomes. This is the next section.

Contribution analysis.

Contribution analysis "offers an approach designed to reduce uncertainty about the contribution the intervention is making to the observed results through an increased understanding of why the observed results have occurred (or not!) and the roles played by intervention and other internal and external factors" ("Contribution Analysis | Better Evaluation," n.d., p. 1). This section of the chapter is an attempt to complete a contribution analysis for this research by proposing a very preliminary expression of a change theory based on the explanatory theory developed above. The purpose of conducting a contribution analysis is to address the questions remaining from the analysis conducted thus far. Has, and if so how has, foresight influenced the observed outcomes in this research? Is this reasonable? What conditions are likely to be important for dialogue-based foresight to deliver similar outcomes as identified from research findings in this dissertation? ("Contribution Analysis | Better Evaluation," n.d.; Mayne, 2008)

Mayne (2001) outlines six steps for conducting a contribution analysis. These steps have been abbreviated to four for this research, as his steps are created as a rigorous method used for program evaluations in areas in which there is limited opportunity for variation. This dissertation is an assessment, not a rigorous evaluation, of a creative practice. Step one identifying the attribution problem has already been completed. The next step is developing a theory of change.

Abbreviated Steps from Mayne for a Contribution Analysis

Step 1: The attribution problem

Step 2: Develop a theory of change and risks to it

Step 3: Gather the existing evidence on the theory of change

Step 4: Assemble and assess the contribution story and challenges to it (Mayne, 2008, p. 1)

Multiple outputs and outcomes are dependent on several independent variables as previously explored and outlined in groups in the conceptual framework for this dissertation. As mentioned throughout this dissertation and has been established through the data collected, foresight is as much an art form as it is a science. Thus, guidelines not strict rules have been suggested in the foresight literature. The preliminary theory of change is if certain guidelines are met there is a strong likelihood that the outputs/outcomes of the project will be similar to or stronger than those demonstrated in the dissertation cases. It is important to note, however, that random anomalies can theoretically occur. Neither the concept nor the actual guidelines in this theory of change are unique. They have been identified in other guidelines and suggestions provided by experts in the literature (available for example in Hines & Bishop, 2015). Guidelines offered by the experts are more comprehensive and invaluable as guides. These guidelines are specifically based on empirical evidence from the practical cases reviewed and viewpoints on foresight from Canadian members of the foresight community. They are not comprehensive. Table 17 outlines the preliminary theory as formulated per guidelines.

Table 17. Basic important elements for dialogue-based foresight to deliver similar outputs/outcomes as per this research

When Important	**Guidelines**
Phase 1- preparation	• ensure project leader and team have expertise on the topic, process, objective
	• access sufficient & appropriate resources
	• engage the right diverse range of people early and to the end, set the basis for trust & openness, seek broad inclusion and engagement if possible and appropriate
	• acquire leader support from major proponent organization
	• involve decision-makers as participants throughout the process if action is needed to be taken on their part
	• review & describe: type of problem, the context, objectives, level of urgency, success
	• prepare per: research question, communication, clear objectives, well thought-out process, appropriateness of

	foresight approach & tools, types & guidelines & how impact project, manage expectations
	• keep in mind organization, system and project level issues
Phase 2 – the process/activities	• deliver process well including face-to-face dialogue preferably, repetitive attendance, interaction
	• communicate clearly and often throughout
	• ensure the process is rigorous, creative, in-depth, and questions the narrative as well include cross-sectoral/ holistic/transdisciplinary/diverse perspectives
	• consider timing as critical in both the length of the process and when the process is held relative to the context
Phase 3 – outputs and outcomes	• address: so what?
	• seek both process and product-based outputs - process is key
	• deliver on objectives and provide take away, i.e., report
	• ensure implementation of outputs
	• follow-up/revisit process and findings – preferably ongoing process
	• attempt other ways to improve on outputs/outcomes as appropriate

A review of outputs/outcomes from this research.

From the analysis several deductions are generated. Overall, a range of challenges present themselves and the projects involve significant effort and time. External factors are very important and difficult to manage. However, several outputs/outcomes have been associated with the projects. Of course, there is significant variation across the projects in terms of extent of the following, but this list of outputs/outcomes garnered from the case study findings should provide a general outline of likely outputs/outcomes from dialogue-based foresight if the guidelines above, as per the theory of change, are followed.

- Ease transitioning within and working with complex problems
- Similar benefits as appropriate and listed under the benefits section in this chapter
- Individuals affected in primarily one or more of the following dimensions: cognitive, social, perception, paradigm, and creativity
- Some people changed
- Both product and process-based outputs

- Outputs range between conceptual and practical
- Extent of outputs and outcomes are variable
- Different types of applications arising for product or process outputs
- System-level change is possible
- Overall view of foresight positive
- Increase in foresight literacy
- Range in terms of perceived value, but at least:
    - Mid-value
    - Average success
    - Some satisfied participants
    - Goals somewhat met
    - Value at least equal to the investment made
    - Efficiency/effectiveness at least average
    - Collaboration stronger than average
    - Level of impact depends on many variables

Assumptions.

Some assumptions have been made for this theory.

- There is no perfect recipe or one right way to conduct foresight
- Project is appropriate for foresight
- Needs are aligned with outputs, outcomes and foresight's strengths
- External factors are critical and are usually near impossible to predict and very difficult to manage
- Foresight process generally fits the definition outlined in this dissertation
- Project is completed

Weaknesses and risks in this theory.

The greatest ongoing weakness or risk in this theory is the ongoing impact of external factors on the foresight project. Any one area of the project could be affected by an external factor which could have an undeterminable affect on its success. In addition, there is no one right way of conducting foresight, with many different elements interacting in many different

combinations. For example, one aspect of the theory or the level of attention placed on it could have more significance in one project versus another. Next, the discrepancies of degree between the proposed and actual findings or the lack of support from certain cases are a weakness, e.g., instances in which there is inconclusiveness from the findings from external or in-depth cases. Finally, this dissertation is conducted at a macro-level and does not address all the micro elements involved.

The evidence.

Evidence for this theory comes from several places. One place is the current transdisciplinary literature on foresight and its elements, such as results of dialogue and collaboration, that broadly confirms the guidelines. Another place is external assessments for two of the cases. A third place is from the results of research conducted in this dissertation: on the foresight community, the four cases and the findings presented on the two external cases. More specifically, the pattern based on evidence for the propositions and the countering of rival explanations for this pattern as well as chronological sequencing from the conceptual framework formed the basis for this change theory.

The contribution story.

Dialogue-based foresight has influenced complex problems as is evident in six cases within this dissertation. The way in which this has occurred has been investigated, analyzed and confirmed at an aggregate level. The extent of influence is not certain, but it is known some impact and value has been delivered all of the time, not necessarily urgent or transformative but incremental. More importantly, two of the cases could be delineated as more transformative than incremental. Furthermore, there are ways to improve upon foresight outputs and outcomes.

A credible pattern has been identified above and it has fostered an explanation theory and then a preliminary change theory. Thus, the important conditions required to achieve outputs and outcomes similar to those identified in this research are presented. Moreover, there is strong reasoning behind the conditions and outputs and the evidence is solid. Accordingly, it is realistic to assume that if the conditions are followed and based on the assumptions, similar outputs to

those achieved in the studied cases as well as those outputs that are very closely associated with outcomes will likely be realized.

It is reasonable to assume that a range of similar outcomes will be achieved if the conditions of the projects are similar and the assumptions are met. What does this mean? The projects have reasonably influenced the ultimate preferred outcomes for the cases, as identified previously in this section, to different extents. The interviewees indicate impacts on outcomes/progress in the area have been largely achieved for Fore-CAN and somewhat for GBFP (with the caveat for both projects that causation is difficult to determine with any certainty). Transformation of Canadian Payments has also likely achieved significant impact. Results are weaker, indeterminate or no progress on the complex problem occurred for the other cases. Even so, two out of six cases reviewed have offered substantial improvements in working with the problems. In addition, it is important to note risks and weaknesses for this theory are considerable. As such, the researcher concludes dialogue-based foresight can have a significant contribution to improving outcomes but whether it actually does is not definitive.

What is important about this conclusion is foresight "can" make a significant positive contribution and not just rarely. Are there practices that make decisive, significant and reliable differences in the outcomes of working with complex problems? The identification of such practices has been highly infrequent, if they exist at all. By their nature, complex problems are unique. A 'blanket recipe' does not exist. Most often several different practices such as collaboration and innovation are identified as very important or necessary components to making progress but not with certainty. To illustrate further, policy options or huge governmental initiatives like the Paris Climate Accord are far from certain to result in significant improved outcomes. According to many of the interviewees for this dissertation, other traditional methods of addressing complex problems are not as effective as foresight. Furthermore, many of these methods, such as using strategic planning, forming commissions, research or the traditional methods of policy formulation are not certain to yield positive results in working with complex problems and only occasionally make effectual contributions to ultimate outcomes.

In addition, there are many circumstances in which critical advances in humanity have been made through alternatives to rational/scientific/incremental approaches, for example: accidental discoveries, opportune timing and/or context, creative elements and emergent factors. In the context of complexity emergence is highly likely and effectual. Thus, certainty is not a necessity. In fact, many valuable processes or products do not produce positive impacts with certainty over an extended period in complex adaptive systems, comparable to antibiotics and pesticides. Yet, these ventures are pursued and refined because they "can" deliver substantial results.

The wide-ranging benefits of a foresight project augment the value of foresight. Even if a transformative outcome cannot be achieved, several outputs of a well-delivered and appropriately chosen foresight practice often makes the investment in proceeding with a foresight project worthwhile. The various outputs/outcomes identified through this research and outlined above can make an immediate and significant difference on their own, for instance, through cognitive changes, meeting secondary objectives, advancing foresight literacy and increasing social capital. Also, these benefits can have immeasurable positive long-term impacts.

Several links and elements in this theory would benefit from more research and testing including:

- the effects of additional key factors, such as "extra" tools used, urgency of problem, or stakeholder culture, could be identified and tested,
- effects of substitutes for face-to-face group dialogue at certain points of the process could be tested,
- effects of the guidelines could be researched and compared across different types of foresight projects,
- the degrees to which impacts from following the guidelines are experienced could be identified, and
- the way changes in these guidelines affect outputs and outcomes could be researched and described.

Summary.

This chapter has made the voyage more complete by providing for a deeper understanding of the foresight community's work. This has included a comparative analysis of discoveries from excursions, an assessment of what one would expect to find and what was actually found, an examination of different explanations for the findings and different descriptions of experiences. Dialogue-based foresight can produce significant value and benefits that are likely comparable to the impacts of the cases or increased if certain guidelines are followed. However, influence on outcomes is wide-ranging. As identified in this dissertation, this can mean the outcome can be transformative or progress has not been achieved for the complex problem and thus foresight has not had a significant influence. Although less likely, it can also mean the project has had a small effect on the outcome, but this effect makes a very important and lasting impression in the future. Reasons for these range of impacts can be several and difficult to pinpoint, e.g., context, group of participants, mismatch of expectations and a defining aspect of process delivery or approach. A multi-perspective analysis may provide some further insight into these reasons. This analysis is conducted in Chapter 10.

Chapter 10: Review of Results

This dissertation offers information on foresight practiced in Canada and presents discoveries from assessing the use of dialogue-based foresight on complex Canadian problems. At the beginning of this dissertation, in Chapters 1 and 5, several sub-research questions and propositions laid the groundwork for responding to a research question and developing important broader insights. This dissertation answers that overarching research question, "How are foresight practices used to address complex problems and how can dialogue-based foresight assist society to alleviate complex problems and their effects in the Canadian context?", using the conceptual framework outlined in this document.

Insights into how foresight has helped Canadian society work with complex problems and what dialogue-based foresight can contribute to this effort overall have been presented in Chapters 7 to 9. Chapter 11 presents an answer to the latter part of the research question from a higher-level perspective. This dissertation is important because there is very limited publicly available research as to how foresight has been used overall for complex problems in Canada. In addition, a comparative assessment of dialogue-based foresight cases used within the context of addressing progress in specific complex problems is rare.

This chapter is an overview of the dissertation and its key groups of findings in preparation for describing the results from the last phase of this research. Transdisciplinary literature and multiple perspectives are incorporated throughout the dissertation. The integration of multiple perspectives into the dissertation are reviewed first and the benefits of this integration examined. Then the chapter summarizes the presentation of this dissertation and briefly reviews each finding before it introduces Chapter 11.

The process utilized to answer the questions and propositions put forth as well as to garner insights has entailed document reviews, case studies and consultations with 100 individuals overall. This effort has led to the discovery of six groups of key findings which have been presented in detail in Chapters 7 to 9 and are reviewed below.

- How foresight is practiced in Canada - Foresight is practiced by a relatively small group of very productive practitioners, but ambiguity on concepts exists and there is a lack of a

central repository of information or cohesion in the field. Agreement exists on the value of foresight for addressing complex problems, importance of foresight being conducted well and appropriately, and the benefit of linking foresight to several approaches and tools.

- Range of foresight types practiced – A wide range of foresight types have been industriously applied in Canada but misconceptions, such as foresight as prediction, limit the field. More empirical research on types of foresight and development of associated guidelines would be helpful.
- Validation of findings in foresight literature – Funding inconsistencies hamper the field, yet proof of value and related communication may help. Foresight is valuable for complex problems and it is unique, improvable, benefits from engagement and produces numerous impacts resulting in advancing outcomes.
- Barriers to alleviating complex problems hinder dialogue-based foresight practice outcomes – These barriers include the time required for deliberate change; dated structures, paradigms and processes; and problems are incredibly hard to address.
- Strengths and weaknesses of dialogue-based foresight – Foresight works well in certain areas which take into consideration its strengths and weaknesses. However, foresight as well as the value of its process, including foresight guidance to the point of implementation of outputs, are not fully appreciated.
- Dialogue-based foresight's value in addressing complex problems – The value of foresight includes diverse and significant benefits with the potential for transformative outcomes. The cases studied in this dissertation have had positive impacts on complex problems.

Multi-perspective analysis.

There are three objectives for this section. To ensure a robust research process for this dissertation, the first part of this section reaffirms multiple perspectives have been integrated into the research design, data collection and data analysis processes. Then, garnered from integrating multiple perspectives additional benefits resulting from more comprehensive findings are identified. The second part of this section accomplishes the third objective, which also relates to robustness, examining the effects of different perspectives on the research findings. Searching

for patterns among the findings according to different factors, such as gender, level of involvement in the project or work role are important to ensure validity and reliability of the findings and to identify whether answers supplied by the interviewees have been affected by other factors than those being studied.

In addition, multiple perspectives are important in relation to working with foresight and complex problems. A valuable and unique aspect of foresight is the multiple perspectives brought into the process sometimes by necessity and often by design. Through the use of multiple perspectives a critical part of the foresight process is exposing the deeply held beliefs or assumptions of individuals and in many cases challenging and reframing these beliefs or mental models (Inayatullah, 2008; Wilkinson et al., 2013). Many of the interviewees for this dissertation have indicated that they have benefited from a mind change/paradigm shift/new ways of looking at topics. Indeed, a significant amount of the value in foresight work, as indicated by foresight community members and case participants, is from this result and this is invaluable to working with complex problems (Head & Alford, 2015; Waddock, 2012).

As indicated by the participants of this research, creativity and innovation are also outputs of multiple perspectives being integrated into the foresight process and these two areas are important to addressing complex problems (Westley et al., 2011). As part of its process, foresight also offers comprehensive perspectives through transdisciplinarity and systems thinking. It engages multiple levels of society, multiple time horizons, multiple views and a robust examination of possibilities and consequences of actions on a problem. These are all strengths in working with complexity (Head & Alford, 2015; Kishita et al., 2012; Wiek & Larson, 2012).

This section conveys three key findings. First, multiple perspectives are important and they are integrated throughout this dissertation. Second, by using multiple perspectives a diverse range of foresight effects are demonstrated and a more comprehensive understanding of foresight, its community members and its impacts are made available. Third, the responses provided by research participants cannot be delineated into a group of views, for example based

on gender, professional role, or location, that has had a significant impact on the findings of this dissertation.

Integration of multiple perspectives throughout the document.

The plan to integrate multiple perspectives into the dissertation is reiterated below, the ways in which this plan has been carried out and its value are then described.

There are various ways in which multiple perspectives have been integrated into research design, data collection, and data analysis for this dissertation. In the research design, the process as well as the results of the projects, the context surrounding the projects, and the relative effects of the different projects have been assessed. In addition, various perspectives on foresight based on different features of projects selected as case studies, for example, size of project, timing of project and problem addressed, have been taken into consideration.

Data has been collected according to the different groupings outlined below. For example, data collection occurred per participant's role and values/beliefs as well as using a variety of lenses and examining human dimensions. Data analysis has been completed in terms of stakeholder and sector type of the interviewees, their values and roles, impacts of their perspectives on cases, and human dimensions. Analysis through different lenses, as appropriate, has been integrated throughout this document.

Integrating multiple perspectives into design, data collection and analysis:

- Design: formative (process), summative (results), context, relative (impacts per case), varying projects
- Data collection: Document review and questions, as appropriate, to identify *values/beliefs, per role* (e.g., org./personal), *lenses:* transdisciplinary, temporal, mixed methods, multi-perspective, pragmatist, multi-level, probe *human dimensions:* emotional, spiritual, cognitive, physical, social and additional information as appropriate
- Data analysis: per stakeholder and sector type, values and role, impacts across cases, human dimensions (as in data collection)

The two reasons for integrating multiple perspectives into this research has been to complete a more comprehensive study and to create a robust and rigorous dissertation. Multiple perspectives have been integrated and this has increased the validity and reliability of the findings through triangulation, sampling and multiple case comparisons. Comprehensiveness is evidenced through the outcomes of including multiple perspectives. Examples of benefits accrued include being able to:

- describe the participants and their views, values, and beliefs on a variety of topics;
- assess how participants have changed over time due to the foresight process;
- examine how context and time affect a foresight process as well as its impacts;
- highlight the different levels at which foresight is conducted and impacts occur;
- identify the importance of using a transdisciplinary/systems lens;
- measure the changes in human dimensions and related subject areas;
- cast a wider net to capture different types of outputs and outcomes, and then
- study the relative impacts across cases.

Through integrating multiple perspectives into the dissertation process the benefits listed above have resulted in several discoveries. Changes in individuals have been measured as per self-identified differences in the increase of foresight literacy and increases in social and human capital and other human dimensions/subject-related dimensions such as creativity and decision-making. Discoveries have been facilitated in terms of (i) gaining an awareness of the foresight community, (ii) understanding foresight and its elements, (iii) assessing and appreciating the full impacts of the cases, and (iv) appreciating the various external and internal effects on the cases, by, for example, reviewing values and beliefs, context, formative, summative and relative perspectives. Thus, the dissertation has been able to provide a set of preliminary aggregate guidelines/theory of change which has led to a contribution story, ways in which foresight outputs and outcomes could be improved, and an assessment of the value of foresight in addressing complex problems.

Assessment of patterns based on perspectives in interviews responses.

Does perspective make a difference and if so how? Are there any patterns? For example, do interviewees with more experience in foresight have significantly different perspectives on a

set of questions than those that do not, or do individuals from certain locations, of a particular gender, or in the private versus public sectors have different perspectives that affect certain responses in a similar way? This section addresses these questions by reviewing the data and assessing whether there are any patterns that present themselves per a particular group a person belongs to, a role they may fulfil or a set of values and beliefs they may have. For instance, research participants can be categorized per their views, e.g., as indicated by their responses, and per other personal defining features, such as their role, gender, and level of involvement in the project. Through the search for patterns among group responses the research findings can be strengthened or adjusted. Also, if patterns can be identified they provide us with an increased understanding of the interviewees' responses.

The parameters analyzed include interviewees':
geographic location,

- gender,
- private/public sector work role,
- values/beliefs,
- work role,
- level of involvement in project,
- level of experience in foresight,
- association to project, i.e., partners or team members versus participants, and
- human dimensions and related subject areas.

The process used for this analysis was similar to the one used for pattern matching in the Chapter 9. This process included identifying questions for each of the parameters, as necessary, within the three in-depth cases and then identifying the members of 'likely groups', like team member. Then, the responses were reviewed for several questions per group identified and compared within and across the cases to find patterns. For example, all females within a case, gender assumed from data collected about the individual, were identified according to the codes used to give them anonymity during transcription and analysis of findings. With the aid of NVivo software, the group of codes for females were used to identify similarities in responses to various questions. The similar responses were then noted. This process was used to identify other

groups and potential patterns, such as those who worked in the private sector versus the public sector, those who lived in Ontario versus other parts of the country, and those who were a part of the organizing team versus a participant.

Findings indicate that although there are very minor levels of agreement among certain groups of individuals, these are mostly not significant to have had a major impact on the findings for this dissertation. For example, one group of six individuals may have one to three matching responses to a few questions but not the same individuals in the group match responses and there is no pattern to the responses. For instance, three females out of six may have thought Fore-CAN was collaborative and another two of the six females may have agreed upon what was needed to address the problem or that the cognitive dimension was strongly affected by the project. First, there was generally more agreement among the interviewees for these three questions. Furthermore, there is no discernable pattern among the questions agreed to or consistencies among those females who match responses.

Another illustration is from the GBFP case which has a larger group of academics involved in the sample than other types of respondents. These participants naturally have a higher level of agreement in all questions because of their numbers. Yet, when comparing their responses to questions that would give GBFP a positive review one can see there is no consistency among this group members' responses, most responses are rationally justified by each interviewee and other categories of respondents in the sample balance out the responses in various numbers. The one significant pattern identified throughout all the searches was noted for GBFP in which some of those identified as members of partner organizations had less involvement in the project and difficulty remembering elements of the project. However, this pattern did not detrimentally affect the findings.

In summary, multiple perspectives are valuable and have been successfully incorporated throughout this dissertation fostering more robust and rigorous research results. An interesting finding is that the various perspectives of individuals interviewed have not significantly affected the results in a detectable pattern. However, the exploration of the topic and the development of findings and insights have benefited widely from the inclusion of several perspectives.

Brief recapitulation of the dissertation.

Chapter 1 reviewed the current problematic state of affairs and its link to foresight, potential sub-research questions, key definitions, project assumptions and parameters, and the significance of the research.

Chapter 2 consists of the first of three literature reviews. It covered the topics of complex problems in their context of complexity and ways in which to understand people who define and are intertwined with these problems. Key findings include:

- suggestions for addressing complex problems and complexity, including working across boundaries, innovation, flexibility and broader engagement practices as some examples;
- the local is intricately linked to the global;
- both the perception of individuals and the context in which they interact are very important;
- in this research breadth necessarily replaces significant research of depth for any particular variable; and
- multiple lenses and indicators are important as guides to collecting data because they provide for a comprehensive examination of the topic as well as rigour and robustness.

