

WASTE MANAGEMENT & THE CIRCULAR ECONOMY IN CANADA:
AN ANALYSIS OF POLICY LAYERING

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Abstract

Waste has become intrinsic to everyday life, where the average person throws away packaging or products no longer needed on a regular basis and does not know much about the rest of the item's life cycle or where it came from originally. However, waste management is increasingly becoming one of the most challenging responsibilities of jurisdictions around the world. With the costs of maintaining operable waste management systems, such as landfilling and recycling, rising at the same time as environmental and socio-economic pressures, innovative solutions are needed. An answer that is becoming increasingly popular is the circular economy, which closes the loop of the linear business model by minimizing the input of new, raw materials and resources. This is achieved through designing products for reducing, reusing, or recycling as much as possible instead of jumping to the traditional ways of waste management. While many countries, industries, and advocacy organizations have already implemented some circular policies, little is known about an optimal design. Much of the literature speaks of the need for a paradigm shift to achieve a circular economy. Given the well known difficulties of bringing about such a shift, I investigated Canadian provincial policy instruments used to generate the circular economy to discover whether incremental first and second order policy changes are bringing about policy designs that promote circularity. Focusing primarily on the provinces of Saskatchewan (Western region), Ontario (Eastern region), and Nova Scotia (Atlantic region) in Canada, I have evaluated the shift from waste management to waste reduction to circular economy using the full spectrum of policy changes from patching to packaging.

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The University of Saskatchewan and the place of which this research and thesis were completed is located on Treaty Six territory, the homeland of the Métis. Although the research established its scope using provincial and national boundaries, the implementation of a circular economy includes comprehensive, equitable, and shared decision-making between all people.

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INTRODUCTION

Jurisdictions around the world are challenged to manage their enormous piles of solid waste. Not only does waste disposed, incinerated, or in landfills pose significant risks to soil, water, air, or biota contamination, but it is also a major human health hazard, particularly to children, and an important factor affecting economic development (Ma and Hipel, p. 4-5, 2016). The World Bank estimates that the total amount of annual municipal solid waste generation worldwide is expected to reach 3.4 billion tons by 2050 (Ding, et al., p. 2, 2021). The problem is that solid waste mainly consists of single-use items that are endlessly in demand. All sorts of single-use items are continuously constructed, shipped, and sold to consumers to meet people's daily needs and desires. The exchange of goods has expanded and transformed into a complex economic market that drives investments and employs millions of people across the world. This network of trading opportunities has opened and extended the possibilities for the world to create, innovate, and communicate. Although the expansion of the market across the world has led to tremendous success, it has proved to be inefficient at times because of the rise in market externalities. William Davies (2013) explains that "an externality arises when the cost or benefit of a particular good cannot be contained within the two-way relationship of exchange but impacts upon third parties who are not party to it," adding that although this relationship may be "positive" or "negative," it always "creates a problem" (p. 39). The problem is usually that someone is receiving a benefit that they should have to pay for or is paying a cost that they should not have to because the true environmental cost of managing a products' end of life is not included in the original transaction.

The linear business model or linear economy is currently standard and widespread amongst most businesses around the world. The problem with this model is that businesses produce a substantial amount of solid waste. Therefore, it can be described as the 'take-make-waste' model because resources are used for a very limited time before disposal, almost completely devaluing them (Environment and Climate Change Canada, p. 6, 2021). Although some products are kept for long periods or diverted for re-use (recycled), many products are not. In 2018, 72% of solid waste in Canada was sent to the landfill because of the linear model (Environment and Climate Change Canada, p. 5, 2022). Landfills are filling up and contributing to pollution, biodiversity loss, climate change, adverse health effects, inequitable living and working conditions around the world, and resource depletion. Policy makers across Canada have attempted to address the impacts of the linear model by implementing waste management regulations, environmental protection acts, and Extended Producer Responsibility (EPR) policy, but the advocacy lies mainly with public and private councils, start-ups, and non-governmental organizations. Ultimately, the linear model is not sustainable long-term.

A solution to the waste problem of the linear business model is to shift towards a circular economy, which recognizes the finiteness and value of resources and produces as little waste as possible, without severely impacting the economy (CQP, CPEC, EEQ, p. 13, 2018). According to the BC Ministry of Environment (2017), the circular economy "is focused on closing resource and material loops, minimizing the input of new, raw materials, and adopting renewable energy as a fundamental source for powering the economy and all its processes (p. i)." Many existing policies and regulations focus on the 3R's – reduce, reuse, recycle – but the circular economy encompasses much more than these processes.

The circular economy model advances environmental priorities, generates innovation and competitiveness, and stimulates economic growth and development that transforms externalities

from negative to positive (Ontario, p. 6, 2017). A study of seven European nations found that a transition to a circular economy would reduce greenhouse gas emissions by up to 70% while growing the workforce by about 4% (Stahel, p. 435, 2016). In parts of Canada, the circular model has already been used for years through recycling used tires, beverage containers, oil, oil filters, packaging and printing paper, household hazardous materials, prescribed materials, and electrical and electronic equipment (Manitoba, web, 2022). A noteworthy example is the company EVRAZ (IPSCO), which recycle scrap steel into new items rather than sourcing from traditional iron ore. This practice leverages environmental and economical benefits for the companies. According to EVRAZ, for every ton of new steel made from scrap steel, 2500 lbs. of iron ore, 1400 lbs. of coal, and 120 lbs. of limestone are conserved (2022). EVRAZ obtains over 95 000 tons of scrap metal every month, providing a substantial revenue for the company (PIMS, 2008). Incorporating more and more products into the circular economy model is a step-by-step process brought about through amended or replaced policies, which is known as layering. Although there are several good examples of circular systems in place, there are many other products that can and need to be re-designed if they are to be used in a circular economy model.

Before Canada can fully commit to the circular economy, more of its products need to be made sustainably. This means changing the production methods so that they pose less of a risk to ecosystems (e.g., air, soil, water, plants, and animals) (Taelman, p. 2, 2018). One way this could be achieved is through processes that release less greenhouse gases into the atmosphere or harmful substances into the subsurface, which also helps avoid some harmful impacts on human health and well-being (Taelman, p. 2, 2018). In addition, sustainable goods production requires redesigned business models, strategies, and regulations to guide and support the public and industry. But changing production methods, reworking business models, implementing new strategies, and introducing regulations are complex undertakings as they can be quite costly economically and socially (Nikolaou and Tsagarakis, p. 604, 2021). Moving from a linear to a circular economy model appears to be an ideal solution for increasing sustainability, but how to achieve this transition in Canada is largely unknown.

A policy approach that moves towards a circular economy involves a classic paradigm shift from waste management to waste reduction through increased environmental protection or extended producer responsibility regulations and statutes, but overall, it is more than just a means for environmental protection. The protection of the economy, social structures, and governance cannot be ignored. This big-picture approach would need to be combined with advocacy projects, but the extent to which these projects can be implemented varies by jurisdiction. Jurisdictional capacity may be influenced by the values and ideologies of the political party in power, the geographical size and population, the resource availability, the economic state, or another factor at any given time. Thus, paradigm shifts are complex and difficult to achieve without incremental changes. In policy, change is divided by first, second, and third orders, which all play a role in influencing new policy outputs. *First order change*, standard adjustments to existing policies, and *second order change*, modifications of the policy instruments used, are in practice achieving *third order change*, in which the goal(s) of the policies themselves change (Hall, p. 279, 1993). The policy design and outputs will lead the way in developing sustainable communities around the world and, thus, are of utmost importance.

Within any institution, the motivation for creating a new policy can vary drastically from pure design to non-design (Howlett and Mukherjee, p. 64, 2014). A policy is designed well when it is based on previous knowledge and is intentionally and logistically processed (Howlett and

Mukherjee, p. 57, 2014). When a policy is formed from irrational, ulterior motives, such as a knee-jerk response to a crisis, its process is not designed and is therefore considered a ‘non-design’ (Coban, p. 1055, 2023). Howlett and Mukerjee (2014) argue that the process of designing and developing a policy falls on a spectrum from design to non-design with four other stages in between (p. 64). The closer a policy comes to authentically and purely designed, the better. In the context of designing policy for the circular economy, new and innovative strategies for re-using, recycling, and re-purposing strategies are constantly being introduced, which influenced a shift from waste management to waste reduction and towards a circular economy eventually. Notably, most efforts to reduce emissions respond to evolving technology and market pressures, as opposed to top-down policy approaches (Awada et al., p. 11, 2021). Individual efforts are not meant to be discounted, but this thesis focuses on policy outputs because policy design is naturally top-down and, if done well, holds individuals accountable.

Sustainable production and waste management policy designs vary across Canada, yet they are imperative to the function of every jurisdiction. To improve the health and prosperity of all people, boost the economy, and sustain ecosystems in Canada, all policy outputs must be assessed to determine how to implement the circular economy model.

This thesis seeks to assess some of the circular economy policies that have been designed in Canada through a comparative policy analysis (See Appendix A). Answers to the following questions remain elusive in the literature; thus, they will form the basis of this master’s research.

Key Questions:

1. What policy instruments have been used to implement and develop the circular economy at the provincial level in Canada?
2. At the provincial in Canada, does policy layering cause low intensity circular economy policy?
3. What outputs (processes and methods) best design circular economy policy?

This thesis is organized into four chapters. **Chapter 1** (What is the Circular Economy?) explains several ways that the circular economy is defined and provides background for why the definition has variability around the world. The three pillars of sustainability (social, environmental, economic) are used to inform the definition for the purpose of this research. **Chapter 2** (Theory and Methodology) analyzes the circular economy by using a specific scope and set of methods (web-based research, exploratory literature review, definition analysis, a scorecard, content and sentiment analysis, a political timeline, and comparative analysis) to test the theory of layering. I also include the limitations of the study in this chapter. **Chapter 3** (Policy Design: The Circular Economy in Canada) contains the main results and analysis of the research. I apply the theory and methodology to Saskatchewan, Ontario, and Nova Scotia. Lastly, **Chapter 4** (Recommendations and Conclusion) outlines and discusses the policy recommendations and answers the research questions.

CHAPTER ONE: What is the Circular Economy?

This chapter outlines and compares the various ways that the term ‘circular economy’ has been defined. One way of defining it is not necessarily better than another, as different definitions accommodate varied circumstances. A comprehensive list of definitions is found in Appendix B. At the end of this chapter, I identify the definition used in this thesis.

1.1. Definition

The Ellen MacArthur Foundation (EMF) (2021) defines the circular economy as “a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution (p. 3).” According to the EMF, it is based on three principles: “1. eliminate waste and pollution, 2. circulate products and materials (at their highest value), and 3. regenerate nature” (Ellen MacArthur Foundation, p. 3, 2021). In my review of the literature, I found this definition of the circular economy is quoted and used the most. The EMF is a credible, international charity with a network of more than 25 countries in Europe, North America, Latin America, and Asia (Ellen MacArthur Foundation, 2022). Nobre and Tavares (2021) note that popularity of the EMF definition could be due to the organization’s strong and steady activism since 2010 and the support from global partners, such as Google, Unilever, Philips, and Renault (p. 1). Other definitions of the circular economy use some of the same key words as the EMF’s definition, including ‘regenerative,’ ‘design,’ ‘maximum/highest value,’ ‘reduce/reuse/recycle,’ and ‘keeping products and materials in use.’ Provincial governments, municipalities, industries, and non-governmental organizations in Canada, such as the National Zero Waste Council and the Vancouver Economic Commission, are amongst those seeking to define and implement a circular economy.

1.2. Alternative Definitions

The circular economy does not have one concise, universally accepted definition. Hence, globally there is a general uncertainty accompanying the concept, and numerous definitions have emerged. Regardless of a group’s definition, many use aspects of the circular economy in their policies, even if they do not necessarily use the term. They may use these aspects because the concept has been developed incrementally over time through layers of waste reduction and sustainability policies. The variety of definitions of the circular economy used around the world is not disadvantage and can enable countries and jurisdictions to learn from each other and advance as a global unit to produce the best outputs possible.

Some researchers argue that discrepancies in the definition of the circular economy form largely because of the broad diversity of critical sub-themes that motivate the Global North and Global South (Grobler et al., p. 68, 2022). The Global North is generally differentiated from the Global South by political and socio-economic dimensions, with the Global North comprising countries classified by the World Bank as upper-middle and high-income and the Global South comprising low and lower-middle income countries (Confraria et al., p. 266, 2017). North America, Western Europe, and developed parts of East Asia are typically considered the Global North, while Africa, Latin America, and developing Asia (Middle East) are the Global South (Confraria et al., p. 266, 2017). Countries in the Global North are typically part of the Organization for Economic Cooperation and Development (OECD), while those from the Global South are not (Confraria et al., p. 266, 2017). Using the Scopus database, Gobler et al. (2022), analyzed articles about the circular economy published between 2004 and 2020 (p. 68). They found that until 2016, at least

80% of the articles focus on the Global North or China, while very few address the Global South (Gobler et al., p. 68, 2022). It is only in the last five years of the period analyzed that the number of articles published on the circular economy in the Global North and the Global South were more equal (Gobler et al., p. 68, 2022). According to Gobler et al. (2022), the articles reveal that the Global North is focusing on reducing carbon emissions and waste, whereas the Global South is emphasizing reducing and eradicating poverty, enhancing the well-being of the people, and minimizing environmental damage (p. 68). The varying dynamics between the public and private sectors in the two regions means that different approaches are used in implementing the circular economy: the Global North is interested in improving engineering and governance of resource loops, while the Global South is concerned with social participation in public policy design (Grobler et al., p. 68, 2022). The different policy environments, funding opportunities, education and professional levels, and available infrastructure may also be explanations for aspects included in the definition of the circular economy (Grobler et al., p. 68, 2022).

Although the timeframe and scope of this thesis does not allow for a detailed investigation of the circular economy policy in areas outside of Canada, it is valuable to consider the ways other countries are leading the design of the circular economy. In Europe, numerous countries have been working on circular economy principles for some time, including Finland, France, Slovenia, Netherlands, Italy, and Germany (Ellen MacArthur Foundation, 2021). However, their methods for integrating circular economy principles differ based on their economies and sometimes address only one or several parts of the definition proposed above, meaning they are not fully circular (Ellen MacArthur Foundation, 2021). For example, Germany has a very heavy industrial economy and is looking at the circular economy in terms of resource efficiency, material flows, and material availability, whereas the Netherlands is taking an innovative approach in its materials and business models (Ellen MacArthur Foundation, 2021).

The Nordic countries are viewed as leaders in the circular economy. In 2019, they declared that they “should become the world’s most sustainable and integrated region by 2030,” with the circular economy as a central tool (Storli and Heilmann, 2020). The Nordic way of thinking, living, and working – particularly their highly skilled and educated workforce, high degree of trust, social cohesion and capital, transparency in governance, commitment to values, and world-class infrastructure and regulatory framework – are key advantages for integrating a circular economy (Storli and Heilmann, 2020). In addition, the ‘Nordic Waste Group’ (NWG) and the ‘Working Group for Sustainable Consumption and Production’ (HKP) were merged in 2019 to become the ‘Nordic Working Group for Circular Economy’ (NCE) with the goal to cut new resource consumption and re-use waste instead, develop non-toxic and resource-efficient cycles, and work on policy instruments for a green transition (Bergeland and Wiese, 2019).