The second literature review, Chapter 3, presented a review of material related to change, assist and support mechanisms for people as they work with complex problems and situations, particularly foresight as the mechanism under in-depth study. The field, the practice and elements of the practice of foresight were reviewed in detail. Important themes are as follows:

- the delineation of key aggregate change factors in the case studies is useful,
- there is potential of dialogue-based foresight to address complexity and complex problems further than the current demonstrated broad and incremental effectiveness already achieved for foresight generally, and
- the importance of foresight practitioners' ability and users' openness and capacity to engage with foresight in addition to other dynamics.

The third literature review, Chapter 4, addressed the use of foresight for complex problems related to the long-term well-being of humanity. The chapter explored foresight as it has been used to address complex societal problems and social change and the topic of assessing foresight. It determined that a comprehensive evaluation of foresight is incredibly difficult but there is value in assessing larger aggregate sets of factors. In addition, the chapter presented how dialogue-based foresight can be considered to have stronger positive impacts on complex problems and ways to strengthen the literature on foresight. Finally, a conceptual map was offered to link the literature review concepts together.

Chapter 5 provided a conceptual framework for the research. In addition, it put forth several propositions and outlined causality.

Chapter 6 presented the comparative case research design. Four different cases and two additional externally assessed cases were studied to understand similarities across varying problem areas and foresight types. In addition, this allowed for identifying whether similarities in other factors exist. This chapter also includes how the foresight projects are selected; an operational table; information on data sampling and data analysis; the ways in which multiple perspectives are assessed in this dissertation; contingency plans and ethics.

Chapters 7 through 9, and the beginning of this chapter, presented several different primary research results. Some of these findings have been briefly highlighted in this section. An overall review of the key findings is presented below.

Chapter 7 revealed findings from the first phase of research for this dissertation which focused on individuals who work in the foresight field. It presented the findings from a document review and consultations with foresight community members regarding the practice of foresight. The material describes varying views of 61 individuals and identifies approximately 100 projects conducted on Canadian topics within the last 15 years. There is a range of different projects and a few were briefly explored. Although foresight does have challenges, it has opportunities and can demonstrate significant value in working with complex problems if it is used appropriately and delivered well. Efforts continue to take place to work with and improve foresight in several

ways. It is a conclusion of this chapter that information communicated broadly and clearly about the foresight practice and its potential value is very important to the field. Furthermore, additional research into foresight typologies and development of guidelines, especially as foresight is practised in Canada, would be fruitful.

Chapter 8 provided the second set of findings. It built on results from phase one by targeting participants in the following four Canadian dialogue-based foresight projects: Fore-CAN, GBFP, 2020 Media Futures, and Canada in a Changing Global Energy Landscape. In addition to the cases studied in-depth, two externally reviewed cases were described: Transformation of the Canadian Payment System and Agricultural Adaptation to Climate Change. Beyond the document review, responses from 39 interviews conducted were thematically analyzed and findings presented. The conclusion of this chapter is that although dialogue-based foresight can be valuable it is difficult to deliver and its impact is influenced by several factors. While some projects achieved stronger results than others, all six cases demonstrated benefits. Further, several findings from Chapter 7 and found in the foresight literature have been confirmed. To illustrate, managing expectations is a challenge and implementation of project outputs, in general, could have benefited from more concrete results.

Chapter 9 offered an in-depth analysis of the findings. The findings from the case studies were compared and then assessed against the propositions from Chapter 5 of the dissertation. These propositions are confirmed with only minor discrepancies being apparent. Rival explanations were offered, then discounted or addressed further. The chronological sequences method was used to confirm that external factors, preparation for foresight projects, and foresight process and activities lead to foresight process and product outputs. The resulting preliminary explanatory theory was then augmented with a preliminary change theory. Based on the findings in this dissertation, the change theory identifies key elements for a similar dialogue-based foresight process to realize similar observed outputs/outcomes. At this point, a contribution analysis was provided which showed dialogue-based foresight can provide significant outcomes but without any certainty.

Results.

How foresight is practiced in Canada.

Foresight has been practiced in Canada for at least 50 years (F. G. Thompson, 1992). There have been many valuable projects completed on Canadian projects and research into foresight has been advanced. However, a significant volume of work on the current practice or community in Canada does not exist. There is no central repository of information on projects, community members, current concepts as well as activities. Although this is not necessarily uncommon for a relatively new field and difficult to maintain with the rapid changes in society, it can be invaluable as a reflection on the work, for increasing appreciation for the field and for advancing knowledge. This dissertation attempts to address this gap to some extent. The focus of this dissertation is on foresight used for Canadian complex problems, specifically dialogue-based foresight projects are assessed as they address complex societal/public-sector problems versus corporate or exclusively organizational concerns.

The first group of findings in this dissertation revealed information about the foresight community in Canada and its practices. This group confirmed the first proposition in that the information discovered has validated the findings available in the general foresight literature. For instance, ambiguity and different perspectives surround key concepts within the foresight practice ("Conversation with Wendell Bell," 2007). Foresight also works well with other tools and approaches and if used appropriately and applied with consideration ("About Us – The Millennium Project," n.d.; I. Miles et al., n.d.). In addition, community members value foresight and see foresight as valuable in addressing complex problems (Kahane, 2002; Slaughter, 2010). A final example, typologies and guidelines are helpful for foresight (Hines & Bishop, 2015; Könnölä et al., 2011).

Additional findings, which are not readily available in the literature, show there is a diverse yet relatively small group of individuals, approximately 200-300, in Canada who have been working in a practice area that is difficult and faces several issues in its ongoing development. This dissertation also relayed some 100 projects that have been completed on Canadian topics over the last 15 years. Unfortunately, information on foresight work in Canada is not easily accessible.

Range of foresight types practiced.

Many potential foresight clients along with members of the general public likely have a narrow conception of foresight as scenario building or - mistakenly - that foresight is about predicting the future; however, foresight is a wide-ranging practice with various types used for various purposes. One of the findings is different types of foresight have been productively used in diverse ways in Canada, e.g., policy directed foresight, foresight with strong emphasis on tools, and foresight directed at sustainability concerns. More information on different types of foresight through the study of completed Canadian foresight projects is advantageous in furthering foresight knowledge and in the development of specific guidelines.

Alternatively, other types of foresight, such as experiential foresight, corporate foresight, strategic foresight and technology foresight have also been used. This range of other foresight types have different influences on complex problems. Further examination into the different benefits of these foresight types, how they are best utilized, and their associated likely outputs and outcomes would advance the practice. In addition to furthering foresight and providing useful information, this examination and its broader communication would advance foresight literacy.

Validation of findings in foresight literature.

As foresight is a relatively new and unique field with unusual perspectives, such as a systems view, transdisciplinary, as well as both creative and scientific, surrounded by ambiguity and with mixed success, it is sometimes misunderstood and judged negatively. Furthermore, improved economic status has been a driver of its use and downturns have had the opposite impact. This has created instability in sources of foresight funding, thus jeopardizing the maintaining or building of foresight capacity in Canadian society and the ability to practice an optimal version of foresight. An increased demonstration of the value of foresight through a range of respected publications as well as other forms of communication is very important to the advancement of the field. This dissertation has been able to validate in the Canadian context several findings available in foresight literature appearing in multidisciplinary materials.

Seven of the propositions outlined in Chapter 5 related to key findings from the foresight literature. In addition to the proposition described in the first group of findings, six additional propositions have been confirmed and thus these findings have been validated by this dissertation's case evidence. These include:

- dialogue-based foresight is widely and incrementally effective and worth the investment with numerous impacts;
- broad but selective inclusion and engagement have a positive impact on outcomes;
- dialogue-based foresight is used for complex problems;
- dialogue-based foresight can play an important and unique role in working with these problems;
- dialogue-based foresight provides product outputs that further outcomes; and
- there are several ways to improve foresight outputs.

Barriers to alleviating complex problems hinder dialogue-based foresight practice outcomes.

There are at least three fundamental barriers in addressing complex problems as also evidenced in the literature: time needed for significant deliberate system change, context not receptive to change, and complex problems being very difficult to work with (Head & Alford, 2015; McConnell, 2016). One of the findings in this dissertation is that these barriers create significant challenges for dialogue-based foresight in affecting project outcomes. This is not as obvious as it seems. Working with some of the barriers, such as uncertainty and interconnectedness are actually strengths for foresight. First, it usually takes time for significant deliberate system change to occur, as noted in Soroka's insight in Agricultural Adaptation to Climate Change (2016). Also, the project team in the Transformation of the Canadian Payment System has identified the difficulty in deliberately changing the system while keeping up with complexity (Meredith et al., 2016). In addition, developing foresight literacy and integrating dialogue-based foresight into organizations are hindered by the time it takes for systems to change and accept a different practice, e.g., Canada in a Changing Global Energy Landscape. These examples align with the researcher's assessment of case impacts years after their completion and discovering that only now are some of the outputs/outcomes from the foresight process being fully realized.

Second, the context in which complex problems are being addressed is not receptive to change. One of the reasons it takes so long for systems to experience deliberate system change is because the system is not receptive to change. Path dependency and institutional inertia are just a couple of the explanations for this barrier (Greenwood & Hinings, 1996; Westley et al., 2011). This barrier for systems change is also a barrier for foresight. This context also has a significant effect on foresight success, as per the confirmed fourth proposition in which context is found to have a significant effect on the success of dialogue-based foresight. The case studies reveal the importance of the following factors to project outcomes: whether there is a strong need to change, whether participants or project proponents are open to and ready for change, and whether the overall system is supportive of change.

Third, complex problems are very difficult to work with and ameliorate. This difficulty translates rather obviously to any method or approach addressing complex problems. Even though foresight has strengths working with some of the traits of complex problems, like uniqueness, traits still pose challenges. Foresight is no different. Complex problems are by definition hard to work with including the reality that they are difficult to define and there are no test for solutions.

Strengths and weaknesses of dialogue-based foresight.

Knowing what foresight is, its purpose, strengths and weaknesses are very important. These are key elements of foresight literacy and appreciation of the practice; they are important for potential foresight clients, foresight practitioners and foresight participants alike. Furthermore, these elements help identify when to use foresight, what approaches/tools to link to, and where to focus efforts in improving foresight. The findings from this dissertation validate the importance of these aspects, as outlined by foresight literature, with case evidence and views from community members. Other important areas of foresight have also been identified, e.g., factors external to foresight and linking foresight to other approaches. These are outlined throughout the preceding chapters.

Foresight is not well-suited for all types of projects or research questions, and dialogue-based foresight is even less suited. Thus, the project undertaken and specifically the research questions formulated are very important in terms of, for example, appropriateness and managing client's and participant's expectations. To elaborate, foresight is "overkill" for a simple technical problem or too lengthy for a complex decision with agreement required from several parties to be made in a week. Thus, it follows that a research question too broad or narrow may be inappropriate and if it is not well worded can facilitate a search on only a minor or even irrelevant part of the problem. Moreover, foresight is invaluable as a built-in organizational process fostering a culture and common mind set rather than for the purposes of only a one-off project.

There are several situations to which dialogue-based foresight is well-matched. To illustrate, dialogue-based foresight is particularly valuable for complex situations entailing long-term capital-intensive infrastructure projects and for risk management. Dialogue-based foresight can also be used for basic research. It is also a useful practice where there are numerous diverse stakeholders with different viewpoints on a complex problem, possibly in a long-term conflict. Alternatively, the practice facilitates transitioning through complex situations. As final examples, dialogue-based foresight is applicable to situations needing the development of innovative robust solutions and work with reforming and strengthening systems. Thus, overall dialogue-based foresight augments areas such as governance, policy development, decision-making, conflict resolution, innovation, systems change, engagement and collaboration, building knowledge and understanding, and facilitating paradigm shifts.

More specifically, examples of dialogue-based foresight's strengths and weaknesses discovered through the research in this dissertation and mentioned throughout are identified below.

Strengths

- Works well with other areas
- Provides clarification and understanding
- Addresses problems holistically
- Explores and tests possibilities

- Facilitates innovation
- Increases adaptive capacity
- Fosters social learning/action learning/learning
- Enhances problem definition
- Provides a plan
- Provides a vision
- Manages the transition from the present to the future
- Provides for a dialogue
- Explores alternative perspectives with current practical knowledge
- Facilitates finding common ground
- Encourages action
- Co-creates the future
- Facilitates creative thinking
- Facilitates anticipation and mind change
- Fosters collaboration
- Increases knowledge
- Facilitates integration of efforts
- Creates more awareness/appreciation of the situation
- Changes perceptions and cultures
- Results in product outputs
- Increases foresight literacy
- Devises markers for change
- Addresses uncertainty

Weaknesses

- Is expensive and resource intensive
- Is hard to do well
- Requires a long time for deliberate change
- Requires a significant amount of time for the process
- *Difficulty with…*

    - Managing client(s)' and/or participant's expectations
    - Asking specific and well-formulated questions
    - Engaging the right diverse mix of people
    - Managing project and contextual/institutional/system barriers
    - Addressing impact of individuals changing jobs
    - Establishing (transformative) leadership support
    - Delivering a well-balanced rigorous and creative process
- *Lack of…*
    - Using foresight on an ongoing basis
    - Recommending a path/actions
    - Implementing a plan/strategy - action taken
    - Communicating to participants and broadly
    - Following-up with participants
    - Establishing a drive for foresight
    - Foresight literacy overall
    - Foresight capacity

Both process and product outputs of dialogue-based foresight can be many with different levels of emphasis depending on the project pursued, but the interviewees in this research have indicated process has a stronger impact on complex problems. A critical point and a dialogue-based foresight area lacking appreciation is the value of foresight literacy and creative non-rational impacts, e.g., paradigm shifts and out-of-the-box thinking, which are particularly attributable to process. These impacts are not defined by action plans and artefacts per se but by changes in, for example, mental models, openness and anticipation. In a world consumed by products, easily measured results and action taken, process and abstract types of impacts are sometimes seen as nice to have but not necessarily vital. As some interviewees noted, products can become obsolete but experiences and changes in mental models are long-lasting. However, dialogue-based foresight also provides product outputs and they further outcomes, as per the associated and confirmed proposition.

In consideration of appreciating foresight, some of the expectations for rigour and creativity along with informational and instrumental uses of foresight can be confusing and lead to mismanagement of expectations. This confusion and potential conflict are also related to the discussion in Chapter 3 around the art and science of foresight. Foresight's strengths are in creativity, flexibility and imagination through systematic methods. Rigour has been associated with prediction, quantitative methods and instrumental purposes. The two areas seem very different but can and do complement each other in the approaches and purposes of foresight. For example, rigour can also be applied in the implementation of foresight for informational purposes, such as in the use of systematic processes, qualitative methods, and facilitation of foresight. Foresight, however, does not predict. It is critical that foresight maintain its creativity and its rigour appropriately balanced for the undertaking.

Furthermore, and of greater importance, it is apparent from the case study findings that foresight is seen as more successful if it goes beyond the informational purpose to address the implications of the process and follow-through. Alternatively, the foresight process needs to be continuous or at least be engaged to the end of the implementation process. Deliberate change in working with complex problems is not linear. It can be depicted as a sail boat trying to reach its destination in storm like conditions through many reefs (*Sailing and the Change Process*, 2013). Many different attempts may be required, the dynamics change, and timing is important.

This dissertation process has found figure 15 helpful in illustrating foresight's involvement in complex challenges. Foresight professionals of projects for informational purposes often pass off the information garnered throughout the project entirely to the subject matter experts or invested participants at the horizontal mid-point of the figure. In fact, clients or foresight practitioners may request this be the case so the client can make their executive decisions confidentially or apply their expertise to decide what to do with the information with no need for involvement of the foresight practitioner. However, transparency, accountability, governance, and stakeholder co-creation are necessitating the involvement of more individuals further along the foresight project. Furthermore, implementation of efforts may be hampered by not having a foresight practitioner to facilitate efforts, address potential barriers, and monitor

changes in a turbulent environment. All parties of a foresight project may benefit from reflecting upon their roles.

Concerning foresight's strengths, there are many opportunities to improve upon foresight outputs, several of which have been listed in this dissertation, e.g., broad implementation factors, linking to other practices, and tailoring foresight, and confirmed as a proposition. This is important in recognizing the significant room that exists for foresight to improve upon its practice if it has the resources to do so. The possibilities offered are not necessarily novel but represent the kinds of improvements required at an aggregate level to improve upon alleviating complex problems and their effects. A preliminary expression of a change theory in the form of guidelines has been offered to outline key elements of dialogue-based foresight.

Figure 15. Foresight guidance throughout project to implementation

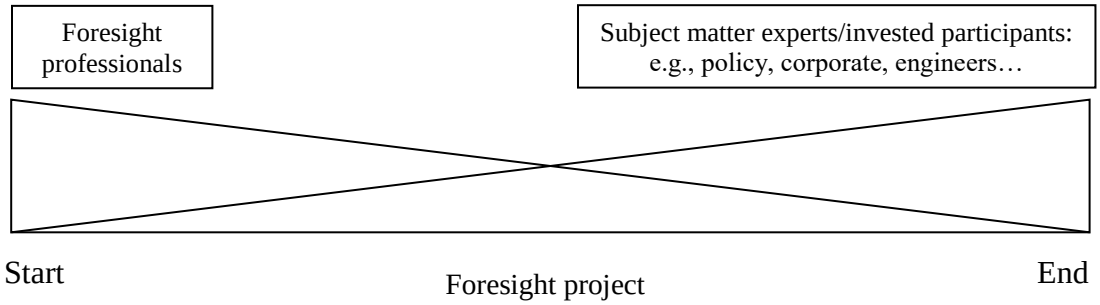


Figure 15. Developed in personal communication with Trevor Hancock on November 20, 2018.

Dialogue-based foresight's value in addressing complex problems.

Identifying value is very important for dialogue-based foresight because it is an expensive practice in a context where there are significant competing needs for the same resources and alleviating complex problems is critical to societal and individual well-being. Based on the findings from three of the dissertation cases, the rest did not have the information available, the value of dialogue-based foresight was judged by interviewees to be equal or more than the invested resources. Fore-CAN had the strongest rating. The foresight community in phase 1 of the research also outlined the return on investment as significant when taking into consideration the potential payoff of foresight, as a unique practice, ultimately advancing outcomes. However, in a broad sense the value of dialogue-based foresight can be difficult to

define specifically because it is subjective and relative. Also, the value can be huge now or later or it can be small now but critical. Complexity makes it harder to achieve and assess value. As such, in this dissertation the degree of foresight value is left open to interpretation as the rest of the related findings are presented under this section.

Dialogue-based foresight offers numerous incremental and greater than incremental benefits that can have significant value and thus define dialogue-based foresight as a valuable practice. These benefits also have a wide-ranging positive influence especially on outcomes. This influence can be significant. Through confirming several propositions in Chapter 9, a pattern has been revealed and then reinforced by an explanatory theory. This pattern demonstrates:

1. foresight literature findings are validated with practical evidence in a Canadian setting;
2. dialogue-based foresight is effective, valuable and significantly changes people;
3. dialogue-based foresight has played and can continue to play a unique and valuable role with complex problems, likely advancing outcomes;
4. process, context, tools, products, broad inclusion and engagement are all important to success; and
5. foresight outputs can be improved in several ways.

The explanatory theory presents how chronological steps can lead to stronger outputs but is not definitive in terms of linkages to outcomes. Also, many likely outputs/outcomes for dialogue-based foresight projects are identified based on case analysis and on the practitioners' use of the presented guidelines.

Five propositions around the value of dialogue-based foresight have been formulated in Chapter 5 for testing through this dissertation and confirmed in Chapter 9.

1. Dialogue-based foresight projects have significantly changed/assisted individuals and groups of people. The changes/outputs have had a positive impact on the management of complex problems in Canada.
2. Outcomes related to complex problem management have improved if dialogue-based foresight was used. This improvement is likely due to the use of dialogue-based foresight.

3. Dialogue-based foresight has played an important role in creating effective, efficient and/or collaborative ways to alleviate complex and/or urgent complex problems and their effects.
4. Dialogue-based foresight has been used to address Canadian complex problems and can play a unique and valuable role in continuing to work with these types of problems. This is much more likely to occur: within certain parameters such as appropriate use of foresight and well conducted foresight, with the advancement of foresight research and practice and with attention to multi-level organizational and system issues.
5. Dialogue-based foresight is widely and incrementally effective with numerous impacts in several different areas. The value of dialogue-based foresight is worth the resources invested. The degree of this effectiveness, the related mechanisms and the specific value and benefits of dialogue-based foresight per project have been studied per the cases in this dissertation.

Methodological review: Rigorous and robust research.

There are a variety of ways in which this dissertation meets the criteria of rigour and robustness. The methods and processes used to achieve these criteria overlap across research elements but for illustration purposes several of them are outlined and categorized. Through the design, for example, multiple perspectives, flexibility, and variety in cases are integrated. For replication, multiple cases plus external cases and the use of a common case study process are utilized. In data collection several methods are applied: external evaluations of cases, triangulation for reduction of bias, identification of a broad and larger population sample and selection of cases as per access to data. Within data analysis more tools are used: corroboration and congruence across data, various analytical methods, and verification of findings with interviewees as well as experts. Finally, the chain of evidence is outlined through the presentation of the report (Yin, 2009). An example of rigour and robustness in the research is the corroboration between findings on the foresight community, across cases and within each case, as well as the foresight literature.

Summary.

This dissertation uses empirical evidence to confirm the findings of previous studies that have indicated foresight provides a wide range of incremental benefits, and this dissertation has concluded that dialogue-based foresight can provide stronger than incremental benefits, but most importantly transformative outcomes. The incremental benefits can be very important on their own and significant benefits have also been achieved. As such, foresight is a valuable tool/lens/practice. The capacity of dialogue-based foresight to provide significant advancement in outcomes related to complex problems on more than a rare occasion is critical.

Determining causation for foresight's medium-term effects in a context of complexity is nearly impossible. Foresight is not a precise science even if it has scientific elements within it. Even if improved outcomes have not been proven with certainty or for all the dissertation cases, they are likely based on the benefits achieved and the positive value attributed to the cases by the participants. Moreover, the bar in assessing foresight has been high; seeking positive impacts on complex societal problems which are by their nature extremely difficult to work with and to reduce/transition through their effects. As such, a strong contribution story is a valuable finding.

Like other practices, however, foresight has developmental needs and issues in general that can, are, and should be addressed over time to improve its efforts in alleviating complex problems. This dissertation lays out several ways at an aggregate level for how foresight can be improved, e.g., link with other approaches and practices, and more research conducted on specific typologies and practices. This research has also identified key areas surrounding the foresight practice, for instance, the foresight community, the foresight field, and addressing of system gaps, which if strengthened can improve outputs of the process. Different uses, types and methods of foresight, such as the use for education, experiential type and causal-layered analysis, are also worth examining in the context of complex societal problems.

This dissertation has advanced both practical and theoretical knowledge around foresight. First, this dissertation is an aggregate study that has provided an increased appreciation of the Canadian foresight community, how foresight is used in Canada and the contribution of dialogue-based foresight. Second, the research results have validated many findings in the

literature and established the basis for a preliminary expression of an explanatory theory and change theory. Third, practical knowledge on the strengths and weaknesses of aspects of conducting dialogue-based foresight is offered. Guidelines proposed in Chapter 9 have been based on this information. Some of the key messages offered throughout the dissertation are reviewed below.

Conceptual, practical, and social benefits have been identified in all four cases studied in this dissertation. Interviewees across the cases mention creative thinking, alternative perspectives, and learning as primary beneficial results. To describe further, Fore-CAN and GBFP facilitated more awareness of the problem, changed perceptions, and advanced discussions among various stakeholders. Aligned with these findings, interviewed project participants were impacted mostly in terms of social and cognitive dimensions, followed by paradigm, perception and creativity dimensions.

To recapitulate, foresight or dialogue-based foresight is not appropriate for all situations or questions to be addressed. However, dialogue-based foresight is well-suited to several applications. These include instances of risk management, where many stakeholders are in conflict or addressing a new highly uncertain area (Amanatidou, 2017), transitioning through complex problems, where there is a need for innovative solution development, modifying systems, and long-term capital-intensive efforts. As such, a sample of broad societal areas in which the use of this type of foresight is beneficial include policy, enabling paradigm shifts, and governance.

Foresight literacy, foresight culture, and process outputs from dialogue-based foresight are often not appreciated as much as concrete product results. Yet, process is very important, even more so than products, in working impactfully with complex problems. This is also one of the reasons why dialogue-based foresight should be practiced continuously within organizations or at least utilized till implementation efforts are in part underway.

Several propositions from Chapter 5 have been confirmed on the value of dialogue-based foresight, briefly these include: (i) individuals and groups are significantly influenced and these

influences have assisted complex problem management in Canada, (ii) complex problem management outcomes improved likely due to use of dialogue-based foresight, (iii) efficiency, effectiveness and/or collaboration are ways in which dialogue-based foresight has alleviated complex problems and their effects, (iv) dialogue-based foresight can continue to play a valuable and unique role with Canadian complex problems under certain conditions, and (v) numerous wide-ranging incremental impacts have been identified and explored.

In addition, this chapter examined how multiple perspectives are integrated into the dissertation and lays out the importance and benefits from their inclusion. It also conducts a brief analysis of the effects that interviewees' multiple perspectives have on the dissertation findings, and concludes their impact is not significant.

Chapter 11 of this dissertation covers phase 3 of this research, the development of insights into how dialogue-based foresight can assist society towards alleviating complex global problems and their effects. So far, dialogue-based foresight has proven to be valuable. It has several strengths and most participants say it is worth the investment. However, potential clients need to be informed with respect to knowing clearly what they want, what options exist, the objectives/value desired and what foresight offers. Furthermore, Canada needs to advance knowledge and practices to improve foresight, tailor it as appropriate and address its weaknesses. As such, foresight can and is already being improved upon. Foresight literacy and capacity also need significant development. However, resources are limited.

There are a multitude of tools and approaches to work with complex problems and foresight is only one of these. So, what kind of role can foresight have? Society is not fully aware of the untapped potential of foresight, e.g., in its different types and subset of activities. There are instances when challenging aspects of dialogue-based foresight have been overcome, e.g., implementation has levels of success in Fore-CAN and Transforming Canadian Payments, and linkages to areas made, e.g., governance and design. Moreover, outcomes have been hard to measure and are not always concrete but could be significant. Also, society does not know with complexity and transitioning the tipping points or areas of emergence and effects of foresight on these areas. With these gaps in information, lack of a definitive significant improvement in

outcomes of complex problems, and limited resources for development, dialogue-based foresight needs to be critically and carefully placed in this milieu. This is the objective of the Chapter 11.

Section 4 Implications from the Findings

This section outlines how to make sense of the voyage of discovery, what has been learned from the exploration and how the learnings can be applied. In addition, the dissertation is concluded by assessing where the trip has taken the dissertation, further implications, areas left undiscovered, and places to go to next. Chapter 11 addresses the question of "so what?" in terms of insights into where foresight fits or has a role in working with complex problems and the crises humanity faces. Chapter 12 concludes the dissertation.

This dissertation began with identifying humanity's struggle for survival in a complex global environment, such as threats from artificial intelligence, climate change, mass extinction, and nuclear war. A massive effort has been dedicated to this situation, but only incremental advances have been achieved. The document revealed significant barriers that exist in working with complex problems. Furthermore, society is becoming increasingly fragmented. In this context, the first two phases of this dissertation, as outlined in the operational plan for this research in Chapter 6, included the examination of foresight and dialogue-based foresight as a practice working with complex problems in Canada. In phase 3 of this dissertation the research builds on the findings to provide insights into how foresight and specifically dialogue-based foresight can be used to assist society in alleviating complex problems and their negative impacts. These chapters are important because they complete the answer to the research question posed at the beginning of the dissertation and provide recommendations.

Chapter 11 is divided into five parts. The first part presents interviewees' views, from both members of the foresight community and participants from the case study research, on complex problems. The second part presents findings from an expanded transdisciplinary literature review on humanity's struggle for survival and efforts engaged in working with complex problems. The third part provides a discussion of preliminary insights from the combination of the first two parts and earlier research completed for this dissertation. The next part offers perspectives on these insights from experts who work with complex societal problems

and/or foresight. Finally, the fifth part incorporates these expert views into the preliminary insights to provide results for phase 3 of the research.

Chapter 12 provides conclusions of the dissertation. First, it addresses the sub-research questions formulated in Chapter 1. Then, it provides a final review of the dissertation findings followed by implications and recommendations based on the research. Next, the chapter identifies limitations of the research. Subsequently, the significance of this research is delineated for different audiences. Finally, a summary of the chapter and concluding comments for the dissertation are offered.

Chapter 11: Insight Development on Foresight Applied to Complex Problems

This chapter presents and discusses the findings of phase 3 of the operational plan for the research process for this dissertation, as outlined in Chapter 6. The purpose of this phase is to advance upon aforementioned findings to provide insights into dialogue-based foresight's potential contribution to complex problems by situating it within the efforts being undertaken to ameliorate complex problems and their effects. To achieve this objective, data has been gathered through responses from individuals already interviewed for the first two phases of the research, a literature review and new expert interviews. The data is then analyzed, discussed and integrated to provide a set of insights/final findings to respond to the dissertation's research question identified in Chapter 1: "How are foresight practices used to address complex problems and how can dialogue-based foresight assist society to alleviate complex problems and their effects in the Canadian context?"

The findings outlined in Chapter 10 have provided information on the Canadian foresight community and foresight projects, identified complexity's barriers to foresight, validated literature findings on foresight through the Canadian practical context, described dialogue-based foresight's strengths and weaknesses, and outlined the value of dialogue-based foresight in relation to complex problems. This chapter advances these discoveries by examining the appropriateness and ways in which to capitalize on the value of dialogue-based foresight. It documents the unique role dialogue-based foresight and to some extent foresight in general can play to further society's efforts.

It is important to align foresight with activities conducted in relation to complex problems to assess and facilitate dialogue-based foresight's potential contribution to these problems. Therefore, society's efforts towards addressing complex problems and how these efforts are carried out need to be understood. The vast literature provides valuable knowledge on this topic. Other information required includes whether there is a way humanity could be more effective or expedient in its efforts and if or how foresight fits into these efforts. Further, a determination on how foresight and specifically dialogue-based foresight can be productively used by society is important. This includes an assessment conducted on the barriers to foresight. Finally, of significance is how and whether society should improve/increase foresight's use.

In conclusion, this chapter reinforces findings from the material examined in the literature review located in the first half of the dissertation: why humanity's struggle for survival exists, a huge amount of effort is directed at this predicament and/or complex problems, why it is hard to alleviate complex problems, current efforts are not enough, a need to be proactive, and an abundance of information exists on topics related to this effort. This chapter also puts forth key findings.

- Various divergent fronts of activity, pursued simultaneously, are needed on an ongoing basis.
- Shared aspirations and a shared narrative with memes are important.
- The overall work on complex problems needs to be more transformative and urgent.

As such, most efforts are important by individuals and groups. Two overarching frameworks help to organize topics/efforts: *mainstream planned* and *wide-ranging independent*.

Although there is not one correct or significant enough way to address complex problems, there seems to be increasing agreement on the elements required. Specifically, consensus is forming around the importance of areas such as collaboration, the human dimension, systems thinking, openness and innovation. New subject areas, approaches, and tools have also been developed. Linking and integrating different topics are important. Specific suggestions are offered in the literature. Practical considerations in terms of implementation of initiatives and approaches is a predominant issue.

Foresight, and particularly dialogue-based foresight, plays several roles in alleviating complex problems including reframing mental models, increasing understanding of the problems and fostering collaboration, yet the practice can be improved in several ways (Bengston, 2018; nik, 2014; Schmidthuber & Wiener, 2018). This dissertation has found methods of improving foresight consist of, for example, improving communication throughout the process, providing a continuous process, and addressing the question of so what?. Furthermore, several barriers to the mainstreaming of foresight need to be addressed. Finally, this chapter identifies at least four important roles for foresight which should be developed and fulfilled to alleviate complex problems and their impacts:

1. applying dialogue-based foresight to define shared aspirations and values,
2. building foresight and foresight literacy,
3. using dialogue-based foresight to ease the effects of complex problems and transition through humanity's struggle for survival, and
4. employing dialogue-based foresight to address specific complex problems on a continual basis.

Analysis of interviewees' views on complex problems.

Findings and a thematic analysis of responses to interview and survey questions primarily relating to complex problems is presented in this section. The first set of responses is from phase 1 of the research, which sought the opinions of the foresight community. Other than the findings on the value of foresight, the information covers material not reviewed in Chapter 7. The second set of responses to specific case-based questions is a reiteration of the findings from Chapter 8 in the form of a comparison of data collected across three cases.

Phase 1 feedback.

As identified previously in Chapter 7, most foresight professionals believe that foresight can be very valuable in addressing complex problems (Q5 Table 8.4). To reiterate, the main reasons for this include: holistic thinking, diverse external input, more robust decisions, learning, long-term thinking, and providing a space for creativity and innovation. This has been reinforced from the case interviews.

However, there are many barriers to addressing complex problems and these include primarily government related issues, a lack of understanding complexity, and difficulties with collective action (Q20 Table 8.1). For instance, participants are quoted as offering the following barriers.

> *A lack of appreciation* [exists] *for how complex and uncertain the world really is and* [people who] *believe it is predictable or it can be planned in any degree of certainty are mistaken.*

It is difficult to tell people to give up benefits now for the long-term future and it is perilous for politicians to address the long-term, i.e., smoking effects were recognized 40 years prior to changes taking place.

It is difficult to tell people that there is no one right answer there are multiple right answers and you can't prove which one is the best. This requires a complete mindset change.

Complex problems have many multiple interests and getting the parties together is difficult.

When the interviewees were asked about what activities in general should receive more resources for working toward alleviating complex problems, responses included activities that are not foresight related and those that are foresight related. Those that are not foresight related include a combination of rethinking how and why society performs its functions, innovating and finding or developing system linkages. In addition, allocating more resources towards research, generating knowledge and learning are offered as responses. Foresight related activities include furthering training, public education, communication and broader engagement (Q21 Table 8.1). To illustrate, interviewee comments included: "information that is open-sourced and can be populated and driven by communities – a free platform for sharing and accessing data, visualizations and tools are very important"; "every policy person/group in government should have some foresight capability"; "we need new decision-making processes, for example, pipeline decisions"; and "show demonstrated value of foresight to educate decision-makers which will then generate a greater respect for the outcomes in the greater resource for the processes".

The three remaining questions from this phase of research, which have not been presented previously, include what role foresight has in working with complex problems and how it can be improved as well as what are the strongest factors impacting collaboration. The responses for the first question are foresight has a role in aiding decision-making, education, thinking and creativity (Q22 Table 8.1). Regarding how to improve foresight: communication, evaluation, "get in the room", and professional development were mentioned the most often. Examples of responses for question 22 are quoted below.

Problem structuring is important to make complex problems amenable to discourse. Many people work on problems before they are well structured. There is lots of disagreement around the problem – evidence, norms, process, outcomes. Foresight has a role in lending structure to understanding problems by going through the foresight process.

Foresight could open options and help people understand complexity and realize all decisions lead to unintended consequences.

Useful tool but with current set up of institutions and competing priorities I am sceptical foresight could make a difference.

Putting the results of foresight exercises into the public domain is important since I have difficulty identifying them means that there's not much out there in the public.

Better evaluation framework needs to be developed and the impact of the work already done demonstrated (have to have good indicators of success and communicate them well – sort of a marketing thing).

In terms of the question on collaboration: openness and understanding, system factors and cultural barriers are the top responses. Political and organizational challenges, need, and language are the other more common replies. One response resonated: "difficult to understand each other across sectors and disciplines at the level of complexity needed, so, people speak at a high level/general level but lose specificity or speak specifically but lose understanding" (Q23 Table 8.1).

Table 18. Findings per question–phase 1 targeting primarily complex problems

Questions in abbreviated form	**Most common responses and rate[ab]**
Q20 Barriers to addressing Complex Problems	Government related issues - 9, Lack of understanding complexity - 8, Collective action is difficult - 6
Q21 Which activities should receive more resources	Non-foresight: innovate/rethink/system linkages - 9, learn/research/knowledge - 9, engage - 3 Foresight: training/public education/communication – 13,

	broader engagement - 5
Q22 What role does foresight have & can it be improved	Aid decision-making - 10, educate & thinking - 4, creativity – 2 Improve: communication - 3, evaluation/ 'get in the room'/ professional development - 2@[c]
Q23 Strongest factors impacting collaboration	Openness – 7, understanding, system & cultural barriers – 7, political & organizational challenges – 3, need & language – 3,

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "evaluation" was mentioned 2 times as was "professional development"

In summary, the feedback from the foresight community members indicate foresight is valuable for complex problems primarily because it facilitates broader and different types of thinking, learning, innovation and robust decision-making. Many barriers to addressing complex problems are also identified, e.g., government-related issues. Interviewees indicated societal efforts in working with complex problems need to focus on several areas such as linking systems, rethinking functions, researching, learning and innovating as well as strengthening foresight through, for instance, training and communication. Also, to achieve collaboration participants stated important factors are, e.g., understanding and openness.

Phase 2 feedback.

Questions from the cases, which have already been presented in Chapter 8, present views on complex problems from a wide-range of individuals working within different roles and problem areas. The relevant material from the case interviews is restated in detail in Table 19 in a cross-case comparison format and summarized below.

To begin with, the responses to defining the main problem in the Fore-CAN case and in 2020 Media Futures revolved around a new context of rapid change and that society is unable to handle this environment or get ahead of issues that may arise. Further along these lines, the question around major impediments to the management of the problem received similar responses from both Fore-CAN and GBFP respondents in terms of issues with governance and need for integration as well as lack of knowledge and resources. Thus, there is a need to work together, prepare and be proactive to handle the changes that are occurring. Along the same lines the following question on what critical action is needed brings up points around collaboration

and strengthening systems.

Progress has been achieved; yet, continual efforts are required to maintain progress and make further advancements. What has helped so far in working with specific complex problems has been defined in both Fore-CAN and GBFP cases as various initiatives, greater need and collaboration. Signs of progress include a variety of changes in both cases, for example, greater collaboration, internalization of a concept and increased commitment, Table 14 provides more detail. Some of the reasons for limited improvements with the complex problems in GBFP, Fore-CAN and 2020 Media Futures are: it is difficult to change, change is slow, and the problems need greater recognition of their importance. At best, incremental progress is expected for sustainability. Foresight is seen as at least equal to or more valuable than other traditional efforts, such as commissions, conferences, strategy development and other public policy processes, in working with complex problems in all three cases.

Table 19 outlines case participant's responses to questions primarily directed at complex problems. This table offers an easier form in which to compare cross-case responses. Three of the four cases examined in-depth have been assessed here. Most of the answers are provided by Fore-CAN and GBFP interviewees as timing did not allow for asking of some of the questions from 2020 Media Futures participants. Canada in a Changing Global Energy Landscape had a limited number of interviewees who were interviewed over a shorter time. Most of the directly complex problem related questions were not asked of this group and thus this case is not included. It is interesting to note the synergies across the cases.

Table 19. Findings per question–cases complex problem specific

Questions in abbreviated form	**Most common responses and rate[ab] - Fore-CAN**	**Most common responses and rate[ab] - GBFP**	**Most common responses and rate[ab] – 2020 Media Futures**
Main problem	No commitment to collaborate & react – 10, Population growth, environmental change & new diseases - 6	Not asked	Addressing change by looking at future directions, implications & tools

Critical action needed	Collaboration & plan - 9, AHEM system - 6, Foresight okay – 4, info. surveillance - 4	Collaboration/understanding & integrating views & evidence – 3@[c], Ecosystem collapse/educate people – 2@, Miscellaneous listing of issues such as planning, transportation, climate change – 5	Not asked
Major impediments to management of problem	Integration – 11, intelligence gathering – 4, money - 2	Governance – 6, Difficult & Comfort/failure to appreciate/lack of info & incentives/not enough resources/seen as luxury & competing demands/specific reasons (e.g., pop growth) – 2@	Not asked
Aids to advancement	Bad experience and need – 7, Specific initiatives – 6, Interprovincial initiatives - 5	Numerous miscellaneous items mentioned once each - growing interest in particularly environmental sustainability through activities	Not asked
Problem well managed…or?	Needs work still – 7, Funding to maintain efforts – 5	No - 8, Yes – 6 Need more focus on social and overall plan	Not asked
Value in comparison to traditional	More valuable – 6, Depends/Equal/No response – 3@	More value – 10, Equal/no response – 2@	Mostly Equal
Signs of progress	Collaboration/proactive & help others/commitment to AHEM/CZ/hard to say - 3@	Internalization of sustainable development – 7, Lots of different things - 7	Various but mostly lack of progress
Reason	Collaboration – 4, Understand importance – 3, More info. & tools/ongoing investment/realize can't do it alone – 2@	Slow sustained effort – 5, Hard to change – 4 (lack of progress), Problem is more critical - 3	Collaboration -adapting hard, regulations, technology, market, lack of problem recognition (lack of progress)
Needs to	Continued effort – 4,	Collective regional plan – 4,	Various – mostly

happen next	Refresh foresight – 3, Animal health strategy - 2	Convince big corporations - 2	related to improving foresight
Georgia Basin in 25 years		Incremental progress or hope for it – 11, Going down - 3	

[a]Number of times comment made. [b]More than one response may be reported by one individual. [c]"@" stands for each and is used to indicate that each of the responses separated by "/" marks have been provided the number of times prior to the "@", i.e., "-3@" each comment separated by the slash symbol is offered three times

In summary, the thematic comparative analysis shows the context of complexity has created a situation in which traditional ways of working are not sufficient. Additionally, significant barriers hinder efforts. In order to productively work with complex problems: collaboration, working with systems, acquiring more knowledge and being open to thinking differently are all necessary. Due to this new turbulent context, there is a need to be proactive and recognize the problems society faces. It has been helpful to work on several fronts to address various problems, but this is not enough. With only incremental advancement likely as efforts require society and individuals to change how they act and think as well as what they value, work needs to be ongoing but with more energy directed at transformative and urgent impacts. Foresight has a role in working with complex problems, but it can be improved in several ways, primarily through training, improved communication and public education.

Literature review on working with complex problems and situations.

A transdisciplinary literature review, including a review of grey literature, is necessary to provide insights on foresight's role in this milieu of efforts directed at complex problems and situations. This literature review cannot be exhaustive due to the scope and continuous production of this material. However, the review is sufficient for the purposes of this section. This literature review is different from the reviews found in Chapters 2 to 4. The previous reviews occurred over three years ago and examined specific key concepts related to this dissertation topic: complex problems and their context; change and support mechanisms including the foresight field and its processes; and foresight for the long-term well-being of humanity. The purpose of this section at this stage of the dissertation is different from the previous literature reviews. Rather than examine specific but broad concepts, this review targets

the topic of complex problems in greater depth. This different perspective consists of acquiring a broad comprehension of the volume of global efforts and scholarly thinking, in primarily modern Western society, towards working with humanity's struggle for survival and complex problems. The end goal is to formulate preliminary insights and situate foresight's role within these current endeavors. Information has been acquired through a literature search of a multitude of topic areas in various sources as identified in Table 20.

The challenge for this literature review has been the enormous breadth and depth of effort that has been and continues to be undertaken concerning complex problems and humanity's ultimate struggle. The literature is burgeoning, dynamic, interrelated and presented from within different frames of reference. This can be seen in the pages ahead which are composed of the presentation of a wide array of at minimum topics, subjects and approaches. Thus, in summarizing and sense-making of this literature it has been challenging to delineate concepts that are sometimes used interchangeably, for instance, as methods, approaches, subjects, topics, concepts, disciplines, fields, initiatives, efforts, and practices. Nevertheless, it is critical to place foresight within this somewhat obscure backdrop by taking the perspective of seeing "the forest from the trees".

Although several documents continue to justify and describe the global emergency humanity faces, many other documents focus on why it is difficult to address this emergency as well as ways in which to both alleviate and transition past this predicament. The messages from many of these documents are: the emergency exists; it is very important to address the survival of humanity of which complex global problems are symptomatic and alleviate their negative impacts; the need is urgent; how society transitions through this predicament is important; attention and focus are required ("Shaping the future of geopolitics," 2017; Sharpe et al., 2016; Slaughter, 2015).

There are ongoing multiple challenges in working with humanity's current struggle for survival and the complex problems society faces. These challenges are at all levels and include, for example, public perception of complex problems, our brains are not wired to think about the future, conditions of complexity, oversupply of information some of which may not be

trustworthy, power struggles, underlying values, and path dependency. Thus, this struggle and its complex problems are being engaged in several ways. As previously indicated, there does not yet seem to be one correct solution or approach or method, as per one of the parameters for complex problems (Head & Alford, 2015; Luederitz et al., 2017; Paquet, 2013; Paquet & Wilson, 2015; Riley et al., 2015; Salter, Robinson, & Wiek, 2010).

It is important to understand the different perspectives on this topic and approaches being formulated. For instance, how are people working with this global emergency and how can society survive it? How does society alleviate the effects of this transition, the effects of complex problems and complex problems themselves? Can society improve its efforts and where does foresight fit?