Other countries engaged in policy design for a circular economy are China, Latin America, and the Caribbean. In China, circular economy policies have been devoted almost exclusively to reducing, reusing, and recycling, but are expanding into eco-design principles (Ellen MacArthur Foundation, 2021). The Circular Economy Coalition of Latin America and the Caribbean has published a report stating that the circular economy in this region is based on three design-driven principles (eliminate waste and pollution, circulate products and materials, and regenerate nature), which are consistent with those included in the Ellen MacArthur Foundation definition (UN Environment Programme, p. 10, 2022). The variety of efforts across the world supports the need for a more universally recognized definition of a circular economy and for further design of key principles of circular economy policy.

The differences in approaches may also be related to ‘non-design’ in the policy development processes. Over time, some jurisdictions may have added certain aspects of the circular economy to existing policy, while other jurisdictions have added something else or nothing at all. These differences may have resulted in different definitions. Some jurisdictions may be making greater progress than others, changing their original definition along the way.

Lastly, misinterpretations and misuses of the ‘circular economy’ concept are common, particularly through a process called *greenwashing*. This occurs when an organization deceitfully labels and markets itself as environmentally friendly to attract and target a specific set of environmentally conscious customers but is doing very little to minimize its impact (Markham, p. 1, 2014). As pressures for businesses to transition to a circular economy increase, some organizations and companies might resort to greenwashing marketing schemes that mislead consumers instead of implementing significant changes. A prime example is the fashion industry, which is “responsible for 2-8% of the world’s greenhouse gas emissions, 20% of the world’s wastewater, 100 billion dollars lost due to underutilization and lack of recycling, and 9% of annual microplastic losses to the ocean (Adamkiewicz et al., p. 1, 2022).” Some of the ways this industry uses greenwashing techniques include falsely exaggerating their sustainability policies, promoting easy return policies which incentivize guilt-free consumption, and ‘eco-labeling’ using insignificant certifications (Adamkiewicz et al., p. 3, 2022). These are relatively easy strategies to market to uninformed and indifferent consumers who believe that they are purchasing clothing that is ethically and environmentally conscious, as well as of higher quality (Szabo and Webster, p. 722, 2021). This is a serious issue as the industry faces demands to improve both its environmental and ethical practices in the global market (Zaidi et al., p. 827, 2019). Collectively, some circular solutions to these problems include recycling and re-using used materials, offering clothing swaps, supporting second-hand clothing libraries, and improving working conditions by providing fair wages (Adamkiewicz, et al., p. 2, 2022).

1.3. Pillars of Sustainability

In 1987, Edward B. Barbier used a triple Venn diagram to represent how the dimensions of sustainability – biological (environment), social, and economic – interact (p. 104). This visual indicates that sustainability is achieved when all three systems are balanced [grey] (Figure 1.1). However, it also signifies the trade-offs that result if only two of the three key systems are engaged [green, orange, purple] or if the focus is on just one of them [blue, yellow, red]. Although integrating only one or two of the systems at a time is not inherently bad, harm can be directed to the uninvolved system(s). For example, an abundance of resources may lead to a strong economic system, while causing environmental degradation and a decrease in the quality of living conditions, simultaneously. These trade-offs in the environmental and social systems are neither efficient nor equitable and thus, not sustainable.

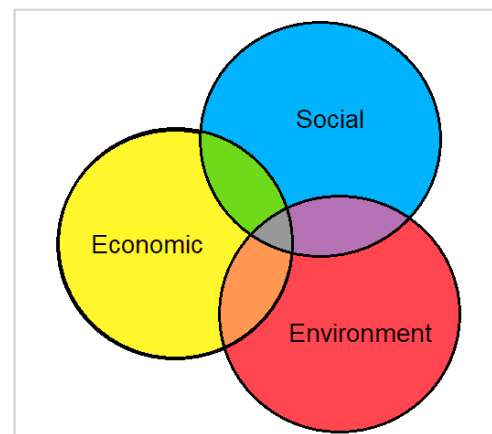


Fig. 1.1 The three pillars of sustainability (Dueck, 2023)

The three pillars of sustainability also provide the foundation for the United Nations’ 17 Sustainable Development Goals (SDG). They represent urgent issues facing all countries and encourages immediate action through global partnership (United Nations, 2015). Applying the

principles of a circular economy to their fullest extent and in the best way possible will contribute to the achievement of the SDGs and a sustainable world for all.

The Social Pillar

Many scholars have noted that the social aspect of sustainability and circularity appears to be the least recognized of the three pillars (Clube and Tenant, p. 1, 2023; Stewart and Niero, p. 1010, 2018). An effective social system fulfills basic needs, which are “in-born requirements that need to be satisfied for the individual to remain healthy physically, emotionally, and mentally” (Missimer et al., p. 35, 2017). Most people can meet their own needs so long as they are not hindered by the community structures on which they depend; however, globally, many people suffer a lack of well-being due to the circumstances of their society (Missimer et al., p. 35, 2017). A variety of factors may negatively influence a person's well-being, rendering the social system a complex series of challenges, including tackling poverty, quality of health and education, gender and racial inequalities, and housing. It is these kinds of circumstances that policymakers try to improve by developing and using various policy instruments, including circular economy policy design.

A circular economy can improve human lives around the world by changing the culture from one of unrestrained on-demand consumption to one in which people consume only what is required for the positive well-being of all, albeit at the expense of several powerful interests (Nikolaou and Tsagarakis, p. 604, 2021). To accomplish this shift, people in all roles would have to reconsider their lifestyles and consumption patterns. Government officials, such as city councils and ministers, would need to adopt circular economy principles in their policies, while providing opportunities for citizen engagement and participation (Clube and Tenant, p. 6, 2023). For example, people in positions of power would regularly assess the needs of their community and develop an action plan to improve key areas, stating this information clearly and accessibly for all people, particularly underserved populations. Individuals would also have a responsibility to actively support and contribute to a shift to a circular economy through advocacy and personal education (Andrews, p. 313, 2015). Industry and businesses would play a key role by re-assessing their mission statements, goals, strategies, and procedures, as well as critically considering the actions of their suppliers, product ingredients, packaging, and production methods to comply with the circular economy principles. The existing logic of business structures would have to be altered for more collective and inclusive approaches and outcomes (Clube and Tenant, p. 6, 2023). Lastly, sustainability and circular economy concepts would have to be incorporated into new education curricula across all subjects and levels of education (Andrews, p. 306, 2015). Generally, the circular economy is not an overly complicated concept to grasp, which raises questions about why more people have not adopted its principles, particularly policy makers. However, completing all these complex initiatives means facing some significant barriers such as high financial commitments, lack of sufficient infrastructure, low government support, and complications on the global market, which will depend primarily on consumers, industry leaders, and the government (Skare et al, p. 19, 2023).

The Environmental Pillar

The Ellen MacArthur Foundation's (2021) definition of circular economy is based on the principles of eliminating waste and pollution, keeping products and materials in good condition, and regenerating nature (p. 3). The first principle – eliminate waste and pollution – is

straightforward. Currently, our economy operates as a ‘take-make-waste’ system, where raw materials from the Earth are *taken*, products are *made* from them, and then they are eventually thrown in the landfill or are incinerated (Ellen MacArthur Foundation, 2022). Right from the start, the products and their packaging are designed to become garbage. This means that precious and finite resources are designed to be wasted eventually. In a circular economy, the products and packaging are designed to be reused repeatedly, recycled into something new, composted, or skipped entirely (Ellen MacArthur Foundation, 2022). Consequently, the *waste* aspect of the ‘take-make-waste’ system is removed altogether and a back-and-forth loop between raw materials and products forms. In an ideal situation, this loop will continue to cycle in a ‘circle’ for a long time. For example, the company ‘Apeel’ has integrated a circular system and eliminated the need for plastic waste by creating a coating that can be applied to fresh fruit and vegetables to enhance their natural defences and reduce spoilage, which is normally the role and purpose of plastic packaging (Ellen MacArthur Foundation, 2022). Other good examples are, DyeCoo, which uses carbon dioxide as a solvent for dyeing fabric and reduces chemically toxic wastewater, and Lush, which does not package its products at all. In an ideal circular economy design, all companies would incorporate practices like these.