Several concepts have been broadly reviewed in the literature review section provided earlier in this dissertation (Chapters 2 – 4). Table 20 lists these as well as additional topics particularly applicable to this phase of the dissertation. Through reviewing the topics again from the researcher's previous literature search and additional topics that came up through the dissertation research process, other areas were identified and reviewed. Some of these topics listed in Table 20 overlap, e.g., disciplinary lens and public administration.

Making sense of the literature.

There are a multitude of different approaches being used to address a recognized and defined situation of humanity's struggle for survival. The range of these approaches can be described using concepts and subjects from the previous literature review as descriptive tools: lenses and dimensions, change processes, the context of complex situations and the problems, foresight, and topics covered under public administration. For instance, some individuals or groups believe the key to tackling complex problems is in terms of levels of society, such as, working with communities rather than at a national or global level. Another example is addressing these problems through looking at what has been done historically or how people work with the future. Furthermore, approaches that address the cognitive dimension may focus in on decision-making and sense-making as psychological approaches to crises or alternatively

ways in which to bring about a paradigm shift in a population. Many other tools or conceptual frameworks can be used to describe these approaches.

To illustrate further, complex problems are in many cases being addressed through the lens of complexity (Homer-Dixon, 2010; Probst & Bassi, 2017; Room, 2011). This means that complexity is being defined and studied in several different ways and several different subjects are addressed in terms of what complexity means to them and how to apply complexity thinking to those areas, for example, what does complexity mean to the field of evaluation and how can evaluation researchers/practitioners use the concept of complexity. By defining the different elements and aspects of complexity there may be more effective ways to use these concepts.

Table 20. Topics related to working with complex problems

Group Headings	People	Change/Influence	Complex problems/ Context	Foresight
Specific topics	Various dimensions: • Cognitive • Emotional • Spiritual • Social • Physical/behavioural • Paradigm shift (e.g., values, beliefs, mindsets) Various lenses: (throughout) • Epistemology • Disciplinary • Perspective • Temporal • Level • Process/method	Transformative & incremental methods/at different levels of society Crises as opportunities Disruption/Integration Change labs Resilience Co-creation Action research Education Innovation Knowledge to action/knowledge translation/dissemination System dynamics and change Interventions Transition management Integration and implementation science The arts Social media	Humanity's struggle for survival Complexity Well-being Sustainability science Public administration Corporate social responsibility Social partnerships Socio-ecological systems research	In general Anticipation Social/ transformative foresight Dialogue-based foresight

An example of another way to organize topics is through a disciplinary lens, such as through public administration. Public administration is very appropriate due to its broad interdisciplinary applied work with societal problems and governing/transitioning change. Individuals external to public administration are not likely to appreciate the breadth of the field and its interdisciplinary scope, as displayed below in only a sample of related areas of study in public administration to complex problems. For instance, creativity, social learning and culture are all important topics within public administration. Even some scholars do not appreciate the current importance and diversity of public administration. However, public administration has the capacity to deal with ambiguity and turbulence because it is not a strict science, such as economics, focused on rational models and quantitative data (Fukuyama, 2004, 2018). Outside of North America public administration is productively practiced with a broader focus on the craft and art aspects of the field. More over, it is becoming evident that the social sciences and arts have significant contributions to make to alleviating complex problems, for example, in terms of human dimensions, fostering creativity and analyzing societal challenges. Furthermore, cognitive diversity is important for generating ideas and multiple perspectives.

Public administration, as the mechanism enabling policy development and ensuring policy implementation, has additional strengths in working with complex problems and complex situations. In other words, “policy is not what politicians say but what actually happens” (Trevor Hancock, personal communication, September 27, 2018). The public’s lack of trust in governments and the limited capacity of politicians to make progress towards humanity’s long-term well-being have been two major factors driving the call for alternative forms of governance and increasing engagement of stakeholders including the broader public (T. W. Allen, 2017; Boyd, Nykvist, Borgström, & Stacewicz, 2015; Dinges, Biegelbauer, & Wilhelmer, 2018; Duit & Galaz, 2008; Ostrom, 2010; Young, 2017). These areas of research in public administration have been growing in importance. These two major factors, as above, also demonstrate the Canadian public executive branches’ slow appreciation of humanity’s struggle for survival, slow ability to change the work culture, and the lack of uptake of recommendations from practices such as foresight for complex problems. Yet, public decision-makers have a critical and inherent role to play in alleviating humanity’s struggle and its complex challenges.

Complexity, growing public demand for quality and timely services, and the increasing number and severity of ongoing complex problems have also challenged administrative capacity (Bourgon, 2010; Farazmand, 2009; Lodge & Wegrich, 2014; Roy, 2013). This has provided a need for public administration to look to other tools and approaches to augment its repertoire of tools and mechanisms, for example, digital tools (Clarke, Lindquist, & Roy, 2017; Margetts & Dunleavy, 2013, 2013; McNutt, 2014) and foresight (Conteh, 2014; Room, 2011; Young, 2017). Authors have offered substantial insights in associating work on complex problems with theories and concepts from the discipline (Head, 2018; Leuenberger & Bartle, 2015). This connection enhances the application of accumulated knowledge from the discipline and furthers scholarship in the area. It also enhances transdisciplinary efforts as well as fosters practical advances. Additional topics of study within this discipline are revealed below as relating to complex problems but not discussed in-depth.

Public Administration – sample of related areas of study to complex problems

- Governance
- Policy design
- Experimental policy
- Evaluation/social impact assessment
- Networks
- Social learning
- Public participation and deliberation
- Management
- Organizational studies
- Policy instruments
- Personality
- Perception
- Self-awareness
- Motivation
- Leadership
- Creativity/innovation

- Decision-making
- Problem-solving
- Culture

To sum up, the abundance of literature on the related topics that are listed above underlines the vast work being undertaken relating to complex problems. It also reveals the current struggle in addressing complex situations in an environment defined by complexity and in an area that is new terrain. In addition to the new approaches and emerging fields working with complex problems and humanity's struggle for survival, public administration is a discipline well-suited for this effort as a holistic approach. Although, some scholars in the discipline have started to engage with foresight the discipline has been slow to appreciate humanity's emergency and action required. Even so, it is heartening to again realize the scope of the work overall being conducted to facilitate the transition taking place in our current society and address humanity's struggle for survival.

The rest of this section has been broken into three parts: the different approaches and ways in which complex problems and the struggle for humanity's survival are being addressed; the linkages between these various approaches and topics; and specific suggestions as to what needs to be done, why and how.

New and emerging approaches.

To reiterate, the monumental number of ways in which humanity's struggle for survival and complex situations are being dealt with and could be dealt with is almost incomprehensible. What makes this even more significant is the level of complexity in which these activities and concepts are functioning. Concepts such as interconnectedness, tipping points, butterfly effects, and emergence are conditions which describe a nearly boundless context. This means the frame in which people function is constantly shifting and not only can the minute initiative or activity have unpredictable consequences, these consequences can be very significant and far ranging (Helbing, 2010). Meanwhile, very large efforts can have little or no impact.

There has been an increased need to work with complex situations and related problems which have not been adequately addressed by current systems and disciplines. In many cases, these situations have since been identified as ongoing complex problems (Hämäläinen, 2015). Thus, many of the different approaches and ways to address complex problems are relatively new, developing since the 1970s or sooner, or are experiencing a recent increase in interest placed on the subject. A sample of them includes: social innovation, transition studies, foresight, governance, systems change, sustainability science, and integration and implementation science (Lang, Wiek, & von Wehrden, 2017; Loorbach, Frantzeskaki, & Huffenreuter, 2015; Markard, Raven, & Truffer, 2012; Martin, Dale, & Stoney, 2017; "What is I2S?," 2009). Sustainability science has only recently evolved due to the difficulties in realizing sustainability. Social innovation is another field which has been around in the literature in different forms for a century, but only within the last two decades has expanded on its own as well as through related concepts, e.g., social entrepreneurs and change labs (Martin et al., 2017; Olsson, Moore, Westley, & McCarthy, 2017).

All these areas are related in that they address some area of societal functioning and/or change. For instance, transition studies "is an emerging field of research that seeks to integrate insights from areas such as complexity science, innovation studies and environmental science to better understand large-scale systemic change in societal systems and explore possibilities for influencing the speed and direction of change in these systems" (Loorbach et al., 2015, p. 49). In addition, integration and implementation science refers to "a new discipline providing concepts and methods for conducting research on complex, real-world problems" (Bammer, 2013; "What is I2S?," 2009).

Regardless of the many different approaches and ways being suggested and used to address these problems, barriers exist in their application. In addition, each one has issues or developmental needs to be addressed. Processes and structures as barriers, as well as a mismatch between complexity and current systems hinder working with complex problems (Hämäläinen, 2015; Head & Alford, 2015; Paquet & Wilson, 2015; C. A. Scott, Kurian, & Wescoat, 2015; Young, 2017). These barriers can present themselves in terms of limits on conceptualizing and deciding upon ways to work with complex problems as well as a disconnect between knowing

what needs to be done but being unable to implement the required changes due to, for example, path dependencies or power structures (Akamani, Holzmueller, & Groninger, 2016). Furthermore, some of the areas have similar developmental issues as foresight. For instance, social innovation, policy experimentation, sustainability science, transdisciplinary and evaluation are fields that have developmental issues in terms of obtaining agreement on definitions and concepts, lack of funding and capacity issues, and communication challenges (Brandt et al., 2013; Lang et al., 2017; Nair & Howlett, 2016; Varady, Zuniga-Teran, Garfin, Martín, & Vicuña, 2016).

As an example of a common issue, several of the fields presented above face challenges in scaling their efforts to achieve transformative change and include more individuals in their processes. For instance, transition management, social innovation, and foresight face these challenges (Johansen & van den Bosch, 2017; Loorbach et al., 2015; Nair & Howlett, 2016; Wilkinson, Ringler, & Mayer, 2014). Some approaches to scaling have included building hubs (Bourgeois, 2014; Dentoni, Waddell, & Waddock, 2017; Msangi, 2013; "What is I2S?," 2009), change labs and action networks (Bradach & Grindle, 2014; Hassan, 2014; Introne, Laubacher, Olson, & Malone, 2011; Waddell, 2016), using new technologies (Raford, 2014; von der Gracht, Bañuls, Turoff, Skulimowski, & Gordon, 2015), and developing consortiums for research (Draimin & Rajasekaran, 2015).

Defining and linking approaches and topics.

It has been useful for this dissertation process to think of the variety of approaches as fitting under one of two overarching forms: mainstream planned and wide-ranging independent. The mainstream planned form can be defined by the incremental planned aligned approach. The wide-ranging independent form can be described as not necessarily connected, planned, or aligned. An example of the latter is different individuals or groups or organizations working as separate bodies that are each driven by a specific process or topic or objective, e.g., a grassroots project, a social entrepreneur, and the Gates Foundation. The former is a more systematic approach that involves current institutional structures to make progress in a linear well–coordinated form, e.g., the United Nation's Sustainable Development Goals and the Paris

Climate Accord. The mainstream planned form is what our society has been used to, while the wide-ranging independent form was less prevalent but has become more prominent now.

General methods/approaches can be applied across many settings and subjects, for example, transdisciplinary, evaluation, inclusive deliberation, foresight, social partnerships and design. These methods/approaches can provide critical enhancements to different aspects of processes used to work with complex problems. For instance, transdisciplinary is a key component in working with systems and complex problems because it offers capacity to work beyond disciplinary boundaries with a primary focus on the problem or the system. Similarly, engagement and co-creation are forms of increasing inclusive deliberation in various processes to derive associated benefits, such as innovation, improved results, and buy-in.

The human dimension of addressing complex problems is increasing in importance and is an example of a subject area to be taken into consideration across various approaches (Akamani et al., 2016; Cameron & Potvin, 2016; Marshall et al., 2017; Tait & Hanna, 2015). This dimension is apparent in several forms and topics: resilience; creating hope and positivity; addressing psychological factors relating to the ramification of change, for instance, the lack of evidence changing attitudes; and explaining as well as facilitating behavioural change, such as the manner in which to facilitate change related to sustainable practices. Additional topics include dehumanization of current society, just as brought about through the digital world; ways in which to help citizens understand complexity, complex problems and crises as well as become engaged; increasing the human dimension in policy; and paying greater attention to human values (Barber, 2011; Cameron & Potvin, 2016; Clayton et al., n.d.; Ofstad, Tobolova, Nayum, & Klöckner, 2017; C. A. Scott et al., 2015; Tait & Hanna, 2015).

To explore further, two important concepts referred to in the literature and in this dissertation's interviews apply to the human dimension and complex systems in general: resilience and feedback loops. As a complex living system, resilience is important to survival and is defined as "the capacity to deal with change and continue to develop" ("resilience," 2007). Foresight has shown to be effective in these areas within the dissertation case studies. Feedback loops are critical for individuals to realize the direct ramifications of their actions, such as related

to the environmental sector. In many cases through the complexity of our society feedback loops now have indirect, long-term, and/or unobservable impacts which diminish the ability and value in observing the consequences of an action taken (interviewee, personal communication, October 14, 2016).

Lack of trust, fear, blame, apathy and hopelessness are human emotions and states that become increasingly notable during times of crisis (Christensen, 2009; Paquet & Wilson, 2015). These conditions can have severe implications for societal wellness. There are also factors associated with dehumanization that has evolved in a technologically-based individual-focused society, e.g., desensitization to human factors through media (Allwood, 2017).

A final illustration on the human dimension is the importance of positivity and hope to counteract the negative states discussed. Although it is important not to provide "a blanket" of comfort through hope, it is important to give society and its individuals something to strive toward and feel positive changes and impacts are attainable (Bartunek & Adler, 2015; "Conversation with Wendell Bell," 2007). However, hope and positivity can be detrimental when complacency is the result (Hicks, 2010; Ojala, 2016). Expert interviewees for the dissertation indicated the importance of foresight focusing on aspirations for the future rather than dystopias.

Foresight naturally works well with other areas, including those discussed in the above paragraphs, and is itself composed of various methods and approaches several of which are from different subject areas, e.g., brainstorming, interviews, and SWOT analysis. It is referenced as useful in, for example, public administration, governance, research, (Bezold, 2010a; Meredith et al., 2016; Msangi, 2013; Roberge & Dinning, 2014). In the meantime, foresight harbours the potential to benefit from work in areas such as design, evaluation, social innovation, and social sciences research. For instance, other ways to use foresight are being advanced, e.g., experiential foresight and action foresight (Milojević & Inayatullah, 2015; Raford, 2012; José Ramos, 2017). Components of foresight, e.g., scenarios and visioning, are also studied with several functions, benefits and limitations cited (Bezold, 2010b; Oteros-Rozas et al., 2015; Wiek, Binder, &

Scholz, 2006). Further applications and needs for foresight are also being offered (McGrail, 2012; nik, 2014).

Specific suggestions on how to alleviate complex problems.

Several authors approach complex problems not by focusing on one area and the linkages it offers but by offering an integration of approaches/disciplines/methods to address a problem. Thus, their suggestions usually offer ways in which each area can link to the other and for how one or more areas can be potentially broadened in its application or tailored to a specific situation. For instance, Probst and Bassi (2018) combine distributed governance with design, social learning, experimentation and collaboration to provide a recipe for tackling complex problems. Wilkinson et al. (2014) link collaborative processes with transition management, foresight and innovation to offer a remedy for shaping the future (Markard et al., 2012; José Ramos, 2017; Young, 2017). As a final example, Nieminen and Hyytinen (2015) propose a new evaluation approach to aid in decision-making by integrating foresight, system dynamic modelling, and impact assessment. Thus, foresight is being suggested as an important approach that should be considered as a part of integrated efforts to address complex problems,

The literature also outlines more details concerning complex problems, e.g., what is being done, what needs to be done, how and why. It offers insight into on the ground activities as well as an integrated practical plan of action. For instance, several books outline remedies for humanity's struggle for survival as well as to individual complex problems by providing practical lessons and recommendations, (Bizikova & Krcmar, 2015; Boston, 2017; Dietz & O'Neill, 2013; Probst & Bassi, 2017; Raworth, 2017; Rootman, Pederson, Frohlich, & Dupéré, 2017). Organizations, such as NESTA and the Institute on Governance, put forth material as well as take an active role in furthering their visions ("Explore Our Shared 2050 Vision," 2018; "Nesta Homepage," n.d.; "Sustainable Energy for All (SEforALL) |," n.d.; "Tamarack Institute for Community Engagement - Community Development Across Canada," n.d.; Governance, 2018; Waddell, 2016). Finally, initiatives such as the Social Innovation and Social Finance Strategy, the Climate CoLab, Healthy Cities and Communities, and Grand Challenges Canada are examples of on the ground efforts towards alleviating complex problems. ("About Grand Challenges Canada," n.d.; "CNW | Steering group recommendations for a social innovation and

social finance strategy for Canada released today," 2018; Hancock, 2018; Hancock, Norris, Lacombe, & Perkins, 2017; Introne et al., 2011).

In Canada, there are some different applied fields/initiatives fostering change as per their approach/subject area, e.g., social innovation, governance, and evaluation bodies, all working within their applied subjects and making in-roads at different levels as they adapt and refine their offerings. Foresight does not currently have an organization broadly representing its interests in Canada. Some of the other fields are connecting as they can to other topic/approach areas. Efforts are a piecemeal approach until the subject or approach is more widely accepted as valuable and is somewhat integrated into more mainstream practices, e.g., institutional procedures. There are several foundations and institutes furthering efforts on complex problems, mostly within complex problem areas, e.g., health and environment. There is no body dedicated to Canadian complex problems in general other than government per se. Silos exist. There is limited capacity, understanding and/or desire for actively working across boundaries and uniting these areas.

However, there are some initiatives going beyond one applied subject/topic/approach, e.g., Healthy Cities and Communities, Canadian Community Foundations Network - Victoria adopting the Sustainable Development Goals (https://victoriafoundation.bc.ca/vital-signs/), and Conversations for a One Planet Region (Hancock, 2018; Hancock et al., 2017). Equally, there are initiatives connecting to global efforts, e.g., GFAR and Millennium Project node ("About us | GFAR," n.d.; "The Millennium Project-Canada Europe Node," n.d.). Most of these initiatives use aspects of foresight. Regardless, it is challenging to connect and disseminate information across boundaries, e.g., sectors, jurisdictions, disciplines, and takes significant effort and resources. Active review of various literature, although time consuming and more theoretical then practical, helps close information gaps.

Tools/activities for foresight and complex problems.

In addition to the many tools and methods foresight has at its disposal (Raphael Popper, 2008), the list below outlines tools/methods that have been identified from both interview results (mostly from phase 1 of the dissertation) as well as literature searches. Again, this is not a

comprehensive list but a sample of those tools and methods that foresight can link to in a productive way. Many of these are also tools and methods that can be used to work with complex problems and as such are listed below.

- Policy development
- Foresight, Competitive Intelligence and Business Analytics (Forciba)
- Gaming
- Product development
- Strategy development
- Technology assessments
- Collective futures global intelligence system
- Spatial & relational approaches/ modelling & mapping software
- Online integrative discussion tools
- Data mining
- Timeline analysis
- Research preparation
- Group concept mapping
- Multi-criterion decision analysis
- Visualization
- Dialogue
- Integrated assessment

An encouraging and important finding on the status of the literature and efforts in this area is there is progress being made in relation to working with complex problems and humanity's struggle, and thus, hope exists for positive outcomes. In comparison with the literature review the researcher conducted approximately three years ago, the researcher has observed the literature review in this chapter broadly shows a growing level of sophistication. There is a greater appreciation of the predicament humanity faces and a sense of what's needed to address its struggle for survival. More importantly, there seems to be an evolving agreement on the importance of some elements in addressing complex problems, e.g., collaboration, working with complexity and systems, and innovation. This will also be apparent in the findings

from the expert interviews presented later in the chapter. More literature seems to be available on how to work with these elements (Cukier & Gagnon, 2017; Probst & Bassi, 2017; Waddock, Meszoely, Waddell, & Dentoni, 2015). In addition, literature seems to increasingly address how to advance transformative change (Hayward & Sygna, 2018; Hebinck et al., 2018; Linnenluecke, Verreynne, de Villiers Scheepers, & Venter, 2017; Patterson et al., 2017; Pereira, Hichert, Hamann, Preiser, & Biggs, 2018; Robson et al., n.d.; Sharpe et al., 2016; Wiek & Lang, 2016).

The progress made means both the situation under which humanity is facing a struggle to survive and the number and severity of global complex problems along with their effects are gaining awareness and legitimacy. The urgency around these predicaments is starting to mainstream, but much work remains. It is a critical time for more interested stakeholders to become engaged. Public administration is a discipline that has a critical role to play but is rather slow to take up the cause. Unfortunately, acceptance of the necessity, knowledge about humanity's struggle, formulation of a strategy, and practicality of planned change takes time.

In summary, scholarly literature continues to document and describe the global emergency and complex problems humanity is facing as well as why challenges exist in managing these concerns. Additionally, this material as well as grey literature offer recommendations for working with humanity's struggle for survival. Due to the importance, difficulty, and urgency of this critical predicament many forms of efforts including developing emerging subjects are being pursued and the literature is rich with information. Work evolving in this area has been outlined in this section. However, efforts are encountering many hurdles. Fortunately, several topics directly apply or link well to other areas, which in some cases mean filling certain developmental gaps or addressing issues intrinsically or extrinsically impacting upon a practice.

The literature also offers integrated approaches and specific suggestions on how the crises should be addressed with the human dimension receiving significant attention. Foresight can augment many approaches. Finally, of promise is what seems to be an increasing amount of written work on what needs to be done and practical elements on how to conduct the work. Unfortunately, it takes time for literature to translate into practice, not all findings from the

literature are translated or convert to practice as anticipated. This section has conveyed these points in addition to making sense of the material through organizing it in different ways and highlighting some topics, e.g., offering clear links to the discipline of public administration.

Development of preliminary insights to alleviate complex problems.

Based on interview findings and an expanded literature review, several insights/observations have been formulated and key pieces of information identified. Appendix D demonstrates a sample of the key points or at least those that resonated with the researcher throughout the process. Once filtering of the information obtained from various sources was completed a set of objectives/preliminary insights have been formulated, at a very general and abstract level, to address the next steps in working with complex problems in Canada and placed foresight in this milieu. The purpose of this step was to have a basis from which to generate feedback on the researcher's understanding of the material and its validity, test practical considerations, and more clearly define foresight's role in addressing complex problems. The following section examines the comments of experts on these preliminary insights.

These preliminary insights/general objectives are offered as potential ways in which Canadian efforts towards complex problems could be more urgent and transformative, similar to operating in a crisis mode under a somewhat planned framework. Moreover, these objectives take into consideration how foresight could play an increased role in alleviating complex problems and their effects by addressing the practice's needs and external hindrances.

1. Acknowledge humanity and Canada are facing a major problem
2. Bring together efforts and begin a national dialogue(s) to unify society (engaging with communities and society against complex problems and humanity's struggle for survival and in favor of a high quality of life for all)
3. Enable inclusivity and connectivity - breaking down the silos (across various boundaries to create a critical mass of efforts)
4. Facilitate collaboration and information sharing (across various stakeholders regarding methods and approaches)

5. Engage in an advocacy role (for change and the development and utilization of methods and approaches to address humanity's struggle)
6. Provide operational assistance: resources, advice, training, assessing, certifying, researching and others

Expert perspectives on a set of preliminary insights.

Several preliminary insights on possible general objectives to address complex problems in Canada were developed and identified above. These insights were then tested through an interview process with selected experts working with complex problems and/or foresight. A brief summary of the dissertation project was provided then the six insights (above) were put forth to eight experts as areas to strengthen foresight and work to alleviate humanity's struggle for survival including complex problems in an urgent and transformative manner. The experts were then asked how they thought society should address these areas.

The reason for this exercise with experts is to vet the six insights listed above for validity, seek input into their practicality as well as garner alternative suggestions and observations. Once interviews were conducted a thematic analysis was used to make sense of the findings. Findings and discussion of the results are presented in this section.

The consulted experts can be described in the following ways. Five of these experts directly work with foresight and three of them directly work with complex problems. Four of them reside in Canada and the rest are located outside Canada. Five of them are males and three of them are females. Upon agreement to participate in this project, a set of slides were emailed to each interviewee summarizing the dissertation and offering the six insights. Feedback was obtained via Skype, telephone or in-person.

A few of the interviewees indicated more specificity in terms of the insights offered, e.g., who should meet these objectives, what they consist of, why they should be met, are they practical and would they allow for more valuable feedback. This was to be expected as indeed the preliminary insights/general objectives were deliberately ambiguous. The purpose of the

exercise was to glean information and open a discussion in those specific areas left vague and to attract general feedback. This purpose was fulfilled.

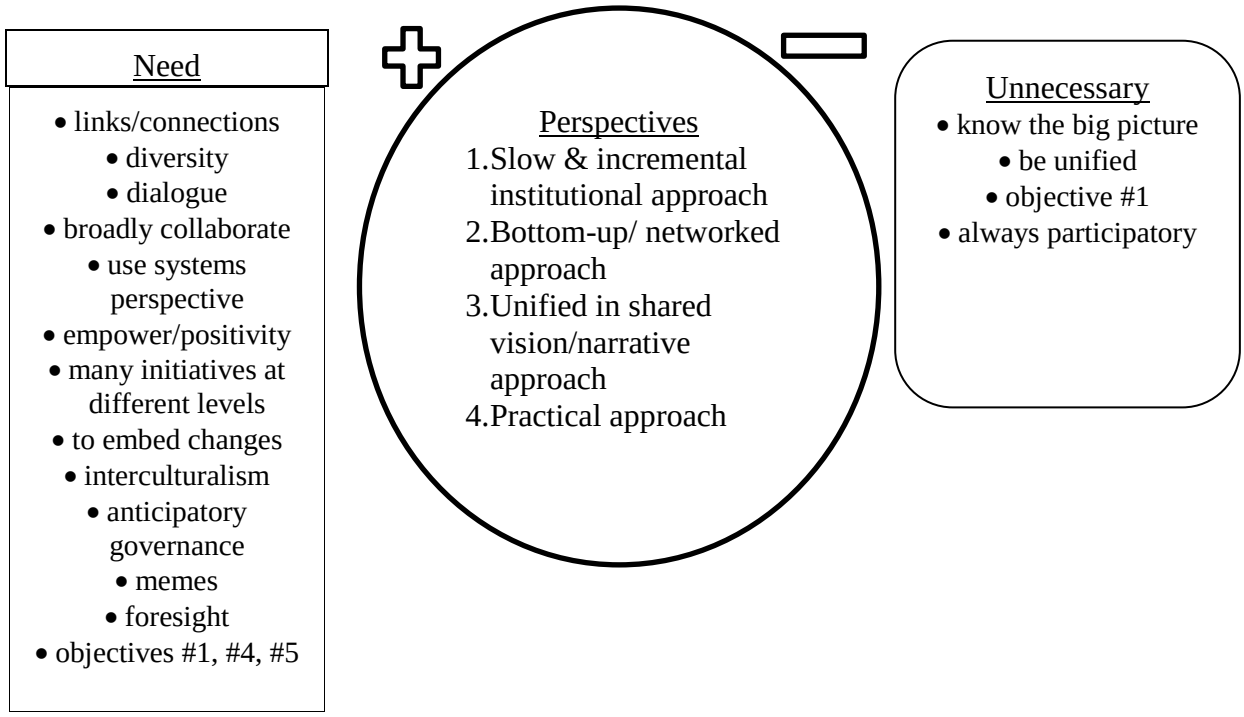
The level of agreement with the insights can be grouped as follows.

- two emphatically agree overall with insights, e.g., “the strategic direction is bang on”
- two agree overall with insights, e.g., “issues around the level and engagement in which to pursue them”
- two agree in general or in principle with insights
- two partially agree with one or more of the points within the insights, e.g., interviewees offered the following: “people don’t need all of this – progress is slowed if you focus on number one” and “the first objective is the most important”

Although agreement with the insights to some extent is evident with all interviewees, certain approaches/concepts are identified as required and others as not required. Within the responses, certain key elements or concepts are mentioned more than once, are related to a theme within the response of an interviewee and/or are related to concepts/approaches mentioned by other interviewees. This allowed for the identification of some themes. For instance, the experts indicate: “enabling, empowering approaches are needed”, “focusing on disturbing the present – see it as a procrastination problem”, “build connections before processes”, “start doing it and people will change” and “bring technology and arts together”. Key concepts or elements, identified as “Need”, and those identified as not necessary, “Unnecessary”, are identified in Figure 16.

Four general approaches from expert validation/triangulation are discernible regarding working with complex problems and humanity’s struggle for survival. One perspective is to proceed with a slow, incremental and institutional approach. Another perspective is using a bottom-up or grassroots approach with networks. A third approach is focusing on the narrative, shared vision and broad collaboration. A fourth approach is focused on the practical. These approaches are also identified in Figure 16.

Figure 16. Representation of expert feedback on how complex problems should be addressed



Approaches are defined by quotes from participants.

1. A Slow, Incremental and Institutional Approach

   "a carefully designed sustained effort is required"

   "we need an incrementalist approach and having institutions is important"

   "we have institutional voices and we need to improve upon them by using them as voices for the future – anticipatory governance"

2. A Bottom-up / Networked Approach

   "approach the voluntary sector to equip them with tools"

   "involve a wider swath of people"

   "how do we engage the grassroots and give them the level of foresight literacy to engage policy level"

   "we need to start without government"

   "need to look at network-oriented solutions"

3. Unified in Shared Vision/Narrative Approach

"ultimately, we need development of a shared vision"
"need a social process – national scale to bring people together"
"would be great to create values, common narrative and shared memes"
"cohere around shared objectives"
"Memes/overarching narrative required"

4. Practical Approach
"egos, resources and practicality is the problem"
"we need specific pathways and practical how"
"we need to address the question of how. Who begins the national dialogues"

These perspectives are not entirely mutually exclusive. Differences arise if the question asks which is the most important to resource, whether an insight is achievable or whether it is important. In other words, deviations come up when focus is on the details. Alternatively, the general importance of a practice/initiative may be seen by some as less important than another approach.

Overall, many of the participants think either humanity does not know enough, or people are not ready as a society to agree and proceed with the insights as a whole. As one interviewee stated, "no existing culture understands what it is up against or has developed a strategy to cope with it". Interviewees indicated the methods to accomplish objectives are difficult and still rife with issues, e.g., problems in building consensus and with governance. Some responses coinciding with this point include the following: "there is a clash of values in bigger spaces when more groups are involved", "time horizons are different for different groups so it's hard to reach an agreement, and "we have to overcome unwillingness to share/collaborate".

Other general comments about the six insights offered include two key points regarding effort required and use of different models. The insights/objectives offered to the experts would entail a massive effort, as per one comment "this list of objectives is a massive undertaking". Moreover, some of the items on the list are cited as against our nature as human beings which creates added difficulties. For example, humans tend to silo naturally, experience tragedy of the

commons and compete. Finally, there are various successful models of change, e.g., the Manhattan Project and the Royal Commission on Bilingualism and Biculturalism, to learn from. These six insights propose only one set of objectives or model that may or may not be better than any other: as per interviewee's responses "we have to work with several models of change", "there is no one solution", "we need a number of initiatives leading in one direction", "we need multiple initiatives at multi-levels with multi-actors" to "co-create the future of human civilization". Thus, many different sets of objectives/models should be pursued simultaneously.

Yet, as a couple of interviewees indicated, these initiatives and efforts should be guided by shared aspirations, values and narratives. Practicality is important and although we will likely never know enough, society needs to have a guide for actions and initiatives that need to proceed urgently. This can be one of the key roles for foresight.

Further, several comments were made specifically regarding the importance of foresight. Reasons why foresight is important include: to improve decision-making and impact upon government, create awareness, prepare the mind, better appreciate complex problems, use foresight as an advocacy tool, achieve shared visions and be exposed to the concept of unintended consequences and integrated/cross-impact analysis. One of the most commonly stated comments concerns the significant value of developing public foresight literacy. As one expert stated, "foresight is developing a shared understanding, shared aspirations and a commitment to optimize values – which are expanding, i.e., social equity".

There are both benefits and issues with aspects of foresight. Beneficial aspects offered by interviewees include: empower by moving toward a preferable future versus a dystopia, use experiential futures, use the causal layered analysis method and address scaling in foresight theory. For instance, one respondent suggested to "infuse foresight towards positive change – ask what pieces of foresight could help". This quote is indicative of the many ways in which foresight is seen to have a positive role in working with complex problems and the benefit of being able to adapt it to a need.

Three issues with foresight regarding resources and the atypical nature of foresight were also mentioned by the interviewees. One issue is the importance in conducting ad hoc experiments for foresight to achieve shared visions, but the difficulty is covering the cost and conducting the process. The other comment is the difficulty in using foresight due to the resources required while gaining the support to then question foundational beliefs. For example, it may be hard to garner funds from the government to conduct a foresight project which challenges/reinvents the governance processes utilized by government. The third issue is foresight being disconnected from other more mainstream processes, as the expert indicated *"*foresight is cut away from other areas, e.g., governance". Thus, foresight faces obstacles in linking to areas in which it can add value.

In summary, the experts provided invaluable feedback on a set of preliminary insights on objectives to strengthen foresight and attend to humanity's emergency and its complex problems. The interviewees revealed the diversity of perspectives that can be found on this topic even within a small group of experts; thus, acting as a reminder that there is no one correct way to address humanity's struggle for survival or complex problems. Most approaches have merit and many can proceed in tandem. Furthermore, even within diverging views there is congruence. Yet, society is not likely to agree on a full approach. For instance, no one thought collaboration or positivity was unnecessary. However, there are enormous practical challenges in achieving any one objective within the insights even if there is general agreement on that objective. In addition, the individual items listed in Figure 16 under "need" are not easy to achieve. Further research is necessary and choices need to be made on the objectives to pursue. Foresight is important and has several roles, but its challenges have to be taken into consideration as well.

Overall, further research is necessary while in the meantime many objectives and approaches should be pursued. As findings throughout this dissertation reported, foresight is important and has roles among these different approaches to working with complex problems, but its challenges have to be taken into consideration. These expert interviews have confirmed and strengthened these findings.

Barriers to foresight.

Although foresight is being practised worldwide, several journals exist on the topic, and educational institutions globally provide graduate level education, it is in many ways an emerging discipline that has not yet reached the mainstream of Canadian society. Foresight is an applied field with limited capacity in Canada. There is only one institution that offers a graduate level degree and other training mechanisms are minimal. Foresight is represented in the federal government but very minimally represented in provincial and municipal governments. Many Canadians and, of particular importance, potential clients of foresight are illiterate in the area or are under several misconceptions regarding the field (Giesecke et al., 2012; Slaughter, 2009). The appreciation of foresight, its value and its appropriate sourcing have a significant effect on the success of foresight and its advancement. As such, acquiring an understanding of why foresight is not in the mainstream yet and what the barriers are is critical to surmounting these barriers.

Hines and Gold (2015) have addressed the topic of challenges in integrating foresight from an organizational perspective. Based on their work, the findings of other authors, and dissertation findings this section outlines the potential barriers to the integration of foresight in the past and present. Four types of barriers are identified: (i) cultural, cognitive, and emotional; (ii) episodic; (iii) system, institutional, and organizational; and, (iv) difficulties with foresight, its history and uniqueness. The specific barriers identified within each type can be classified under different headings, e.g., the cultural barrier may be considered an organizational barrier. Some authors also offer ways to work with the barriers.

Cognitive/cultural/emotional barriers.

Individuals are short-term thinkers by nature, they resist change, prefer what is established, favour the concrete, identify with tangible results and look for certainty (McGonigal, 2017; Popova, n.d.; Smart et al., 2017; Wilkinson, 2017). The Canadian decision-making culture also predominantly prefers quantitative verses qualitative modes of thinking and evidence (Jones, 2017), e.g., biases are perceived as more likely to occur in qualitative work. Foresight can seem threatening as it viewed as none of the above. Thus, the practice can evoke fear and anxiety. In addition, there has been a significant competition for resources and a multitude of activities

going on in the last couple of decades that limits the attraction of foresight ("Conversation with Wendell Bell," 2007; "Foresight Manual: Empowered Futures for the 2030 Agenda," 2018; Hines & Gold, 2015; Wilkinson, 2017). Other personal factors can include overconfidence and personality type. For instance, certain personality types have proven to be more reluctant to accept and/or have difficulty working with certain dimensions of foresight, e.g., uncertainty and the abstract (Bezold, 2010b). These types of factors could be very important in explaining why certain foresight projects have greater impacts on policy-making or effect decision-making in other spheres. Human resources departments commonly use various measures, such as emotional intelligence tests and personality tests, to facilitate hiring and training practices.

Episodic use and integration of foresight not a priority.

Two barriers or challenges to foresight becoming more widely accepted have been identified as its episodic use and a lack of priority to integrate foresight within organizations (Hines & Gold, 2015). Slaughter (2013) elaborates further on the reason for episodic use of foresight over the last few decades. He suggests a large portion of foresight work was completed by not well-trained foresight practitioners and the work was applied mostly to purposes of reinforcing specific interests or advancing concerns of the marketplace. Hines and Gold (2015) describe lack of foresight integration due to its potential challenges and being unnecessary as external consultants were widely available. Lack of foresight integration can be found in the Canadian government which has not seen it as a priority to systematically and comprehensively include foresight as a regular institutionalized requirement despite the formation of Policy Horizons and the use of foresight in several departments. In summary, these barriers have jeopardized the maintaining or building of foresight capacity and the ability to practice an optimal version of foresight.

System/institutional/organizational barriers.

This type of barrier, system/institutional/organizational, has been widely identified through this dissertation's research and validated in the literature. Specific examples of barriers include: staff turnover, lack of a leader or champion, lack of understanding of the foresight practice or how to utilize its benefits, high expectations, competing information, timing, lack of attention to prevention of potential threats, short-termism, and inconsistent funding (Dreyer &

Stang, 2013; Macklin, 2010; Rhisiart, Miller, & Brooks, 2015; M. van der Steen & van Twist, 2012; Wilkinson, 2017). Wilkinson (2017) further identifies barriers as "lack of culture of conversation, strong silos, limited capacity for joined-up thinking and action planning, leadership power contests, and time delays between thinking-action processes" (p. 8). Another perspective has been offered on these barriers and they include the lack of seriousness, incentives, attention, or motivation to use foresight. In some cases, these factors are augmented by hostile reward systems and disconnections in sharing of information (Bezold, 2010b; Rohrbeck & Gemuenden, 2007).

Difficulties with foresight, history and uniqueness.

Foresight is a unique practice for several reasons. It is both art and science; has a multidisciplinary/transdisciplinary, multi-perspective and possibly action-oriented holistic approach; and works with the future and systems in a potentially democratic/participatory/engaging way. Furthermore, the practice works with mental models and allows participants to expand their thinking in different ways, e.g., holistic, transdisciplinary, diverse, future term, context of complexity, and creative/outside-the-box thinking. Alternatively, it provides unusual perspectives and questions assumptions.

Overall, foresight has been successful but as a field it has been confronted with its own challenges, mixed success in its past, experiences of ambiguity and individual project successes/failures. Unfortunately, foresight can be resource intensive, expensive, and difficult to deliver well. It can take a significant amount of time to produce results and it is challenging to measure success. Also, it is sometimes misunderstood and judged negatively based on its history, ambiguity and other barriers stated above. For instance, the image of foresight has been tarnished due to inappropriate use of foresight, poor application of the practices, and field development issues. However, there are examples here in Canada, and numerous worldwide, to remind potential clients of its value.

In addition to these challenges, difficulties identified with foresight in the interviews for this dissertation are in appreciating foresight/lack of foresight literacy. Research has also revealed information is not readily available on foresight as it is practised in Canada, e.g.,

successes are not well documented partially due to confidentiality and partly due to lack of resources or objectives for wider communication. Furthermore, skills in foresight need to be well developed and a greater focus needs to be placed on the process to address factors such as sustaining participant interest, managing expectations, and maintaining an appropriate balance between trade-offs in practice (Brian Colton, personal communication, September 11, 2018). Ultimately, foresight in many circles has been identified as a luxury.

There are several barriers to mainstreaming foresight, as evidenced in this section, but these barriers are not unique to foresight or to Canada, are indicative of the paradigm shift required in society, and are surmountable. Furthermore, due to the timing or context of the field's development some fields have more barriers to overcome than others not unlike the development of children with their inherent traits and external environment. To elaborate on the lack of uniqueness of foresight barriers, many emerging fields, such as social innovation, experience issues with capacity development and mainstreaming. Alternatively, other fields have negative experiences during their development, for example, the challenge of developing scientific practices while challenging the church as an institution or medical practices currently seen as archaic and misdirected. In addition, many countries worldwide have experienced similar challenges as Canada has with foresight. Hence, some of the literature cited above does not identify the challenge per country but indicates the challenge, for example, acquiring stable funding, as a broad challenge with foresight.

Of particular significance, are the foresight barriers that require changes in cognition, systems and culture to be overcome. Foresight conflicts with a paradigm and practices that have become outdated and are path dependent (Randle & Eckersley, 2015). Although, foresight is a tool to facilitate a required societal transformation to ensure the long-term well-being of humanity, it must first overcome at least some of the barriers it is intended to alleviate. As a general movement in this regard exists, as noted from a review of practices and literature in this chapter, these barriers may not be so formidable. Also, several countries and corporations have overcome most of these challenges to integrate foresight into mainstream practices, such as Shell, Finland and Japan (Saritas, 2018). Finally, history has shown human beings have surmounted substantial barriers throughout their history, such as the development of vaccines,

achievement of democracy and liberation of women, if the potential benefits were worth the effort. The totality of barriers foresight faces is much less substantial.

Summary.

This chapter has built on the findings of the previous chapters and their overview in Chapter 10. In this last section, the material within the chapter is summarized and findings on this topic are provided. The research question on how dialogue-based foresight can assist society to alleviate complex problems and their effects in the Canadian context is answered as it relates to the milieu of activities regarding these problems both in Canada and to some extent globally.

In the first part of this chapter, the dissertation interviewees underline the importance of working with untraditional ways to address complex problems in a society surrounded by complexity and hampered by barriers. Productive efforts have been defined as generating knowledge, creating awareness, openness to changes in thinking patterns, collaboration, and paying attention to systems. Ongoing divergent work facilitating more than incremental levels of change in several areas is necessary. Foresight is a valuable practice in working with complex problems, especially if training in the practice, public education, and improved communication is advanced.

The literature review validates the first section of this chapter on interviewees' perspectives, e.g., the need to be proactive, utilize new processes and approaches, employ and improve foresight, and be more transformative. It also provides further information on, for instance, different topics related to complex problems, ways to conceptualize the vast literature, issues in the application of approaches, the importance of linking and integrating topics, and the need for a human dimension. Positively, advances in the literature have taken place in the last three years to further define humanity's struggle for survival and action required including practical elements as well as agreements on the need for certain types of efforts, e.g., attention to systems and complexity, and the human dimension. Transdisciplinary practices and literature are key resources for improving dialogue-based foresight in alleviating complex problems and their consequences.

Based on the two forms of data collection primarily, as well as material previously collected, a culmination of observations and information have been used to formulate a set of preliminary insights/general objectives. A large sample of the observations have been documented in Appendix D to illustrate the material and process used. Finally, experts have reviewed these preliminary insights and reinforced findings while offering critical perspectives on the material presented.

As a sample, experts have reinforced and offered new insights as per the following points:

- There is no single way to proceed with respect to alleviating complex problems
- There is some agreement developing in certain areas of how to work with complex problems
- It is very challenging to work with complex problems and situations
- There is significantly more effort required on various fronts
- Foresight is valuable in many ways
- Significant practical challenges appear in implementation of efforts
- Efforts are not likely to result in quick changes and transformative outcomes, but they can overlap and augment each other
- A variety of approaches used to tackle humanity's struggle for survival at the same time is important
- Overall guidance for initiatives is important
- At least four approaches are available to ameliorate complex problems and humanity's struggle for survival: slow, incremental slow, incremental and institutional approach; bottom-up or grassroots approach with networks; focusing on the narrative, shared vision and broad collaboration; and focused on the practical (Figure 16).

One cannot be certain which effort towards alleviating complex problems will have the greatest impact overall, thus efforts need to continue in various areas, through both overarching wide-ranging independent and mainstream planned frameworks, as described previously in the chapter. Some individuals feel strongly that one correct approach needs to be discovered or pursued and all resources need to be focused on this to make the most headway, while others are open to diverse approaches or may not be satisfied with progress/activities and pursue their own

path. The United Nation's Sustainable Development Goals are more substantial and traditional, fitting within the mainstream planned framework. However, the additional wide-ranging independent framework may turn out to be more beneficial or at least facilitate advances garnered through the planned path. In addition, diversity is important for complex adaptive systems to adapt and survive. Thus, it is prudent to follow both paths. In the meantime, research is ongoing, practices are improving, and more significant coalescence of findings and perspectives occur. Progress is being made and nearly all efforts count even if not everyone agrees on the effort or it is not expert driven. Positivity, hope, and evolving values continue to be very important, e.g., openness and equity.

The dissertation has confirmed foresight has many roles to play in working with complex situations and problems and based on interviewees' views and the literature reviewed it is important to increase this role. However, there are multiple perspectives/approaches to work with humanity's struggle for survival and its complex problems, and foresight is just one approach. Foresight fits well in the context of evolving tools and approaches. Work on the different topics: issues, development and refinement are necessary in most areas.