The second principle – circulate products and materials (at their highest value) – focuses on keeping products in use or dismantling used items into their distinct materials to be used in new ways (Ellen MacArthur Foundation, 2022). There are two fundamental cycles that keep materials in circulation: the technical cycle and biological cycle. Figure 1.2 demonstrates the various ways that the two cycles work (Ellen MacArthur Foundation, 2022).

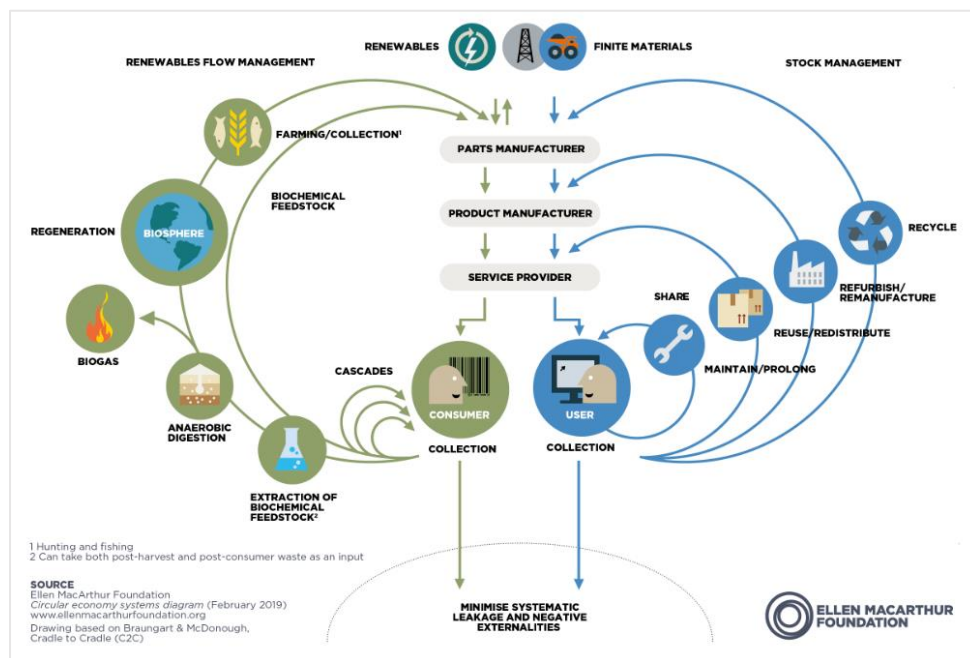


Fig. 1.2 The technical and biological cycles for keeping materials in circulation (EMF, 2019)

In the technical cycle, items can be reused or refurbished by being sold for reuse or maintained and repaired. A good example is the cellphone (Ellen MacArthur Foundation, 2022). The materials can be separated and used individually. In the biological cycle, the materials decompose and provide nutrients that can help grow new materials (Ellen MacArthur Foundation, 2022). The

problem is that many of the products in our current economy consist of two or more materials that are blended or fused together, so they can neither be separated nor recycled in their existing state. In the circular economy, items are designed by specifically selecting each material to have a purpose at the end of its life other than waste.

The third principle – regenerate nature – focuses on conserving natural processes and emulating their cyclical ways into the flows of materials (Tsaligopoulos et al., p. 2, 2022). Regeneration can be done in a variety of ways, such as by supporting farming practices that allow nature to fulfill its course by rebuilding soils, increasing biodiversity, and returning nutrients to the Earth (Ellen MacArthur Foundation, 2022). It may also mean building flexible infrastructure to support biological needs (ie. controlling noise and light pollution), finding ways to re-purpose gray water, or optimizing energy production (Tsaligopoulos et al., p. 2, 2022). Addressing more than remediating harm caused to the environment, this principle prevents environmental destruction from the start and allows nature to restore itself to its best state (Ellen MacArthur Foundation, 2022).

The Economic Pillar

A circular economy model is not just about improving the condition of the environment and reducing pressures on our natural systems, communities, and public health; it also supports a different way of doing business that retains and recovers value that would otherwise be lost as waste (Government of Canada, 2022). The landfills and waste facilities contain numerous items and materials that are still in good condition because people upgrade by buying new, taking on unnecessary expenses. Circular approaches of recycling, reusing, and repurposing can save individuals, businesses, and governments money (Romero-Hernández and Romero, p. 758, 2018). According to the United Nations Environment Programme (UNEP), the global economy would benefit by \$2 trillion a year if resources were managed more efficiently, allowing the cost of raw materials to decrease substantially (instead of increase like they have for the past decade and continue to currently) while continuing to stimulate employment and innovation (p. 92, 2017). In a world where 100% of all raw materials are fully recycled or reused (no new virgin raw material needed), “economic growth” needs to be “decouple[d] from the consumption of raw materials” (Het Groene Brein, p. 1, 2020). This would permit economic growth to be independent of resource availability, particularly shortages (Het Groene Brein, 2020). Most governments, companies and organizations constantly look for ways to cut costs and foster economic growth, thus favouring circular economy strategies as much as possible is in their best interest, and many have begun to transition.

It is important that supply chain management practices adjust to fit the specific conditions of the changing business environment by differentiating between predictable and unpredictable environments (Ciccullo et al., p. 2337, 2018). Where the market is stable, predictable, and controllable, a value stream should be developed to reduce or eliminate waste time and product; this is the *lean paradigm* (Ciccullo et al., p. 2337, 2018). Otherwise, the *agile paradigm* could be used, which involves using key information about the market to exploit all profitable opportunities (Ciccullo et al., p. 2337, 2018). Essentially, when functional products are wasted, the remaining value and associated possible market stream are forfeited (Romero-Hernández and Romero, p. 760, 2018). Increased raw material costs and consumer demand for environmentally conscious products has propelled companies to reduce their waste to make better use of the market (Romero-Hernández and Romero, p. 758, 2018). Circular economy policies can support the maintenance of

products at their highest value; thus, waste is reduced, new value streams are leveraged, and markets are as efficient and effective as possible (Romero-Hernández and Romero, p. 759, 2018). Throughout the transition to a circular business strategy, the opportunities for innovation will continue to increase as the entire business system adapts to changing demands and associated social mindsets.

1.4 Definition for the Purpose of This Research

In this research, the circular economy is defined from a Global North perspective and focuses only on what has been done in Canada. This decision was made to maintain a reasonable scope for a master's thesis. Following an analysis of various definitions from across the world within this context, I have chosen to use the 2021 definition developed by the Ellen MacArthur Foundation in this thesis because it includes the three pillars of sustainability and applies to the Canadian context.

CHAPTER TWO: Theory and Methodology

This chapter describes the theory, scope, and method logic that forms the strategy for this research.

2.1. Theory, Policy Intensity, and Layering

In describing and analyzing incremental policy changes towards a circular economy, this thesis addresses the main criticism of incremental policy change: that the resulting policy design, developed over time in a relatively haphazard way, incorporates elements of non-design and thus, falls short of an optimal design. This thesis focuses on two elements of sub-optimal policy design: 1) a lack of intensity and 2) layering. First, applying the six policy-intensity measures framework to existing Canadian provincial documents related to waste management and the circular economy provides an analysis and evaluation of the content. High scores indicate successful processes, while low scores identify opportunities for growth. The lack of “intensity” in policy design reveals fundamental problems, such as inadequate objectives, unclear budgeting, and ineffective implementation. Second, “layering” of new policy elements on top of older ones causes potential contradictions and ambiguities between new and old policy elements. A detailed examination of policy development related to circular economy policy design improves the existing understanding of how policy intensity is impacted by layering and which policy outputs (processes and methods) lead to optimal circular economy policy.