Strengthening and developing different approaches is important but it depends (i) where people want to focus their attention and how, (ii) which area is easier to advance, or (iii) which areas are seen to be a priority. At this point it seems like a group of individuals who have a similar vision or believe in a certain approach/idea and can combine forces work towards it. Of course, power, influence and wealth likely play a role but are not absolute in their affect: hence both wide-ranging independent versus mainstream planned frameworks. The efforts result in a large cluster of work in a multitude of areas. As such, a combination of various miniscule and significant impacts occur and accumulate over time. Key practice areas/approaches/methods may also filter out through several different mechanisms and be impactful in different groupings. Hopefully, all of this will provide the emergence of positive results in the order required to alleviate humanity's struggle, its global complex problems and their effects.

Alternatively, certain factors would likely increase the possibility for emergence of positive results in alleviating complex problems and their consequences. For instance, increasing

efforts undertaken in this area, guiding the efforts by a shared narrative, addressing practical considerations and by expanding the role of certain applied areas such as foresight. Four instrumental ways in which to expand the contribution of foresight are listed below, but more can be delineated through the literature as well as interviews conducted. First, one factor identified by the expert interviewees is using dialogue-based foresight to identify shared values and aspirations to guide efforts. Second, another factor is enhancing foresight through foresight literacy, supporting wider use of foresight, conducting developmental/capacity building work and research. Third, one more area of importance is using foresight to assist society in transitioning through humanity's struggle for survival. Fourth, using dialogue-based foresight to work on complex problems on an ongoing basis is important.

Chapter 12: Conclusions

This dissertation addresses the Anthropocene which is about humanity facing a substantial and urgent struggle for survival and how people at minimum can maintain and ideally advance the long-term well-being of humanity. A part of the Anthropocene and humanity's struggle for survival is current global society undergoing an unprecedented pace of change and type of change that is contributing to the development of a range of complex problems. Humanity is not adequately prepared to address these problems. From researching dialogue-based foresight, this dissertation provides one feasible way to examine and learn from efforts addressing global and Canadian complex problems to alleviate these problems and their implications. This dissertation is exploratory, descriptive, and explanatory. It responds to the question "How are foresight practices used to address complex problems and how can dialogue-based foresight assist society to alleviate complex problems and their effects in the Canadian context?" As such, the dissertation builds on the foresight literature and progresses it. It also strengthens the work on complex problems. The focus, however, has been to study foresight and dialogue-based foresight for Canadian complex societal challenges.

In addition to filling gaps in the literature, this dissertation has determined foresight practices are used to address complex problems in Canada. Moreover, through the examination of projects using dialogue-based foresight practices to work with complex problems in the Canadian context, several insights have been developed into dialogue-based foresight's potential contribution to ameliorating complex problems and their impacts. These potential contributions have then been placed in the context of efforts towards addressing these problems. Also, this research offers practical and theoretical benefits such as improving the management of complex problems and assessing historical efforts towards them. While there is a significant amount of literature on foresight, the literature is limited in describing the use of foresight in Canada, especially in the form of a multiple case study related to advancing efforts with complex problems. This dissertation fills this gap by providing information about the foresight community and its practices, as well as the comparative study of several Canadian cases.

By nature, foresight is practised as a social process that takes into consideration the human dynamics that are critical to addressing complex problems facing society, e.g., values,

relationships, dialogue, human change processes, collaboration, and personal attributes. Since dialogue-based foresight has been proven to be valuable and unique, it is critical to mainstream foresight and direct efforts at foresight's application to alleviating complex problems. To surmount barriers, this needs to be a conscious targeted process. Interested stakeholders can make progress in their defined roles especially for dialogue-based foresight, as well as foresight. Efforts are already underway by some individuals but contributions from other individuals and institutions are necessary.

To conclude this document, the researcher addresses the sub-research questions identified in the introduction, documents major findings, reviews limitations, outlines implications as well as proposes next steps for further research. Lastly, the significance of this research to different audiences is highlighted and the chapter and overall dissertation are briefly summarized.

Sub-research questions addressed.

To answer the dissertation's research question three phases of research have been conducted. In completing this research a range of sub-questions put forth in the introduction have been answered. These sub-questions are roughly grouped per the phases of research and addressed in terms of these themes.

Findings from scans of the foresight and complex problem communities.

- How can the foresight and complex problem communities be described?

The foresight community in Canada is relatively small with limited capacity, however, impactful in work produced relative to size. The community is not very cohesive or knowledgeable about its activities and ambiguity surrounds the use of several critical concepts in the field. The complex problem communities vary, yet integration of efforts, broader understanding, and cohesion of the community have been goals, to some extent, for all the foresight projects that have been examined. The foresight community has been primarily described in Chapter 7 in the findings from the foresight community scan. The complex problem communities have been primarily described in Chapter 8 per each researched case and then again in further detail through the in-depth analysis in Chapter 9. Descriptive information is available

regarding the use of foresight for complex problems within the scan for complex problem communities. Research conducted for the foresight community scan includes a sample of foresight projects completed as well as information on the foresight practice and key concepts used. As such, perspectives from both foresight professionals and participants are available. Further information on this topic is also provided in the literature review sections located in Chapter 3 and Chapter 11.

Findings from cases.

- What is being done to address specific complex problems? What are the broad issues impeding/advancing management of specific complex problems?
- How can dialogue-based foresight for complex problems be assessed at an aggregate level in the context of specific cases of managing complex problems in Canada? What role has dialogue-based foresight played? What insights can this research provide?
- How and to what extent are policy actors and other stakeholders impacted by dialogue-based foresight projects? How do these impacts affect complex problems? Can more be done to maximize outputs and/or translate these impacts into improved outcomes?

All the three questions under this theme are addressed in the findings from the cases, Chapter 8, and analyzed in-depth in Chapter 9. A few noteworthy items include: similarities across the case comments regarding issues that impede/advance management of specific complex problems, the key roles dialogue-based foresight has played, and the types of impacts of the foresight projects. A critical yet challenging element is the extent to which outcomes and benefits are realized. Through this mixed methods comparative case study various insights have been formed and an important finding discovered: the role of dialogue-based foresight is potentially transformative on more than the odd occasion. Furthermore, this role can be strengthened in various ways as outlined in Chapter 9 and Chapter 11.

Findings from insight development.

- Can dialogue-based foresight approaches create more effective, efficient and/or collaborative ways to address complex and/or urgent complex problems than traditional problem-solving approaches? How? In which contexts? Under which conditions? To what extent?
- Is there a difference in the way urgent complex problems and non-urgent complex problems are addressed? Is a difference warranted?
- Can lessons from the practice and application of current transdisciplinary literature and supporting tools be used to strengthen elements of dialogue-based foresight? How?
    - In-depth review for above questions includes, where appropriate and possible: *How? In what ways? To what extent? Is one change more significant than another? Does it matter? Through what type of mechanisms?*

This theme of assessing dialogue-based foresight's impact on complex and/or urgent complex problems and whether dialogue-based foresight can be strengthened is primarily addressed in the in-depth analysis chapter, Chapter 9, and in the chapter outlining phase 3 of the research, Chapter 11. Briefly, dialogue-based foresight approaches can be more effective, efficient, and/or collaborative. Key considerations in this assessment have been factors around context, elements of dialogue-based foresight delivery, and the extent of impact. How dialogue-based foresight is more effective, efficient, and/or collaborative is addressed in general in this dissertation but other authors have measured empirically and explained in detail the impact of specific elements of foresight, e.g., how mental models are impacted and the benefits of dialogue and deliberation (Chermack, 2011; Lohmann & Van Til, 2011).

Foresight is a transdisciplinary practice composed of several different tools and methods. An important but not necessarily novel finding from phase 3 of the research is transdisciplinary literature including related approaches and tools provide an important resource for strengthening dialogue-based foresight. Findings from the literature can be translated into, for example, refining the current foresight practice and methods, linking to other approaches and tools, as well as adapting other tools and processes (Kristóf, 2013; Rohrbeck & Bade, 2012; Vecchiato, 2012).

Urgent and non-urgent complex problems are addressed in similar ways, however need may drive an increase in the number and timing of efforts undertaken, and strengthen implementation and communication around outputs. This dissertation does not provide illumination on whether need or urgency creates a more effective or expedient outcome of efforts invested. Further, one cannot assume urgency will have a significant positive impact on outcomes, as per the ongoing struggle humanity faces.

Of significance is the lack of differentiation between the ways in which non-urgent and urgent complex problems are being addressed. For instance, one can arguably suggest Fore-CAN and Transformation of the Canadian Payment System were two of the largest and most urgent projects of the broader six cases reviewed in this dissertation. Regardless, the approaches and time involved for these projects were not distinct from the other projects in a way that can be related to urgency. More so, interviewees as well as literature sources have identified the importance of addressing urgent complex problems differently but have only recently started to differentiate between ways to address urgent complex problems and non-urgent complex problems. This leads to a possible hypothesis that significant effective mechanisms do not yet exist to alleviate urgent complex problems except for the potential of preparatory efforts to transition through an immediate overwhelming crisis, such as, the occurrence of a pandemic.

Findings.

Chapter 10 provided an overall review of findings from the previous chapters according to six themes. These are:

- How foresight is practiced in Canada
- Range of foresight types practiced
- Validation of findings in foresight literature
- Barriers to alleviating complex problems hinder dialogue-based foresight practice outcomes
- Strengths and weaknesses of dialogue-based foresight
- Dialogue-based foresight’s value in addressing complex problems

Chapter 11 provided new findings and a discussion of these findings as per phase 3 of the research: insight development into dialogue-based foresight's potential contribution for alleviating complex problems and their effects in the Canadian context. Significant findings outlined in the chapter have led to the development of the insights into the role of dialogue-based foresight, and to some extent foresight. These insights respond to the last half of the dissertation's research question: "…how can dialogue-based foresight assist society to alleviate complex problems and their effects in the Canadian context". These findings are reviewed.

Humanity faces a very complex predicament, a struggle for survival, with several global complex problems that are being addressed in many forms with the hope that these efforts will result in the amelioration of this predicament and global complex problems. Furthermore, societies continue to look for ways in which to enhance this emergence. In addition to discoveries which further strengthened findings in the literature, Chapter 11 offers insights into advancing positive outcomes.

More work from all individuals and groups are required to alleviate complex problems and their negative consequences. The preference of most of the expert interviewees is to have these efforts take various forms in an ongoing concurrent nature. The multitude of activities underway to address humanity's struggle for survival and related complex problems are discernible in two conceptual frameworks: *wide-ranging independent* and *mainstream planned*. It would be beneficial to have shared aspirations, values, narrative and memes as an overarching guide to these activities. It is also important to advance transformative work with timely results. To enable this advancement, integrating and linking to various approaches and subjects are helpful as is taking note of practical considerations. A consensus is developing on the importance of utilizing certain approaches/subjects. For instance, there are certain topics and approaches that may yield stronger outcomes and assist with transitioning through humanity's struggle for survival, i.e., the human dimension and foresight. As such, it would be advantageous to explicitly link the efforts taking place to the ultimate outcome of sustaining and improving individual well-being and humanity's well-being in the long term.

Dialogue-based foresight as well as foresight can assist society in several ways to alleviate complex problems. At least four areas are a priority: developing foresight literacy and capacity for foresight, identifying shared aspirations/narrative/values as a guide, assisting in transitioning through complex problems, and facilitating ongoing use of dialogue-based foresight for specific complex problems. More research in numerous areas would facilitate the contributions of foresight. The insights from Chapter 11 are translated into implications, recommendations and next steps in the next section.

Implications/recommendations/next steps.

It is very important to surmount barriers to foresight becoming a mainstream practice, (e.g., its uniqueness, past negative experiences, lack of its appreciation and understanding, level of resources required), to advance foresight's roles in alleviating complex problems and their negative consequences. The reason for this importance is foresight has been proven to be valuable, transformative and unique with various roles to play in humanity's current predicament. The implications in this section build on the notion of this importance to become a mainstream practice, dissertation findings, and within the findings the roles dialogue-based foresight as well as foresight can fulfil.

This section is broken down into five areas of implications, in no particular order, which are then followed up with recommendations for action and then research. The first two areas are recommendations to direct efforts at advancing foresight literacy and building capacity for foresight. The following two implications are directed at the foresight community and addressing system/organizational/institutional barriers to foresight. The last area focuses on advancing dialogue-based foresight for transitioning, identifying shared values and narratives and facilitating ongoing use of foresight for specific complex problems. Since these areas of implications are mostly not new, details for how to work with these implications are outlined in the literature.

As explained throughout this dissertation, foresight literacy, the communication and education around foresight and the facilitation of a culture of foresight are critical for the advancement of the field as well as for alleviating complex problems and their negative effects.

This is the first recommendation of where to invest efforts. Authors have suggested ways in which foresight literacy can be increased (Bishop & Hines, 2012; "How to Use This Manual," 2018; Miller, 2018). Several materials and websites on foresight in general are also available. Other findings from this dissertation include broadcasting successful foresight cases more broadly, and facilitating organization and dissemination of information in relation to Canadian foresight. Samples of other areas related to this topic include anticipatory governance and developing foresight literacy for school-aged children. Similar to requirements set out in the Calls to Action - Truth and Reconciliation Report for indigenous education (Truth and Reconciliation Commission of Canada, 2015), there needs to be a structural and moral imperative to provide foresight literacy training widely to at minimum public administrative professionals and students, and ideally to embed foresight literacy into the grade school curriculum nationwide. This action would address many of the fundamental elements in these recommendations (of note, the World Futures Review has dedicated both issues 3 and 4 in Volume 10 (2018) to foresight education).

The second recommendation is more resources, especially sustained resources, need to be directed at the development of foresight and its capacity. Although the Canadian foresight community produces significant work, there is limited scope for foresight in Canada and the community is not very cohesive. This is not surprising, as the field has developmental issues and has also suffered setbacks to obtaining mainstream status. Even though members of the Canadian foresight community are addressing these challenges, the community needs support from other members of society. For instance, key stakeholders such as public administration professionals would benefit from greater foresight literacy that they can then use to help increase literacy in the broader public as well as put forth efforts to support foresight in various ways. Areas to address, for example, include: more training and educational programs in foresight, improvements in communication around the practice, facilitation of appreciation/understanding of foresight, advancements in assessment/evaluation of the field, and making headway regarding certification and institutionalization issues, e.g., external provision versus internal departments, of the practice. Building foresight capacity has also been addressed in the broad literature ("Conversation with Wendell Bell," 2007; "Foresight Manual: Empowered Futures for the 2030 Agenda," 2018; "How to Use This Manual," 2018; "The futures toolkit: Tools for futures

thinking and foresight across UK government," 2017; Conway, 2015; Hietanen, Lefutso, Marais, Nyewe, & Daniel Semwayo, 2018; Hines, 2016; JRC European commission, n.d.; Klakurka & Irwin, 2016; M. Ramos, 2004; Wilkinson, 2017).

Furthermore, there are several ways in which foresight could be improved with and without more resources. This dissertation identified at least eight ways in which foresight could be potentially strengthened, e.g., suitability of approach, as per Chapter 4. A portion of these methods are being utilized by some and foresight is being advanced on an ongoing basis. In addition, throughout the findings interviewees have suggested ways in which to improve foresight. Finally, Chapter 9 provided a set of guidelines as part of a change theory based on the empirical evidence from the dissertation and Chapter 11 made specific recommendations for foresight in the context of working with complex problems. However, it can be very difficult to focus on improving the practice when sustained resources are not available and efforts need to be expended on business development, management of expectations, and broader communication.

It is well-known that resources are scarce and efforts to acquire them are extremely competitive. Yet, the implications are that the public, non-profit and private sectors, and specifically educational institutions, need to expend more resources on humanity's struggle for survival and associated complex problems by allocating sustained funding for foresight work in terms of complex societal problems. Literature may be helpful on how to make the argument for foresight (e.g., Conway, 2015; Richards & Carruthers Den Hoed, 2018; Tan & Chong, 2010). Alternatively, resources can include more than providing direct funding. For instance, non-profits and educational institutions can facilitate research initiatives and provide training on the topic.

Strengthening the Canadian foresight community is the third implication from this research. This is in part linked to the other recommendations as sustained funding and greater foresight literacy/culture strengthens the ability of the foresight community to deliver more and higher quality foresight. Moreover, if members of the community have increased confidence in delivering their services this could result in more cohesion around foresight and the ability/further need to address ambiguities as well as weaknesses in the field.

System, institutional, and organizational barriers to practising foresight and achieving impact have been identified throughout this dissertation. Moreover, these barriers have been identified as obstacles to mainstreaming foresight, e.g., short-termism, lack of openness and lack of appreciation of qualitative approaches. The fourth implication is to work to reduce these barriers. An interviewee commented that their department has completed many more foresight projects since they stopped using the term "foresight" to refer to the work. Some of the authors who identify barriers to foresight also suggest ways in which to address the obstacles.

The fifth and last implication includes increasing the use of dialogue-based foresight, preferably in an ongoing fashion, as per at least three areas already identified: transitioning through complex problems, identifying shared values and aspirations, and directing efforts at specific complex problems. This means potential foresight clients and public administration professionals should consider familiarizing themselves with dialogue-based foresight, seek it out, ask questions, keep an open mind and integrate dialogue-based foresight in their work as appropriate. In addition, these groups of individuals can be instrumental in promoting, teaching and researching foresight in general. Increasing the use of dialogue-based foresight also means a need for more leaders/champions/advocates for foresight until the practice becomes embedded in processes of various governmental institutions and mainstreamed into society.

Recommendations for further research.

Throughout this document recommendations have been provided for further research. To illustrate, within the dissertation the findings highlight the importance for research on other types of foresight and their potential contributions to alleviate complex problems; on foresight typologies, successes and lessons learned from Canadian cases; and private sector directed foresight for complex societal problems. Further recommendations are restated and expanded upon in this section.

To advance the findings from this dissertation, comparative assessments of additional cases on Canadian topics would be valuable. Also, this dissertation could be followed up in the long-term or replicated with other research designs. The findings from this research could be

tested in other dialogue-based foresight projects. Research results from this document could also be illuminated by testing of and elaborating on assumptions and links in the change theory identified in Chapter 9. For instance, the degree to which impacts are experienced, providing alternatives to face-to-face group dialogue within the foresight process, and identification and testing of other significant factors, are possible avenues for research. Further research is also necessary to validate changes in individuals at an aggregate level due to dialogue-based foresight, as identified in this dissertation, in terms of providing a stronger contribution story. An immediate pre/post project comparison study and then a longer term follow-up study for the same case would be helpful in this regard.

Of primary importance is research focused on the four areas of foresight that directly relate to alleviating complex problems and their effects: (i) developing shared aspirations/shared narrative, (ii) facilitating a transition through the current crisis, (iii) facilitating improvements and ongoing use of foresight for specific complex problems, and (iv) expanding foresight capacity and literacy through, for instance, educational institutions, e.g., a research chair, large research initiative, formation of an institute, and associated educational programs. It would be interesting to assess the perspectives and knowledge of Canadians, especially potential clients, regarding foresight literacy and complex problems while taking the opportunity to increase the awareness and knowledge around foresight. The implementation of developing shared aspirations/shared narrative would benefit from research on how to increase its feasibility. Countries such as Singapore have foresight functions working in this regard (Ho & Kuah, 2003; Kuah, 2013). Further, research on providing greater description and detail around how best to facilitate transitioning through these complex problems using dialogue-based foresight would be important. In addition, several options exist for next steps in practice, e. g., wider dissemination and discussion of the findings from this research for the foresight community, complex problem community and for related fields.

There are several options that could be pursued in general for further research on dialogue-based foresight for complex societal problems. For example, dialogue-based foresight used in different problem areas could be studied to assess the differences and similarities between the areas; different dialogue-based foresight projects could be assessed at different

scales to provide insights into foresight's effectiveness in different geographically sized areas; and different foresight types could be assessed as to their effects on supporting and influencing people and managing complex problems. In addition, research on wide-ranging independent efforts would be enlightening. Other areas of research are outlined below, originally offered in Chapter 4 of this document.

Areas for further research include:

- Conduct a further examination and comparison of the development of emerging disciplines as compared to foresight;
- Describe overall usage of foresight in the private sector and non-profit organizations as well as in specific regions of the world as linked to complex societal problems;
- Assess trade-offs in foresight practice, e.g., internal versus external function, funds diverted to communication efforts and evaluation, & scaling-up the practice;
- Identify the diverse stakeholders involved in foresight and their roles;
- Conduct a research study to assess public knowledge and perception of foresight;
- Identify clear distinctions between the application and benefits of current non-foresight practices and foresight practices used for similar purposes in all sectors;
- Provide more consistency and transparency in foresight;
- Develop more state of the science type summaries to facilitate appreciation of advances in the field;
- Review specific foresight exercises that have occurred in-depth and present more instances when the exercise may have been counter productive;
- Examine how integration and linking of foresight and other approaches is best utilized from case evidence and delineate results of these activities;
- Attempt to identify the extent of indirect foresight activities in Canada, e.g., used for strategic planning;
- Conduct empirical research as to which practices may be more effective in addressing complex problems in Canada, how and when;
- Generate a typology of the different kinds of foresight approaches used in practice;
- Identify ways in which the impact of a foresight activity is affected by the way the practice is carried out, e.g., inherent teamwork or organizational issues;

- Conduct an in-depth systematic review of the literature on foresight stages and activities to draw out success as well as hindering factors from specific Canadian cases, particularly on participatory approaches would be essential to examining ways in which democratic engagement is possible and can be beneficial;
- Use a different qualitative lens in reviewing the scenario process as a social process;
- Link to other literature, e.g., on social processes such as cognitive psychology, that has a bearing on foresight and can continue to be utilized to understand and strengthen foresight theory; and
- Develop guidelines for a tailored approach to address urgent complex challenges in a transformative way.

Limitations of the dissertation research.

As delineated within Chapter 3 and Chapter 6, the potential for limitations within the research have been identified prior to the investigation and addressed within the research design and write up of the document to ensure robustness, rigour and flexibility. Additionally, problems have been resolved as possible when they arose. These limitations and efforts to counter their effects are reviewed again in this section and expanded upon. The challenges have been methodological and content related.

There are at least four methodological limitations of this dissertation: generalizability, not exhaustive, no direct causal analysis and perceptions-based data collection. The first limitation is inherent to the case design methodology. For instance, the findings are specifically applicable to the problem area and situation studied, with limited application to other problems, contexts and foresight types. Further issues are inherent in case design. However, this is comparable to other methodological approaches in that they also have their own accompanying issues. Next, this research is not exhaustive, in other words, all factors and stakeholders cannot be addressed within the scope of this dissertation. Third, direct causal linkages are not pursued as this is nearly impossible with many factors and a time lapse involved. Finally, a significant portion of the data collected has been based on perceptions of individuals and this type of data depends on the fallible human construct and memory. However, this is not to say that perception is inimical to

reality, epistemologically perception for most individuals is reality. As indicated there is room for further research.

To be expected, issues that have been encountered during this dissertation are comprehensiveness and scope of dissertation topic, i.e., doable, creep of scope, personal expertise, and responsiveness and availability of participant population. As this dissertation topic is focusing on breadth and "big picture" connections, depth has been reduced. This is not a traditional way of completing a PhD and has been difficult to maintain. Further, the content, as seen from the literature review sections, is expansive and limits have had to be clearly defined as to what is important without allowing for creep of scope. Personal expertise in a breadth of areas is also limited as it is unlikely that the researcher can be an expert in a broad number of areas. This has been addressed by consulting experts throughout the process. Other concerns have been accessing and participation of the target population. This has been addressed through the robustness of the research and attending to the issue as it surfaced.

Three more limits exist per the content of the study: the private sector is not well addressed; ambiguity/paradoxes in the field affect the research and communication surrounding it; and foresight, complex problems, and context are under significant and continuous change – "a moving target". To attend to the first limitation a suggestion for further research includes studying the private sector's use of foresight for addressing complex societal problems. As per the dynamic nature of the topics under study, documentation of the findings has reflected data collected and the situation at the specific time studied. Concerning both ambiguity/paradoxes and continuous change of content, segments have been written up in various areas of the document eluding to both challenges, i.e., principles, assumptions, and parameters of the research within the introduction, and literature review sections. To further address ambiguity the researcher has included in some cases the restatement of information and additional section summaries to provide added clarity.

Significance.

The significance of this dissertation has been outlined in the introductory chapter, but it is highly relevant to reiterate and elaborate on some of the points. This section is outlined per the

significance of this research for specific audiences. Foresight is valuable with the potential for transformative impact on more than the rare occasion. This research delineates through a rigorous process specifically how, why, and what has or has not worked in Canada to confirm and build upon findings in the literature. Further, the dissertation provides for a stronger appreciation of foresight and dialogue-based foresight as it is used for complex societal problems with several discoveries relating to both types of practice. Also, research results have identified several roles for foresight, and especially dialogue-based foresight, in assisting society to alleviate urgent and non-urgent complex problems as well as their impacts. Finally, this document has reviewed barriers to mainstreaming foresight and made specific recommendations on next steps.

Significance per audience type.

Potential clients and potential facilitators of foresight, such as members of governments including politicians and public servants, educational institutions, professional associations and complex problem communities have a primary role. This group has the opportunity to appreciate foresight and dialogue-based foresight in greater depth as a valuable tool and lens to ameliorate complex problems and their effects. More so, this greater understanding provides these individuals with the information of how to use these types of foresight with the knowledge that it is not a precise science but rather a combination of art and science. Also, with the consideration of the value foresight offers for humanity's struggle for survival and the evidence of this, foresight can be taken more seriously and furthered as a mainstream practice. The practice is worth the effort of potential clients and potential facilitators overcoming the barriers facing its use and taking on a further important role in facilitating its capacity building.

Theory is advanced in several ways. This dissertation is significant because it has validated foresight findings in the literature empirically in terms of complex societal problems in Canada and advanced knowledge of the practice and the foresight community in Canada. In addition, the development of a preliminary change theory to complete a contribution analysis has provided another theoretical perspective on how foresight contributes to outcomes. New findings have also furthered theory both in foresight, but also in terms of complex problems, e.g., how

complex challenges are being addressed, foresight as a tool to address these problems, and how the literature is progressing in the area. Other significant findings include (i) recommendations for further research, (ii) a greater appreciation of how foresight functions in a national context, (iii) why dialogue-based foresight is an important type of foresight, and (iv) an example of a research review of the interaction of several key topics to provide aggregate assessments and broad transdisciplinary recommendations.

Professionals in the foresight practice field can review case studies and aggregate practice guidelines and be reflective about the practice, including successes, issues, as well as information about the Canadian foresight community. This material is significant for a reflective practitioner. This knowledge allows for improvements and advances in foresight, ways in which to advance mainstreaming of foresight as a field, and reasons to strengthen the foresight community and distribute related information. Moreover, professionals interested in alleviating complex societal problems can relate and perhaps take on and advocate for the roles dialogue-based foresight and foresight can play in alleviating complex problems and their consequences.

Participants in this dissertation gained practical benefits from being involved in the research which can be outlined as follows. Strengthening of networks and collaborative efforts for foresight and complex problem management communities could have been achieved. More organizations and citizens were informed about the connections between foresight, dialogue-based foresight and complex problems. Hopefully, this has resulted in some participants becoming increasingly familiar with and involved in addressing complex problems by working with foresight practices. Lastly, more cross-communication among different levels, e.g., grassroots, elite, and disciplinary areas of the population potentially arose through reflecting on the related material.

Summary.

Foresight is a voyage, an experience and a process that requires levels of appreciation. Throughout this document different aspects and perspectives on foresight have been offered to advance an appreciation of the field and the practice. This chapter has summarized several critical pieces outlined within this dissertation. It has responded to sub-research questions,

reviewed major findings, presented limitations, and offered implications. The significance of this dissertation was then outlined per audience type, covering practical and theoretical dimensions. The dissertation is unique and significant in its approaches to assess foresight interplays with people and context, topic, systematic process including a comparative multi-case study, and delineation as well as examination of a dialogue-based foresight type.

Dissertation concluding comments.

At the beginning of this dissertation, humanity was presented as facing a critical juncture in which the probability of devastating crises is increasing as time passes, crises such as population and level of affluence resulting in demands and impacts rising beyond earth's capacity, technology evolving towards artificial intelligence, technology spreading with the increasing likelihood of a nuclear war, and global ecological change furthering mass extinction of multiple species and reducing the habitability of the planet. Partially due to increasing complexity and a mismatch of current structures and practices, complex problems are increasing in their number and effect without any significant progress in their resolution. Of vital importance is to transition through this juncture with minimal human suffering, with minimal irreversible damage to our society as well as our planet, and without significant dehumanizing of society.

To address these global problems, society's members are, for instance, working against barriers, attempting to fill gaps in practice and knowledge, and formulating different perspectives. One correct, effective, transformative and expedient method/solution/perspective to alleviate complex problems does not exist. Rather, a combination or cross-fertilization of different tools and approaches, and an integration of efforts is required.

Foresight is valuable in different forms and for different functions but selectively. It does not necessarily provide either transformative or urgent results, but it can be transformative or very valuable, with ways to improve at hand. Furthermore, it has unique roles to play in the toolbox of available approaches and can supplement or link well, if appropriately used, to the other tools. However, foresight, as well as the rest of the tools humanity has at its disposal, face many barriers and developmental issues. Efforts are ongoing to address these issues.

There has been a significant change in foresight practice and literature over the past 10 years, and progress is noteworthy within approximately the last three years in the broader literature on working with complex problems and humanity's struggle to exist. Significant support in the literature for foresight across disciplines and fields is unmistakeable (Adegbile et al., 2017; Amanatidou, 2017; Bingley, 2014; Bootz, 2010; Bourgeois, 2014; Oteros-Rozas et al., 2015; Rohrbeck, 2012; Rohrbeck & Schwarz, 2013; Wiebe et al., 2018). The literature is abundant and the practice wide-ranging; both are expanding (Iden et al., 2017; Saritas, 2018). However, there needs to be an active push to mainstream foresight (Dator, 2017) for the sake of humanity's well-being. Many decision-makers, especially in the public administration and policy arenas in Canada, educational institutions as well as more broadly, have been slow to appreciate or act on the significance of the current emergency at their own peril. Yet, using dialogue-based foresight is very timely as a risk management tool and a way to address global concerns such as inequity and sustainability (Bezold, 2017, 2018). More so, each person can contribute to alleviating complex problems and strengthening humanity's chances for survival by engaging with humanity's struggle and foresight.

This dissertation has found dialogue-based foresight to be unique and valuable in assisting society to alleviate complex problems and their effects. Besides the many commonly cited benefits of foresight, the practice offers a way to define the present in terms of the future (Miller, 2018). Furthermore, it provides for an opportunity to define *being Canadian* and Canadians' goals for the future. Through experiential futures, foresight even offers the ability to some degree to experience a potential future. However, foresight capacity, development and literacy must be advanced. Establishing legitimacy, trust and confidence in foresight with stakeholders, including the broader public, are critical to mainstreaming foresight (Slaughter, 2009; Van der Steen & Van der Duin, 2012).

In addition, embedding foresight in practices and applying it continuously should be important objectives for Canada to achieve some form of anticipatory governance and culture change, especially in government institutions (Bezold, 2017; Boston, 2017; Georghiou, 2003; Inayatullah, 2015a; Muliro & Eyakuze, 2013). Governments and stakeholders actively interested

in humanity's well-being need to use the future differently today (Miller, 2017). For this they need to be foresight literate to open up rigid mental frames of the past into flexible and creative minds for the future (Wilkinson, 2017). If this is achieved, more foresight experts will likely be interested in working in the difficult space of the public sector and more likely to impact on complex problem outcomes.

In reflection, work on complex problems and humanity's long-term well-being is not about controlling the situations people are in but rather not entirely losing control of them. It is about being liberated to act and hope but not giving in to complacency, fear or panic. Finally, well-developed stories have been enduring throughout history and society could find it helpful to renew their use of and learning from stories. Stories can provide leadership, but numbers have only augmented stories. History has not found the numbers to be as memorable as the stories. Foresight is about stories, dialogue and achieving balance. It is time to stop deliberating and start integrating foresight.

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Appendices

Appendix A: List of Foresight Related Institutes Worldwide

Nordic Institutes

FMS, Environmental Strategies Research (Sweden) The Pufendorf Institute (Sweden) The Royal Academy of Engineering Sciences (Sweden) Swedish Foundation for Strategic Research Institute for Futures Studies (Sweden)
Kairos Future Group (Sweden)
Copenhagen Institute for Futures Studies (CIFS) (Denmark) House of Futures (Denmark)
Finland Futures Research Centre
Finnish Society for Futures Studies
Finnish Parliament's Committee for the Future
The Nordic Innovation Centre (Norway)
International Centre for Integrative Studies (ICIS) (Netherlands)
The Netherlands Organization (TNO) for Applied Scientific Research

European Institutes

Futuribles (France)
The Club of Rome (Switzerland)
The Institute for Futures Studies and Technology Assessment (Germany) The World Future Council (Germany) The Foundation for the Rights of Future Generations (FRFG) (Germany)
Future 25 (Germany)
The Foresight Programme and Horizon Scanning Centre (UK)
Forum for the future (UK)
EcoLabs (UK)
Shaping Tomorrow (UK)
Humanitarian Futures Program, King's College, (UK)
The Future of Humanity Institute (UK)
Manchester Institute of Innovation Research (UK)
International Futures Forum (Scotland)
The Futures Academy @ Dublin Institute of Technology (Ireland)
"Poland 2000 Plus" Forecast Committee
Institute for Strategic Research (Hungary)
The Russian Futures Studies Academy
Club 2015, Russia
The Estonian Institute for Futures Studies
The Forward Studies Unit (Latvia)

Global Institutes

UNESCO, Bureau of Strategic Planning, Anticipation and Foresight Program (France)
European Science Foundation's Forward Looks (France)
The OECD International Futures Programme (France)
The European Foresight Monitoring Network (EU) (Brussels)
Foresight for the European Research Area (FORERA)
Institute for Prospective Technological Studies (IPTS) (Spain)
The Millennium Project (USA)
REOS: Innovation in Complex Social Systems

The World Futures Studies Federation
Humanity Plus/World Transhumanist Association

USA Institutes
Belfer Center for Science and International Affairs (JFK Sch of Govt, Harvard U) (USA)
Future Search Network (USA)
Institute for the Future (USA)
International Institute of Forecasters (USA)
The Hawaii Research Center for Futures Studies (USA)
The Association of Professional Futurists (USA)
Institute for the Future (USA)
The Institute for Alternative Futures (USA)
The Long Now Foundation (USA)
The National Academies Keck Futures Initiative (USA)
The Stanford Center for Foresight and Innovation (USA)
The World Future Society (USA)
The Tellus Institute (USA)
RAND Corporation (USA)
The Frederick S. Pardee Center for the Study of the Longer-Range Future (USA)
Acceleration Studies Foundation (USA)
Foresight Institute (USA)
The DaVinci Institute (USA)
Institute for Global Futures (IGF) (USA)
Institute for the Future at AACC (USA)
Arthur C. Clark Center for Human Imagination @ UCSD (USA)
Resources for the Future (RFF) (USA)
The Arlington Institute (USA)
Singularity University (USA)
Global Options (USA)
Norwich University Applied Research Institutes (NUARI) (USA)
SRI International (USA) (Menlo Park, CA)
TechCast (USA)
Trends Research Institute (TRI) (USA)
Science and Technology Innovation Program at WWICS (USA)
Atlantic Council The Strategic Foresight Initiative (USA)
Center for Future Consciousness (USA)

Canadian Institutes
OCAD University Strategic Foresight and Innovation (Canada)
Strategic Innovation Lab (sLab) at OCAD University
Social Innovation Labs
Policy Horizons Canada
Foresight Canada
International Institute for Sustainable Development (IISD) -Foresight Group (Canada)

Oceania Institutes
The New Zealand Futures Trust
metafuture.org (Australia)

Centre for Australian Foresight
The Asian Foresight Institute (Australia)
Foresight International (Australia)

Asian Institutes
Asia Pacific Economic Cooperation (APEC) Center for Technology Foresight (Thailand)
Strategic Foresight Group (India)
The Mother's Service Society (India)
University of Kerala (India)
The Azerbaijan Future Studies Society (Azerbaijan)
The Graduate Institute of Futures Studies (Taiwan)
Center for Engaged Foresight (Philippines)
Centre for Strategic Futures (Singapore)
The Center for Futurism in Education (Israel)
The Interdisciplinary Center for Technological Analysis & Forecasting (Israel)

Other Institutes Worldwide
The Institute for Futures Research (South Africa)
Futures studies Forum for Africa & the Middle East (FSF) (South Africa)
International Academy of Political, Administrative, and Futures Studies (IAPAS) (Mexico)
Development Foresight Institute (Jamaica)
Nucleo de Estudos do Futuro (Center for Future Studies) (Brazil)

Appendix B: Interview and Survey Questions

Sample interview questions for foresight community research (phase 1).

1. What is your principal professional role?
2. Have you been a participant in a foresight project?
3. Have you been a client for a foresight project? (instrumental in the decision to proceed with or fund a foresight project)
4. In your opinion, what is the value of foresight in addressing complex problems?

   A. Very valuable
   B. Valuable
   C. Limited Value
   D. No Value

5. Dialogue-based foresight is defined in this survey as a foresight approach focused on both process and outputs and reflects an open, honest and engaged exchange of viewpoints and ideas. What do you think is the value of dialogue-based foresight in addressing complex problems?

   A. More valuable than other foresight approaches
   B. Same value as other foresight approaches
   C. Less valuable than other foresight approaches

6. In your experience, how important is democratic engagement to foresight when addressing complex problems?

   A. Very important
   B. Important
   C. Slightly important
   D. Not important

Can you elaborate?

7. Would you be able to identify two major difficulties you are familiar with in incorporating democratic engagement into foresight activities?

8. Do you consider shared mental models important for foresight to have an impact on addressing complex problems? *Mental models can be defined as an individual's conceptual constructions of reality based on their personal beliefs and assumptions.* Why?

9. Can you please identify what you would consider as two successful Canadian foresight projects completed within the last 10 years?
10. Can you please identify what you would consider as two unsuccessful Canadian foresight projects completed within the last 10 years? Consider those projects that were well prepared and well delivered.
11. How have you defined successful foresight practices versus failures? What is the key difference?

12. For the purposes of this survey, a stakeholder in the Canadian foresight community (as related to complex problems) has been defined as an individual who has worked in the area of complex social/policy problems and either:
    A. conducted or contracted foresight projects with Canadian content within the past 10 years;
    B. delivered education, consulting and/or research services in Canada for more than one year;
    C. and/or consumed education, consulting and/or research services in Canada for more than one year. Alternatively he or she could have participated in several foresight activities or an ongoing project.

    Generally, the types of people included are academics, professionals, clients, researchers…

    Can you please identify three highly knowledgeable and well respected stakeholders in this Canadian foresight community.
13. In your opinion, what does foresight offer that is critical in comparison to other similar services, for example, planning sessions, community member engagements, market studies, etc. ?
14. Can you provide insights into how foresight could be improved generally? and for complex problems specifically?
15. How would you complete this statement? Foresight can be more valuable if used with the following services/interventions...
16. Would you please consider this statement. Foresight can be more valuable if used with which tools...
17. What are your top two biggest problems, challenges, or issues with foresight?
18. Can you please identify any negative effects you may have experienced related to participating in a foresight activity or project?
19. Have the foresight activities or projects you have been involved with been evaluated? How? Is there a major need for improving upon evaluation processes? If yes, can you go into more detail?
20. Based on your experience and current assessment, what are the most significant barriers we face in addressing urgent complex problems?
    Urgent complex problems being defined as complex problems that need to be addressed expediently due to potentially major detrimental consequences for human well-being.
21. On what types of activities do you think more resources should be placed to address urgent complex problems?, *e.g., research, advocacy, public engagement, horizontal coordination, foresight, etc.*?
22. Do you think foresight has a role in addressing complex problems? What is that role? Why? Could and if so should foresight be improved in its role?
23. What are the strongest factors you have come across that impact upon cross-sector collaboration?

24. Do you have any additional comments you would like to share either regarding earlier questions or anything else I haven't asked perhaps…?
25. Do you have any questions for me?

Survey questions for foresight community research (phase 1).

1. What is your principal role (you may select more than one)?

Response
Technical expert
Researcher
Educator
Consultant
Analyst
Manager
Executive
Community member
Student
Other, please specify...

2. Is your organization considered a ...

Response
Not-for-profit
Public (i.e. government funded)
Business
Social enterprise (i.e. maximize social benefit over profit)
Other, please specify...

3. How do you define foresight or what do you think are the key defining elements of foresight?

4. How have you defined whether a foresight project is successful?

5. In your opinion, if foresight is well delivered how valuable can it practically be in addressing complex societal problems?

Response
Very valuable
Valuable
Limited value
No Value

Why?

6. Below is a sample of foresight projects completed within approximately the last 10 years directed at a Canadian societal or public sector complex problem. Please identify information (fill in as much as possible) for three more projects if you may be aware of them and consider them significant to add to this inventory. Please move bar right to fill out all columns. *More space is provided if you would like to add more than three.*

Scenario-based Planning for a Changing Climate in the Bras d'Or Ecosystem
Canadian Artic Research Initiative
The Global North 2050 Project
SSHRC – Imagining Canada's Future
Blueprint 2020
Policy Horizons' Meta-scans
The Future of Al Qaeda
Children and Physical Activity Scenarios Project: Evidence-Based Visions of the Future
Fore-CAN: Foresight for Canadian Animal Health
Outward Bound 2050
Health Foresight Initiative - to 2030
Foresight Climate Change Impacts and Adaptation in Agriculture 2010-2030
Forest Futures Project (2007-2009)

	Project title	Completion date	Lead organization	Contact name	Successful	I was/am involved in the project
Project #1					☐	☐
Project #2					☐	☐
Project #3					☐	☐
					☐	☐
					☐	☑
					☐	☐

Comments?

Sample interview questions for Fore-CAN case study (phase 2).

1. What was your principal professional role during the time period the foresight project took place – your work role not your role as a part of the foresight project?

2. What is your current principal professional role?

3. What do you think was the main problem regarding emerging infectious animal diseases in 2009?
4. What do you believe was of the highest need or priority action that should have been taken to address this problem at that time?
5. If you were to put yourself in the position of a *gov't* ***OR*** *industry* member what would likely have been your priority?
6. What do you think were the major issues impeding management of emerging infectious animal diseases? and major interventions advancing their management? Why? *To what extent?* Did Fore-CAN help with these impeding issues or facilitate those interventions that advanced it?
7. On a scale of 1 to 5 with 5 being the strongest, how important is a strong Animal Health Emergency Management system to addressing the problem of emerging infectious animal diseases?
8. Do you believe this problem is being well managed now? If not, what would be a satisfactory result?
9. Do you think this foresight project, Fore-CAN, was a success or a failure and why?
10. What significant benefits have been produced by Fore-CAN?
11. Were your expectations for this foresight project met?
12. Have you learned anything from Fore-CAN that you hadn't anticipated you would? What was it?
13. What related follow–up steps did you take after the foresight project, if any?
14. For this question I will list a number of areas and ask you if foresight has affected you in any of them? Please answer yes or no. If one of the following has had a very strong impact please indicate this. (*list dimensions and subject areas*)

Dimension	**Descriptors**
Cognitive	Increase learning, understanding, openness, awareness, long-term focus
Emotional	Positive, empowered, stress, coping
Spiritual	Purpose, hope, vision, aspiration
Social	Connective capacity, networks, dialogue, co-production, conflict management, collaboration, belonging, handle diversity
Physical/Behaviour	Actions taken, physical effects of foresight & other resulting outputs, sustained change, practical rationality
Paradigm Shift	Holistic, non-linear, changed views and mental models
Subject Area	
Personality	Attitudes
Perception	Openness, framing of problem, seeing different possibilities & visions

Self-awareness	More aware
Motivation	Critical, what motivates, more motivated, engaged
Leadership	Views on, changed conduct
Creativity/innovation	More innovative/creative
Decision-making	Different models, How does it occur? Better?
Problem-solving	How does it occur? Better?
Culture	Changes norms, values, social structures, common-good view

15. How many foresight exercises/projects have you participated in? related to animal health? On average please rate the value of foresight from 1-5, with 5 being the highest value? *How did this project rate in comparison to the other foresight projects you have participated in- a)more value b)less value or c)equal value?*
16. What do you think is the value of foresight in comparison to traditional group planning efforts used for addressing societal complex problems? Is it a)less valuable, b) more valuable, or c)of equal value?
17. Do you think the value from Fore-CAN is more, equal to, or less than the value of the resources invested in the project?
18. Using the scale of 1 – 5 for all, can you please rate the value of Fore-CAN in addressing the complex problem of infectious animal diseases in terms of its Effectiveness? Efficiency? Collaboration? Could the value of this type of foresight be increased? If so, how?
19. I am going to identify a few variables and ask you whether you think they have had a particularly strong effect on the how successful Fore-CAN was. Please answer yes or no. The process used? The context (e.g., culture, laws, type of environment) in which the complex problem takes place? Resources invested? Supporting tools used with the foresight project? Alternative interventions taking place during the foresight project? Has any particular element of Fore-CAN stood out as really valuable? Have there been any negative effects of this foresight project? Level of significance? Why? How?
20. Would you say process outputs (e.g., learning, networking, experiencing, and discussing) were greater than product based outputs (e.g., reports, decisions made, policies developed and action steps) for this foresight project? Which would you say have had a greater impact on this **complex problem:** the process outputs or product outputs?
21. Have you or your organization used foresight since?
22. What would you define as progress in working with the complex problem in the last 5 years? What is the main reason for progress? Lack of progress? How much of an impact has Fore-CAN had in terms of that progress (scale of 1 to 5)?
23. What needs to happen next to address this complex problem further, if anything?
24. Do you have any additional comments you would like to share either regarding earlier questions or anything else I haven't asked perhaps…?
25. Do you have any questions for me?