Six Policy-Intensity Measures

I used a combination of the work by Shaffrin et al. (2015) and Fitch-Roy et al. (2021), who use six policy-intensity measures to assess and weight policies (p. 257, 2015). These measures include 1) Objectives, 2) Scope, 3) Integration, 4) Budget, 5) Implementation, and 6) Monitoring (Shaffrin et al., p. 257, 2015). For each measure, an individual score is assigned and can be totaled at the end to obtain an overall score. Each policy can then be categorized within the policy classification table below (Fitch-Roy et al., p. 5, 2021; Table 2.1). The policy classification table consists of four levels, each increasingly closer to the complete transition to the circular economy model (Fitch-Roy et al., p. 5, 2021). The higher the overall score, the higher the level and the closer to an optimal circular economy. Since the score card rubric has three levels (0, 1, 2) and the highest score possible is six, I adapted Fitch-Roy et al. (2021) policy classification table by combining the middle levels into one level to make three levels. This simplified and unified the comparison.

Table 2.1 Fitch-Roy et al. (2021) policy classification table (p.5)

Policy package types and national policy packages.		
Policy package type	Policy package characteristics	Typical policy instruments
Basic waste management	No linkage between waste management and resource use	Basic provision for public service managing of wastes through landfilling or burning
Integrated waste management	Limited linkage between waste management and resource use	Collection and treatment of wastes, some limited usage of wastes
3R/waste hierarchy	Strong linkage between waste management and resource use	Implementation of the waste hierarchy (reduce, recover, recycle) in resource use and waste management
Circular economy	Complete integration of waste management and resource use	Reducing waste and pollution through design, maintaining materials in production and consumption cycles through reusing, recycling and recovering.

The Spectrum of Layering

The concept of a circular economy remains relatively hazy in several jurisdictions around the world; thus, most have not designed policies to support a circular economy; instead, policies have

developed and transformed over time as jurisdictions grapple with improving waste management, increasing the use of recyclable materials and recycling facilities, reducing greenhouse gas emissions, and holding manufacturers to higher standards (Morningstar Sustainalytics, p. 5). This process in which new elements are added to parts of existing policy structures, changing their status without replacing them altogether is known as *layering* (Van Der Heijden, p. 9, 2011). Oscar Fitch-Roy et al. (2021) describe this concept as it is used in circular economy policy design, by stating that high coherence between related policy documents and low layering is optimal (p. 4).

Layering is an umbrella term, manifesting in numerous ways. It can be an institutional response to unexpected shocks (i.e., financial crises or war) or complementary to *incrementalism*, where institutions change in small measures continuously and gradually over time (Van Der Heijden, p. 10, 2011). It can also be a response to path dependency, where initial decisions cannot be easily reversed, thus “self-reinforcing pressures push policy in a particular direction” (Kay, p. 579, 2007). Many have questioned whether layering produces good policy designs (Fitch-Roy et al, p. 985, 2020; Rudoler et al., p. 216, 2019).

Michael Howlett and Ishani Mukherjee (2014) identify how layering occurs on a spectrum from pure design/packaging (best attempt to solve a problem) to non-design (contingent and driven by the situation), with patching, drift, stretching, and tense layering in between (Figure 2.1, p. 57).



Fig. 2.1 Policy design processes (Howlett and Mukherjee, p. 64, 2014)

The optimal type of layering is *packaging* or *pure design*, in which an existing policy is replaced with a new policy (Howlett and Mukherjee, p. 63, 2014). Howlett and Mukherjee (2014) describe pure design as “a knowledge-based process in which the choice of means or mechanisms through which policy goals are given effect follows a logical process of inference from known or learned relationships between means and outcomes” (p. 57). Re-designing a policy based on the strengths and weaknesses of the previous policy is intended to improve coherence and consistency, but it is often unrealistic for institutions confined by external pressures. Therefore, *patching* is more common as most circumstances involve building on the foundation of pre-existing policy and amending specific aspects, while leaving others as they are (Howlett and Mukherjee, p. 63, 2014). Although this level of layering may be slightly less effective long-term, it can still lead to promising results. In any case, it is better than policy *drift*, which occurs when socioeconomic circumstances change and policy outcomes fail to keep up to date (Galvin and Hacker, p. 2, 2019). When long periods of time pass without changes to the policy, elements might be extended or *stretched* to cover areas that they were not originally intended to incorporate, out of need (Howlett and Mukherjee, p. 63, 2014). This stretching can easily introduce inconsistencies and cause problems in the future. As many cases of poor patching, drift, or stretching are piled on top of each other, *tense layering* is formed, leading the policy outcomes further and further away from the goals (Howlett and Mukherjee, p. 63, 2014).

Anything beyond tense layering is deemed as *non-design*, which indicates the most irrational reasoning for developing a policy and almost exclusively serves ulterior motives (Howlett and Mukherjee, p. 63, 2014). Some of the most common reasons for non-design may be bargaining,

corruption or clientelism, log-rolling between different values or resource uses, and electoral opportunism (Figure 2.2, Howlett and Mukherjee, p. 65, 2014). Although layering policies in different ways can create inconsistencies, some experts say the process produces a better result or outcome than if policy was not layered at all because small steps can create large changes with time (Fitch-Roy et al., p. 4, 2021). Fitch-Roy et al. use policy layering to explain incremental changes towards a more circular economy, which is likely to progress as more information is available and understood by policy makers (p. 4, 2021). Examining policy layering in circular economy policy in Canada will help determine elements that should be included in the best design of circular economy policy, as well as those that should not be.

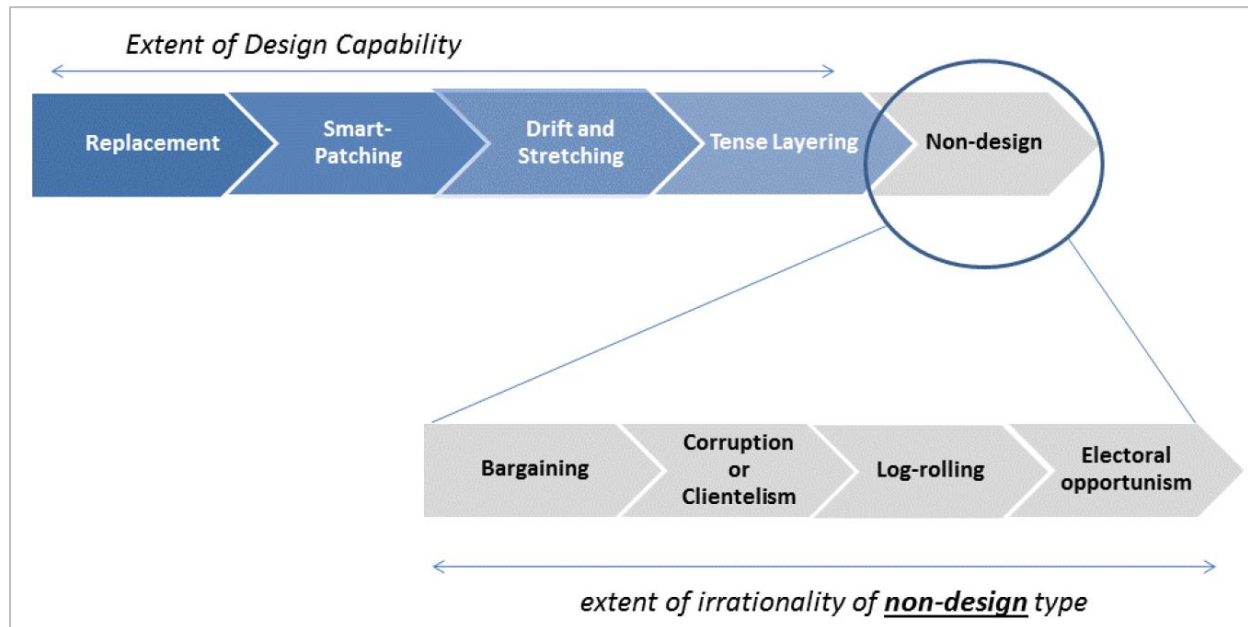


Fig. 2.2 Reasons for non-design in policy development (Howlett and Mukherjee, p. 65, 2014)

2.2. Research Approach: Scope and Method

I determined the scope of my thesis primarily based on time, availability and accessibility of resources, and the limited advancement of circular economy policy in many Canadian provinces/territories on Native land. Combined, I used eight methods to gather, analyze, and rank information pertaining to the circular economy in Canada. The methods are 1) web-based research, 2) academic literature review, 3) definition analysis, 4) a scorecard, 5) content analysis, 6) sentiment analysis, 7) a political timeline, and 8) comparative analysis.