Sample interview questions for Georgia Basin Futures project case study (phase 2).

Only as necessary!

1. *What was your involvement in the Georgia Basin Futures Project or GBFP?*
2. *What is your current principal professional role?*
3. *Past role?*
4. What do you believe was of the highest need or priority action that should have been taken to target sustainable development in the Georgia Basin at that time?
5. What do you think were the major issues impeding progress towards sustainable development in the region at that time? and major interventions advancing sustainable development? Why? *To what extent?* Did the GBFP help with these impeding issues or facilitate those interventions that advanced it?
6. On a scale of 1 to 5 with 5 being the strongest, how successful was the GBFP to addressing sustainability in the region?
7. What significant benefits have been produced by the GBFP?
8. Were your expectations for this futures project met?
9. Have you learned anything from the GBFP that you hadn't anticipated you would? What was it?
10. What related follow–up steps did you take after the project, if any?
11. Were you a participant in any of the events or used the Quest software at all?
12. *If more in-depth role or yes to above*, for this question I will list a number of areas and ask you if GBFP has affected you in any of them in your daily life or other projects for example? Please answer yes or no. If one of the following has had a very strong impact please indicate this. (*list dimensions and subject areas*)

Dimension	**Descriptors**
Cognitive	Increase learning, understanding, openness, awareness, long-term focus
Emotional	Positive, empowered, stress, coping
Spiritual	Purpose, hope, vision, aspiration
Social	Connective capacity, networks, dialogue, co-production, conflict management, collaboration, belonging, handle diversity
Physical/Behaviour	Actions taken, physical effects of foresight & other resulting outputs, sustained change, practical rationality
Paradigm Shift	Holistic, non-linear, changed views and mental models
Subject Area	
Personality	Attitudes
Perception	Openness, framing of problem, seeing different possibilities & visions
Self-awareness	More aware

Motivation	Critical, what motivates, more motivated, engaged
Leadership	Views on, changed conduct
Creativity/innovation	More innovative/creative
Decision-making	Different models, How does it occur? Better?
Problem-solving	How does it occur? Better?
Culture	Changes norms, values, social structures, common-good view

13. Do you know whether the participants changed in any of these respects due to GBFP involvement? How and to what extent? Did the organizations involved in the project change as a result of the project?
14. Do you believe we are getting closer to achieving sustainable development in the region now? If not, what would be a satisfactory result all things considering?
15. Who do you believe we should currently be primarily targeting for sustainability efforts-key leaders in government, industry, communities or everyone?
16. How many foresight/futures projects have you participated in? On average please rate the value of foresight from 1-5, with 5 being the highest value? *How did GBFP rate in comparison to the other foresight projects you have participated in- a)more value b)less value or c)equal value?*
17. What do you think is the value of foresight in comparison to traditional efforts used for addressing societal complex problems? Is it a)less valuable, b) more valuable, or c)of equal value?
18. Do you think the value from the GBFP is more, equal to, or less than the value of the resources invested in the project (~$4 mil plus in-kind over 5 years)? With all of the demands and places for sustainability funds would you now place the same resources in a similar project? Why or why not?
19. Using the scale of 1 – 5 for all, can you please rate the value of GBFP in addressing sustainability in terms of its Effectiveness? Efficiency? Collaboration? Could the value of this type of foresight be increased? If so, how?
20. I am going to identify a few variables and ask you whether you think they have had a particularly strong effect on the how successful GBFP was. Please answer yes or no. The process used? The context (e.g., culture, laws, type of environment) in which the complex problem takes place? Resources invested? Supporting tools used with the foresight project? Alternative interventions taking place during the foresight project? Has any particular element of GBFP stood out as really valuable? Have there been any negative effects of this foresight project? Level of significance? Why? How?
21. Would you say process outputs (e.g., learning, networking, experiencing, and discussing) were greater than product based outputs (e.g., Quest software, reports or articles generated) for this foresight project? Which would you say have had a greater impact on this **complex problem:** the process outputs or product outputs? Which do you think was more effective the workshops/events and other dialogue-based sessions or the use of the software by a person on their own – much greater, about the same or much less?
22. Have you or your organization used foresight since?

23. What would you define as progress in working with the complex problem in the last 5 years? What is the main reason for progress? Lack of progress? How much of an impact has GBFP had in terms of that progress (scale of 1 to 5)?
24. What needs to happen next to address this complex problem further, if anything?
25. What do you think the Georgia Basin area will look like in 25 years in terms of sustainability, e.g., significant progress, same as now, going downhill?
26. Do you have any additional comments you would like to share either regarding earlier questions or anything else I haven't asked perhaps…?
27. Do you have any questions for me?

Appendix C: Canadian Completed Foresight Projects

Project List for Projects Completed Since 2003

Name of Project	Completed	Sponsor and/or Organizer (organization(s))	Contact Name
Chinese Legacy BC	Ongoing	B.C. provincial government	
Scenarios for Alberta's Energy Futures	Ongoing	CESAR, UCalgary	David Layzell
Energy Futures Laboratory	2017	Natural Step	Chad Park
Future of the Region Sustainability Dialogues	2012+	Metro Vancouver	
Strategic Plans	2017	Various Municipalities including BC	
Aging in Place – The Future of	2017	NRC	David Fraser/Brian Colton
Future of Advanced Manufacturing	2017	NRC	Michael Kilfoil/Brian Colton
The Future of Ground Transportation	2016	NRC	John Wood
2018 Security Outlook	2016	CSIS	
Bank of Canada Security Foresight Project	2016	Bank of Canada Security Risk Management Office	Victor Mitev
Big Earthquake	2016	CBC Radio	
Game-changing technologies initiative (http://canadamakes.ca/691/)	2016	National Research Council Canada	Dr. Carl Caron
InVEST Scenarios Case Study: Vancouver Island	2016	WCAM	
Using Strategic Foresight at Work	2016	Foresight Canada	Ruben Nelson
Lower Mainland Flood Management Strategy	2016	Fraser Basin Council	
New Mobility	2016	Metrolinx	WSP Group
Trottier Energy Futures Project	2016	CAE, Suzuki Foundation and TFF	Oskar Sigvaldson
Safety and Security Foresight Program	2015	NRC	
Canada in a Changing Global Energy Landscape	2015	Policy Horizons Canada	
Probable and Possible Health Systems Scenarios	2015	Canadian Alliance for Sustainable Healthcare	Jonathan Veale
Sustainable Canada Dialogues	2015	UNESCO and McGill	

The Future of the Canadian Oil Industry to 2030	2015	Scenarios to Strategy Inc.	Greg MacGillivray
Aging and IT	2015	NRC	David Fraser/Brian Colton
Factory of the Future	2014	NRC	Ian Potter
Future of Environment Policy in Alberta	2014	Alberta Ecotrust	
Monteregie Connection / connexion monteregie	2014	McGill University	Elena Bennett
Of Threats and Opportunities Exploring Canada's National Security Interests in 2025	2014	CSIS	CSIS Academic Outreach
The Future of Asia	2014	Policy Horizons Canada	
The Future of Primary Care in Alberta	2014	Scenarios to Strategy Inc.	Greg MacGillivray
The Future of the Canadian Natural Gas Industry to 2030	2014	Scenarios to Strategy Inc.	Greg MacGillivray
Transformation of the Canadian Payments System	2014	Canadian Ministry of Finance/Viewpoint Learning	
Valgen	2014	Genome Canada	David Castle, Peter Phillips
Army 2040	2013	Canadian Army Land Warfare Centre	Peter Gizewski
Blueprint 2020	2013	Clerk of the Privy Council	Peter Edwards, Adam Fritz, Kehoe
Canada's innovation future	2013	Jack Smith and colleagues	Jack Smith
Energy Futures for Canada	2013	Conference Board of Canada	
Great Lakes Futures Project	2013	Transborder Research University Network (TRUN) for Water Stewardship	Katrina L. Laurent
Imagining Canada's Future	2013	Social Sciences and Humanities Research Council	Claudie Gosselin
Meta-scan 3: Emerging technologies	2013	Policy Horizons Canada	
Pilot Project, Using Strategic Foresight	2013	GOA/Foresight Canada	Ruben Nelson
Summer School Course in Foresight, International Futures Academy	2013	IFA/Foresight Canada	Ruben Nelson
The Future of Al Qaeda	2013	Canadian Security	

		Intelligence Service	
The Future of the Forest Industry in Alberta	2013	Government of Alberta	Bruce Mayer
Agri-Foresight Initiative	2012	Agriculture & Agri-Food Canada (AAFC)	Dr. Judith Bosse
Climate Change Adaptation Science initiative	2012	Fisheries and Oceans Canada	Ruth Hawkins
Driving Policy on a Shifting Terrain	2012	Policy Horizons Canada	
Emerging Global Realities Project	2012	Public Health Agency of Canada	Jan Trumble-Waddell
Imagining the Future	2012	Canadian Association of Radiologists	Dr. David Vickar
Meta-scan 2: Building resilience in the transition to a digital economy and a network society	2012	Policy Horizons Canada	
The Global North 2050 Project	2012	Alberta Innovated Technology Futures	Axel Meisen, Lois Macklin
The Next Economy	2012	Policy Horizons Canada	
Visualizing Climate Change	2012	CALP	Stephen Sheppard
Design of Future-Oriented Citizen Engagement Process	2012	GOA/Foresight Canada	Ruben Nelson
Premier’s Commission Economic Strategy for Alberta	2012	Premier’s Office, GOA	Premier’s Office
Economic Futures for Ontario 2032	2012	OCAD	Greg Van Alstyne
A Way Forward	2012	CFIA	Brian Colton
2011 Feed the Future Research Forum	2011	Western Canadian Feed Innovation Network	Axel Meisen, Lois Macklin
2020 Media Futures	2011	OCAD	Greg Van Alstyne
Canada's Innovation Strategy – A deep dive	2011	Public Policy Forum	John Kao
Children and Physical Activity Scenarios Project: Evidence-Based Visions of the Future	2011	Public Health Agency of Canada	Jan Trumble-Waddell
Environment and Competitiveness	2011	Policy Horizons Canada	
Fore-CAN: Foresight for Canadian Animal Health	2011	Canadian Food Inspection Agency (CFIA) & Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) Research and Technology Initiative	Shane Renwick

		(CRTI)	
Greenest City 2020 – city of Vancouver workshop	2011	One Earth	Nicole Anne Boyer
Health Canada's Foresight Initiative	2011	Health Canada and AITF	Leah Soroka, Lois Macklin
Agriculture Adaptation to Climate Change (within Agri-Foresight Initiative)	2010	Canadian Agri-innovations (CGAI) Program	Leah Soroka, Lois Macklin
Meta-scan 2011: Exploring for global forces shaping our future	2011	Policy Horizons Canada	
Social Media	2011	Policy Horizons Canada	
The Future of the Peace Country to 2050	2011	Grande Prairie Regional College	Axel Meisen
Trends and Drivers for the Canadian Seed Trade	2011	Canadian Food Inspection Agency (CFIA)	Canadian Seed Trade Association
Well-being	2011	Policy Horizons Canada	
Agri-Foresighting Bio-Economy Scenario Planning Workshop	2010	Agriculture and Agri-Food Canada	Ken Andrews
Foresight's Contribution to CASA's Strategic Planning	2010	CASA/Foresight Canada	Ruben Nelson
Canada@150	2010	Policy Horizons	Peter Padbury
Getting Ready for Tomorrow	2010	Plant and Biotechnology Risk Assessment Unit (PBRA)	Jack Smith
Lake Winnipeg Basin Summit	2010	International Institute for Sustainable development	
Renewal Project	2010	National Research Council of Canada	Diane a. Isabella
Scenario-based Planning for a Changing Climate in the Bras d'Or Ecosystem	2010	International Institute for Sustainable development	Livia Bizikova, Bruce G. Hatcher
Foresight Workshop on Climate Change Impacts and Adaptation in Agriculture 2010-2030	2009	Agriculture and Agri-Food Canada	Scenarios to Strategy Inc.
Alberta & Mix of Energy	2009		
Forest Futures Project	2009	Sustainable Forest Management Network	
Outward Bound 2015	2009	Oceansadvance	
Planning Assumptions for	2009	Public Health Agency of	Jan Trumble-

H1N1		Canada	Waddell
Plant Health Foresight Workshop	2009	Canadian Food Inspection Agency (CFIA)	Axel Meisen, Lois Macklin
Foresight's Contribution to Strategic Planning	2008	Mountain Equipment Co-op	MEC HQ
PSTP's Project "Vision 2015" = Public Safety Technical Program	2008	Joint effort: DRDC's CSS, PCO's ONSA (Office of Nat'l Science Advisor), PSEPC	Shane Roberts (PSEPC)
Vision for the Canadian Arctic Research Initiative	2008	Council of Canadian Academies	
Decision Making Framework for Emerging Technologies and Products	2008	Health Canada	Nigel Skipper/Brian Colton
PACT-NBIS Prospective Applications for Converging Technologies in the Nano-Bio-Info Innovation Space	2007	THE Center for Innovation Studies (THECIS) & S&T Foresight Directorate, Office of the National Science Advisor	Ken Andrews
Future of Industry Canada	2007		
Canadian College of Health Executives	2006	CCHSE	John Hylton
Envisioning the Future of Veterinary Medical Education	2006	Association of American Veterinary Medical Colleges	Norm Willis Group
Mining the Future	2006	Town Council of Canmore	Ruben Nelson
Strategic Challenges Facing Canada in Early 21st Century	2005	Foresight Canada	Ruben Nelson
2005 IWADA (International Workshop on Animal Disposal Alternatives) Animal Health Foresight Project	2005	Canadian Food Inspection Agency & United States Department of Agriculture	Ken Andrews, Jack Smith
Foresight Exercise on Infectious Diseases in Canada	2005	National Collaborating Centre for Infectious Disease	
NRC Foresight to 2020	2005	NRC	
related to Canadian biotech strategy	2005		
2003 – 2004 Petrochemicals and Alberta	2004		
Bio-Health Scenarios	2004	National Research Council & Office Technology Foresight	Jack Smith
Georgia Basin Futures Project	2004	SSHRC	John Robinson
Iraq war	2003		

Québec S & T	2003	Conseil de science et technologie	Geneviève Tanguay (now at NRC)

Appendix D: Insights from Data Collection Applied in Phase 3

1. Current status of society and its complex problems

- How society progresses, quality of life and survival is important.
- Society is at a crossroads to prepare for high-risk scenarios, increasing complex problems and their effects, dehumanization and increasing complexity (Homer-Dixon, 2010). Being prepared is important.
- Academic and other institutions, such as governments, systems are slow to change. They are not supportive regarding 'question of fit' due to current needs/context, institutional inertia and path dependencies:
    - Barriers to efforts with complex problems, e.g., Transdisciplinary
    - Slow to recognize current state of global crises
    - Power also an issue
- Strong political component to current status that does not address complex problems in-depth but hinders action.
- Power struggle/power shifts across various "old" versus "new" rising powers and divide between ground and elite efforts regarding complex problems. Thus, disconnects in addressing complex problems.
- Traditional methods of solving problems are not sufficient for the current situation.
- Complex problems/complexity very hard to work with. No one simple answer. Speed of change in new developments, e.g., social innovation and evaluation, does not match pace of change in complexity.
- Complex problems are symptoms of a larger problem.
- Deliberate change is slow except in a crisis, but preparation is important for a crisis.
- Multitude of efforts and resources invested in complex problems, but progress is relatively slow and not meeting needs per timescale.
- Hard to find one transformative act/approach.
- People not wired to think about the future (McGonigal, 2017).
- People are slow to change and favor the comfortable, the traditional, their community's views, and reinforcing information.

- People are scattered in what they know and what they do. Ambiguity and diverging perspectives prevalent in rapid change as well as lack of communication across different views and lack of understanding the big picture.
- Sharing knowledge is important (Riley et al., 2015).
- Hope is very important if it is critically treated (Ojala, 2016).
- Many people want to understand and know how to deal with systems, complexity, and uncertainty.
- Local is inextricably linked to global and vice versa.
- Tackling problems through planned mainstream and wide-ranging independent frames.
- Complexity is not linear; it has tipping cascades, emergence and butterfly effects (Will Steffen et al., 2018). Thus, change can be targeted at incremental or transformative but needs to be holistic with several efforts crossing boundaries and topics maintaining internal strength as efforts advance. As such, many topics/approaches/initiatives are hard to keep track of, determine impacts, or share information. Very hard if not impossible to coordinate. Linking, however, can be very helpful.
- "Triple-loop learning entails members developing new processes or methodologies for arriving at" reframing (Romme & Van Witteloostuijn, 1999, p. 439) and a paradigm shift are needed.
- Important to be more collaborative, link to well-being and focus on cities to alleviate complex problems.

2. Insights from fields and subject areas other than foresight addressing society's complex problems

- There is increasing agreement on the general needs for dealing with complex problems and the use of various tools/approaches.
- Many fields are encountering similar developmental issues as foresight.
- Capacity is low in many of these fields.
- Co-design, co-production, co-dissemination are key areas for complex problems.
- Different topics have unique benefits that can supplement each other. These areas are not typically connected in practice.

- The human dimension is critical.
- Policy experimentation and transition governance connects areas, but incremental not large-scale systems change occurring (Loorbach et al., 2015).
- Experimentation and interventions as well as adaptation and human behaviour change instruments are key for a policy change framework (Tait & Hanna, 2015).
- Monitoring, innovation, building in resiliency and redundancy are important.
- Collective intelligence has a positive impact in Canada (Calof, 2017) .
- Canadian's value social aspects of life primarily over, for instance, economic or environmental (Cameron & Potvin, 2016).
- Governance change happens piecemeal (Torfing & Triantafillou, 2016).
- There are various forms of governance proposed: adaptive governance, polycentric governance, distributed governance, and collaborative governance.
- Government is too rigid and cannot reform. There is distrust of government.
    - Resistance to governance (power an issue)

3. Insights from foresight

- Foresight elements and methods, and foresight literacy are valuable in working with complex problems.
- Foresight is valuable as a whole but it is not usually transformational and hard to do well.
- Processes for forms of engagement are generally: difficult to deliver well, not always practiced as per promises offered, and can in some cases be a form of co-option.
- Foresight can be democratic and transformative but many barriers exist and success of the process is sensitive to several factors (e.g., similar to commissions).
- Design is a key new area that complements foresight. Foresight with innovation and design can potentially be more transformational.
- Evaluations are important but it is very difficult to measure foresight's impacts (series/cluster findings are a solution) (Koleros et al., 2016).
- Although some agreement among the foresight community exists, there are differences in terms of definition of concepts and there is a lack of cohesion. Also, there is a lack of

knowledge about the community and of projects completed (not necessarily much different than other emerging fields).

- There is a lack of foresight literacy among most of the public and even many of those who have participated in foresight. There are layers of appreciation for foresight.
- Foresight methods/approaches are mixed. There is no one right way to practice foresight.
- Typology is important. More detail, improvement and evaluation would be helpful.
- Need more and better reporting of scenarios/projects.
- Need broader confidence in foresight process, increased capacity, communication and training.
- Need to deliver foresight regularly.

4. Roles for dialogue-based foresight to work with complex problems

- Dialogue-based foresight is not necessarily a transformative practice to work with complex problems and humanity's struggle for survival but it can be a very valuable process and has unique roles to play amongst the set of tools available if used well and appropriately. Foresight needs to be delivered appropriately and well. Basic guidelines need to be followed in the practice.
- Dialogue-based foresight at least impacts cognitive, social and creative areas, e.g., increasing collaboration and understanding, facilitating paradigm shifts, resolving conflicts, and creating innovative and robust solutions.
- Dialogue-based foresight has several roles and is valuable in several areas, e.g., in terms of transitioning, linking to other areas, educating, feeding into strategic planning and sharing knowledge. It can also transform situations. It is a governance mechanism that needs more legitimacy, flexibility and authority. It can address a number of needs identified. Suggestions of applications have been offered.
- Dialogue-based foresight can be a unifying force working well across boundaries with other areas in a more neutral yet to be defined space - the future.
- Foresight is one tool for complexity/wicked problems that can potentially be used in different ways, e.g., experiential foresight leads to emotions, teaching foresight changes mentality and provides skills, facilitating broader understanding and conflict resolution (populism/current situation) helps society to collaborate.

- Dialogue-based foresight is similar to planning, commissions, and roundtables but it is more in-depth, open, participatory, critical and innovative. Dialogue and deliberation enhance certain benefits of foresight but create extra issues. Commissions have some similar benefits and weaknesses as foresight (Inwood & Johns, 2014; Lohmann & Van Til, 2011).
- Common problems with many tools/approaches but especially foresight. Foresight is unique, misunderstood, has had mixed success, and is not a mainstream practice.
- Dialogue-based foresight and foresight can be improved in several ways.
- Appropriately, link foresight to other tools/approaches.
- Different types of tools help foresight increase its value, e.g., Platforms, ICT and visualization.
- The "gem" is in understanding individual strengths of tools and combining them as most beneficial.

5. Cross-fertilization

- Cross-fertilization of topics would be helpful to cross divides and fight barriers, build on diverse knowledge and diverse practices, amass efforts, and be more transformative and more expedient. Efforts tend to result in gradual deliberate change (Boston, 2017; Markard et al., 2012) but this is not always so and in humanity's struggle for survival needs to be more aggressive or undesirable changes will likely occur.
- How can society move efforts to a transformative scale? Challenges exist in many areas. Important tasks are to achieve transformational change and create, e.g., efficiencies, focus, resilience, hope, engagement, education, and paradigm shifts. Emergence and tipping points are important.
- There exists an evolving process of change and influence. Holistic tools and approaches are best suited for a holistic topic and systemic problems.
- Meta-governance is important; collaborative advantage exists.
- Hubs and similar organizations exist outside Canada and some forms of them are in Canada.
- A foresight hub for group learning has been proposed (Bourgeois, 2014).
    - Organization would use platforms, collective intelligence, innovation hub and action research.
    - There are other examples of organization and calls for them