The whole country, Canada, is of interest because of the variety of characteristics from province/territory to province/territory, such as the values and ideologies of the political parties in power, the size and populations, the resource availability, and the economic state. However, because of time constraints and similar characteristics within several geographic regions in Canada – West (blue), East (green), Atlantic (orange), and North (yellow) – I selected only one case from each region of Canada that had sufficient available documents (Figure 2.3).

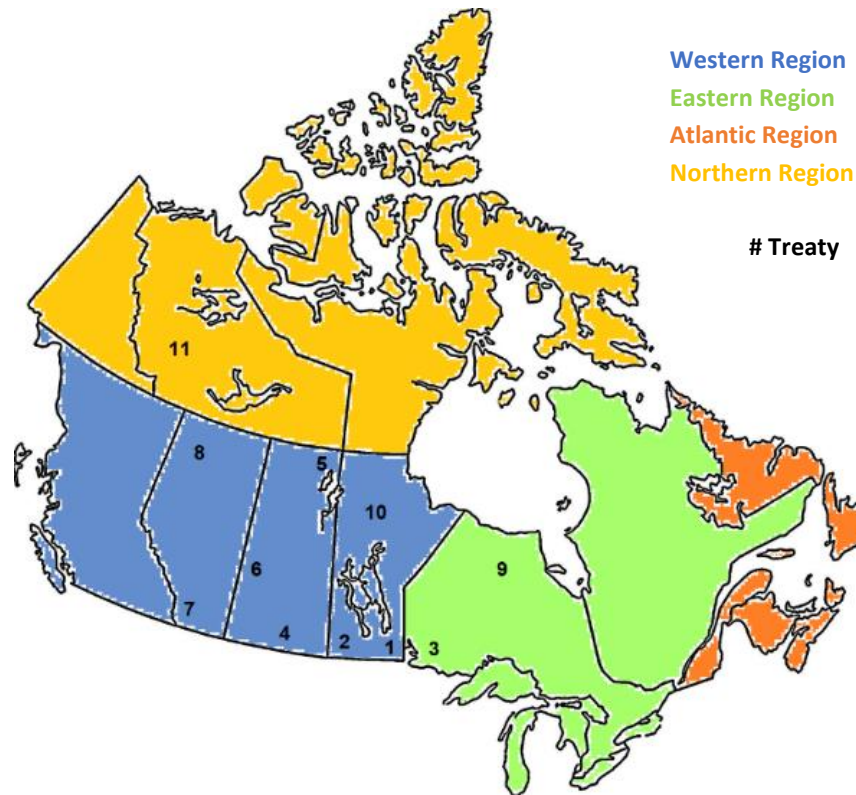


Fig. 2.3 Map of regions of Canada used (Dueck, 2023)

The **Western region** for the purposes of this thesis consists of the provinces of British Columbia, Alberta, Saskatchewan, and Manitoba (Treaties 1, 2, 4-7, 8, and 10. Overall, these provinces are known for strong resource development, such as oil and gas and agriculture. I chose Saskatchewan for its small size, population centrality in the Prairies ecozone, and my personal familiarity. The **Eastern region** includes Ontario and Québec (Treaties 3 and 9), which are known for their large population and geographical size. Ontario was selected for convenience, as Québec had many documents in French, but also for its variety of political power over the last fifty years, size, and population. The **Atlantic region** comprises New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. I picked Nova Scotia because they have advanced circular economy policy the most based on my initial research. Unfortunately, I was not able to include the **Northern territories** (Treaty 11) because of a lack of availability or accessibility to relevant documents.

Method 1: Web-based Research

Web-based research was one of the two primary research methods used to amalgamate circular economy policy documents that exist in Canada, particularly statutes, regulations, guidelines, plans, and strategies related to waste management for each jurisdiction (key question 1). To obtain this information, I first searched the name of the *jurisdiction* followed by ‘circular economy’ (i.e., Nova Scotia circular economy). To these terms, I then added ‘regulations and acts’ and ‘policy’ in separate searches. See tables 2.2-2.4 for a list of documents that were found.

Table 2.2 Waste management documents from Saskatchewan (Dueck, 2023)

Document Number	Document Name	Year Enacted-Year of Last Known Amendment	Weblink
1.1	Household Hazardous Waste Product Stewardship Regulations	2019	link
1.2a	Household Packaging and Paper Stewardship Program Regulations	2013- 2016	link
1.2b	Household Packaging and Paper Stewardship Program Regulations	2022	link
1.3	Solid Waste Management Strategy	2020	link
1.4a	The Litter Control Act	1978- 2011	link
1.4b	The Clean Air Act	1986- 2014	link
1.4c	The State of the Environment Act	1990- 2014	link
1.4d	The Environmental Management and Protection Act	2002- 2014	link
1.4e	Chapter E10-22	2010	link
1.4f	The Environmental Management and Protection Act	2010- 2018	link
1.5	The Waste Paint Management Regulations	2005	link
1.6	The Used Petroleum and Antifreeze Products Stewardship Regulations	2018	link

Table 2.3 Waste management documents from Ontario (Dueck, 2023)

Document Number	Document Name	Year Enacted-Year of Last Known Amendment	Weblink
2.1a	Resource Recovery and Circular Economy Act	2016- 2021	link
2.1b	Strategy for a waste-free Ontario – Building the circular economy	2017	link
2.2a	Waste Diversion Act	2002- 2016	link
2.2b	Municipal Hazardous or Special Waste	2006- 2016	link
2.2c	Stewardship Ontario	2008- 2016	link
2.2d	Used Tires	2003- 2016	link
2.2e	Waste Electrical and Electronic Equipment	2004- 2016	link
2.2f	Blue Box Waste	2002- 2016	link
2.2g	Waste Diversion Transition Act	2016- 2021	link
2.3	Environmental Protection Act	1990- 2022	link

Table 2.4 Waste management documents from Nova Scotia (Dueck, 2023)

Document Number	Document Name	Year Enacted-Year of Last Known Amendment	Weblink
3.1a	Composting Facility Guidelines	2010	link
3.1b	Municipal Solid Waste Landfill Guidelines	1997-2004	link
3.1c	Construction and Demolition Debris Disposal Site Guidelines	1997-2003	link
3.1d	Guidelines for Grease Trap Waste	1997-2007	link
3.2	Proposed Greener Economy Strategy	2014	link
3.3	Electronic Waste Stewardship Plans	2007	link
3.4a	Environmental Act	1994-2017	link
3.4b	Solid Waste-Resource Management Regulations	1996-2022	link
3.5a	Environmental Goals and Sustainable Prosperity Act	2007	link
3.5b	Environmental Goals and Sustainable Prosperity Act	2012	link
3.5c	Sustainable Development Goals Act (as passed)	2019	link
3.5d	Environmental Goals and Climate Change Reduction Act	2021	link

Each document that was retrieved was carefully reviewed and included if a direct relevance to waste management, waste reduction, or circular economy was identified. Once all documents were retrieved, each was given a document number (ie. 1.1) for easy identification. If documents were connected to each other in some way, such as older and newer versions (ie. 1.2a and 1.2b are both the ‘Household Packaging and Paper Stewardship Program Regulations’, however they were enacted in 2013 and 2022, respectively) or stemming from the same root document (ie. 1.4a-f are all connected to the *Statutes of Saskatchewan*) they were assigned the same document number and assigned a lower-case letter to differentiate. The year that the document was enacted and the year of the last known amendment, as well as a weblink, were also included.

Method 2: Exploratory Literature Review

The second primary research method was an exploratory review of academic and grey literature to gain a broader understanding of waste management and sustainability in a circular economy context, as well as existing circular economy policy research and theory. Google Scholar was used to identify definitions of the circular economy that have been widely cited in the literature, both peer-reviewed and grey literature. Key search terms include ‘circular economy’ (3,290,000 results), ‘circularity’ (330,000 results), ‘circular economy policy’ (2,300,000 results), ‘circular + economy’ (3,290,000 results), ‘Extended Producer Responsibility’ (1,000,000 results), and ‘circular economy waste management’ (726,000 results).

Method 3: Definition Analysis

Using web-based searches and academic literature review, I gathered definitions of the circular economy that were used in various documents, including official policy documents, web sources, and academic journal articles. I then compared the definitions to identify any similarities and

differences. Similarities helped determine whether a universal definition had been established, while differences indicated possible alternative understandings or uses for the term and highlighted other aspects that might be valuable to consider. Overall, this process gave me a greater understanding of how the circular economy is viewed around the world.

The definition of ‘circularity’ and ‘Extended Producer Responsibility’ were also examined for similarities to the definitions found for ‘circular economy’ as they were commonly referred to throughout my search for circular economy definitions. A glossary of definitions found are included in Appendix B and a summary in sections 1.1, 1.2, and 1.4.

Method 4: Scorecard

After a web search, I gave an initial score to each jurisdiction based on the amount and quality of information that was readily available (See Appendix A). After analyzing each policy document using the scoring rubric below based on the six Shaffrin et al. policy measures, I gave the documents a score for each measure and then summed all six measures’ scores to get a total score for the document (Table 2.5). I categorized the score of each document by adapting the Fitch-Roy et al. levels to help assess how well the jurisdictions have done. The adaptation of the Fitch-Roy et al. levels I used is below (Table 2.6).

Table 2.5 Scoring rubric adapted from Shaffrin et al. p. 267-268, 2015 (Dueck, 2023)

	0	0.5	1
Objectives: Are there clear targets related to circular design outlined in the document?	No specific target, goal is vague (<i>ie. reduce waste</i>).	Goals are defined, but no numerical targets have been set.	Goals are defined with numerical targets established (<i>ie. cut waste in half</i>).
Scope: What proportion of people causing the problem are included in the policy?	No target groups.	A few groups are targeted, but not all who are responsible.	The policy holds everyone responsible.
Integration: Is the policy connected to other policies / is there any reference to other policies?	No relation.	It appears to be, but the connection is not explicit nor clear.	Direct mention of other existing and related policies.
Budget: What are the set expenditures of the policy?	There is no plan for who will cover the costs.	Responsibility for the costs has been assigned, but no budget is shared.	A budget specific to this policy has been set or funding is established prior to approval.
Implementation: Has the policy been implemented well?	No indication of implementation so far (<i>i.e.</i> , not dated) or has been repealed.	Implemented, but has not been updated or revised regularly.	Implemented and has been updated regularly (<i>i.e.</i> , several amendments). May inform other policies. May be a recent policy.
Monitoring: Is there a specific monitoring process for the policy instrument?	No accountability or check-ins. No review.	Monitored, but not on a regular or set basis.	Specific actors involved must provide regular reports to the implementing agency. Document is reviewed.

Table 2.6 Classification table adapted from Fitch-Roy et al., p. 5, 2020 (Dueck, 2023)

Level 3	Score = 6	Complete cycle from resources to disposal (reducing waste and pollution through policy design, keeping materials in production and consumption cycles through reusing, recycling, and recovering)
Level 2	Score 5-5.99	Several circular policies (strong relationship between resource use and waste management – <i>i.e., implementation of the reduce, reuse, recycle strategy</i>)
Level 1	Score 0-4.99	No circular policies (no relationship between resource use and waste management – <i>i.e., sent to landfill or burned immediately</i>)

For each provincial document, the resulting score per measure was recorded in a table, totaled, and visually represented in figures. Various averages and summaries of the scores were also visually represented in figures.

Methods 5 and 6: Content and Sentiment Analysis

To identify the specific content of the documents in detail, I used Nvivo’s ‘text search’ function to locate and count occurrences of a set of key words related to the six Shaffrin et al. measures. The set of key words are a pre-selected collection of root words that fall under the topic of each Shaffrin et al. measure and are commonly used in provincial waste management statutes, regulations, guidelines, plans, and strategies. Each key word was analyzed within each document. The ‘with stemmed words’ function was used to collect variations of the root word as well, for example Nvivo would count ‘began’ and ‘beginning’ as well as the root word ‘begin’. See Table 2.7 for the key words I looked for in the documents.

Table 2.7 Key words per measure analyzed in content analysis (Dueck, 2023)

Shaffrin et al. Measure	Key Words
Objectives	‘goal’ ‘target’ ‘objective’ ‘circular-economy’ ‘circularity’ ‘waste-reduction’
Scope	‘industry’ ‘government’ ‘public’ ‘businesses’ ‘companies’ ‘organizations’
Integration	‘policy’ ‘regulations’ ‘strategy’ ‘joined-up’ ‘coordination’
Budget	‘budget’ ‘costs’ ‘expenditures’
Implementation	‘implement’ ‘success’ ‘begin’ ‘start’
Monitoring	‘reports’ ‘regular’ ‘milestones’

Content analysis is important and useful as it indicates to what extent a document focuses on the circular economy. It was hypothesized that a larger word count total per measure would yield a higher score. To avoid the false inclusion of words, I used my judgement to determine whether Nvivo used an appropriate homonym. If the word was used in a relevant sense to the circular economy, it was included in the word count, but otherwise it was purposely excluded. For example, the word ‘waste’ can refer to garbage, which is related and would be included, but it can also have other meanings such as *a waste of time*, which would not be related to the topic and not included.

After reviewing the content analysis results, no patterns emerged. Comparing Saskatchewan, Ontario, and Nova Scotia’s content analysis results yielded inconsistent highest and lowest content per key word, as well as per measure. I did not find these results to contribute significantly to the overall thesis and thus moved this section to the Appendices. See Appendix C.

In addition to analyzing the content, I used *sentiment analysis* to distinguish between positive, neutral, and negative expressions of the waste and circular economy policies. Sentiment analysis, according to Thelwall et al. (2020), uses software programming to classify human emotions and opinions in language that may be subjective (p. 2). I used Nvivo, a qualitative analysis software (Figure 2.4). Sentiment analysis is also known as opinion mining because qualitative analysis software divides the policy submitted based on patterns and rules that it has previously learned to connect to a sentiment (Thelwall et al., p. 2-3, 2020). For example, if the phrase ‘This is a very happy dog’ was submitted, the software would detect the word ‘happy’ and associate it with a positive sentiment, while also detecting that the word ‘very’ can emphasize a sentiment (Thelwall et al., p. 3, 2020).

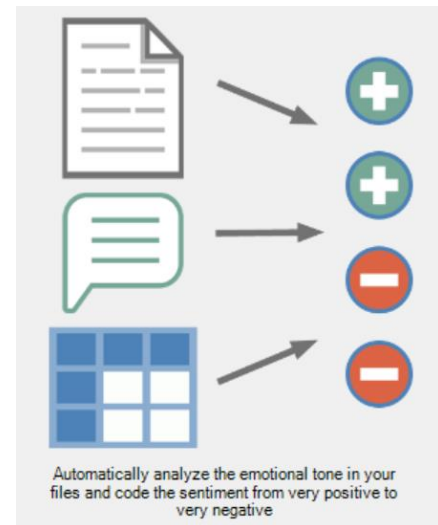


Fig. 2.4 Process for sentiment analysis (Nvivo, 2012)

Sentiment analysis is important to include alongside specific key word counts (content analysis) because a negative sentiment usually raises inconsistencies or other debatable issues that need to be discussed, while a positive sentiment can often confirm that the policies are effective and provide further direction for policy makers (Thelwall et al., p. 5, 2020). This distinction was helpful for determining the level at which policy makers understand and support a circular economy, as well as whether policy is heterogeneous, which would suggest layering has occurred. These results were visually represented in figures.

Method 7: Political Timeline

Lastly, starting in 1971 when the federal Department of the Environment was established, I compiled political information (election year, party leader, party affiliation including seats won, dates in power, official opposition party including seats won) and influential events in each province studied (SK, ON, and NS). This information was cross-referenced with the waste management documents’ scores and sentiment to identify patterns. The results were organized in chronological order in a table.

In a chart, the amendments of each document are visually represented. The vertical axis (left) contained years in increments of one, descending from 2023 to the oldest document year (top to bottom). The years are colour coded by political party in power at the time. The horizontal axis (top) contained the documents used in ascending order of enactment (left to right). A coloured highlight indicates the year the document was enacted, a grey highlight indicates the year(s) that the document was amended, and a black highlight indicates that the document has been repealed. This visual representation is extremely useful for identifying packaging and patching of documents. The score and sentiment for each document is also included.

Method 8: Comparative Analysis

After gathering as much information as possible about the circular economy policy design in each jurisdiction, I compared the policy documents using the six Shaffrin et al. (2015) policy measures (1. Objectives, 2. Scope, 3. Integration, 4. Budget, 5. Implementation, and 6. Monitoring) and the Fitch-Roy et al. (2020) policy classification table. This comparison resulted in a score and

associated level which allowed me to determine the overall success of a jurisdiction in implementing circular economy design.

2.3. Limitations of the Study

This section indicates factors that may have impacted the results of this research, the analysis, and possible ways to overcome these issues in future work.

First, the study focused on the implementation of the circular economy in Canada alone; however, development in other countries were not explored. Second, although the circular economy is significant to many people in Canada, this research did not capture citizen, particularly Indigenous, perspectives. As a result, the scope of the study may be a limiting factor in understanding the best design principles for a circular economy. This deeper understanding was sacrificed to accommodate time and thesis length restriction. Third, for some parts of Canada, the literature and web content are not easily accessible, meaning that policies and programs from jurisdictions may be underrepresented. Speaking with representatives across Canada may allow for an expansion of information sources.

CHAPTER THREE: Policy Design: The Circular Economy in Canada

3.1. Introduction

I conducted preliminary research on many of the existing circular economy documents in Canada using primarily a web-based approach (See Appendix A). Searching for each province/territory individually and Canada, coupled with the terms ‘circular economy’ and ‘circular economy policy’, gave a broad variety of information and sources. At least four resources about each province were reviewed and used, except for Prince Edward Island and Nunavut, which only had three and one resource available, respectively. One of the most significant findings was that each province and territory within Canada is working towards implementing an ‘Extended Producer Responsibility (EPR)’ plan if they do not already have one. The Organization for Economic Co-operation and Development (OECD) defines this as “a policy approach under which producers are given a significant responsibility -- financial and/or physical -- for the treatment or disposal of post-consumer goods” (Confraria et al., p. 266, 2017). It includes the following key features: 1. Shifting responsibility upstream to producers and away from municipalities; and 2. Providing incentive to producers to take environmental considerations into the design of the product. Based on the pre-liminary research, Saskatchewan, Ontario, and Nova Scotia were chosen for further analysis. Chapter three includes a summary of the information retrieved through the assessment of each of the three province’s circular economy policy documents.

3.2. Objectives

The goal was to compile all the statutes, regulations, guidelines, plans, and strategies from Saskatchewan, Ontario, and Nova Scotia that are relevant to the circular economy, particularly older documents about waste and environmental management that have been amended over time (layering). The documents were analyzed using a scorecard based on the six Shaffrin et al. (2015) policy measures (1. Objectives, 2. Scope, 3. Integration, 4. Budget, 5. Implementation, and 6. Monitoring), classification using a modified version of the Fitch-Roy et al. (2020) policy classification table, sentiment analysis, and a political timeline.

3.3. The Province of Saskatchewan

Below is a list of relevant provincial statutes, regulations, guidelines, plans, and strategies produced for Saskatchewan between 1971 and the present. They consist of five regulation documents, six statutes, and one strategy. The ‘Household Packaging and Paper Stewardship Program Regulations’ Reports are clustered within 1.2 (a and b) because they consist of an older (2016) and newer (2022) version of the same document. The Litter Control Act (1.4a), the Clean Air Act (1.4b), the State of the Environment Act (1.4c), The Environmental Management and Protection Acts (1.4d and 1.4f) are clustered within 1.4 because they were repealed by Chapter E10-22 (Act) (1.4e). The other four documents (1.1, 1.3, 1.5, and 1.6) are standalone.

1.1 (2019) ‘Household Hazardous Waste Product Stewardship’ Regulations

1.2a (2013-2016) ‘Household Packaging and Paper Stewardship Program Regulations’ Report

1.2b (2022) ‘Household Packaging and Paper Stewardship Program Regulations’ Report

1.3 (2020) Solid Waste Management Strategy

1.4a (1978-2011) The Litter Control Act

1.4b (1986-2014) The Clean Air Act

- 1.4c** (1990-2014) State of the Environment Act
1.4d (2002-2014) The Environmental Management and Protection Act
1.4e (2010) Chapter E10-22 Act
1.4f (2010-2018) The Environmental Management and Protection Act
1.5 (2005) The Waste Paint Management Regulations
1.6 (2018) The Used Petroleum and Antifreeze Products Stewardship Regulations

Here is a summary of the scores for each of the Saskatchewan documents (Table 3.1). The total scores range from low to high, with document 1.4a scoring 1.5 (lowest) and document 1.2b scoring 5.5 (highest), out of a maximum possible score of 6. The rest of the documents vary within this range. Overall, the higher the total score, the higher the level and the closer to an optimal circular economy policy design.

Table 3.1 Scorecard for Saskatchewan (Dueck, 2023)

Document	Scores of Shaffrin et al. Intensity Measures						Total (/6)
	Objectives (/1)	Scope (/1)	Integration (/1)	Budget (/1)	Implementation (/1)	Monitoring (/1)	
1.1	0.5	0.5	1	0.5	0.5	1	4
1.2a	0.5	0.5	1	0.5	1	0.5	4
1.2b	0.5	1	1	1	1	1	5.5
1.3	1	0	1	0.5	1	1	4.5
1.4a	0.5	0.5	0.5	0	0	0	1.5
1.4b	0	1	0.5	1	1	0.5	4
1.4c	0.5	1	0.5	1	0	0	3
1.4d	0.5	0.5	0.5	0	0	1	2.5
1.4e	0.5	1	1	0.5	1	1	5
1.4f	0.5	1	1	0.5	1	1	5
1.5	0.5	0.5	1	1	0.5	0.5	4
1.6	0.5	0.5	1	0.5	1	1	4.5

The resulting total scores are then classified within Fitch-Roy et al. (2021) classification table, which has three levels. All the Saskatchewan documents scored within level 1, except for documents 1.2b, 1.4e, and 1.4f, which achieved level 2 (Figure 3.1). None of the documents reached level 3. Level 1 includes scores ranging from 0-4.99 and does not recognize a significant relationship between resource use and waste management. Level 2 includes scores ranging from 5-5.99 that recognizes a strong relationship, but not quite a complete cycle. Level 3 is achieved with the maximum score of 6 and is considered an optimal design according to my analysis.

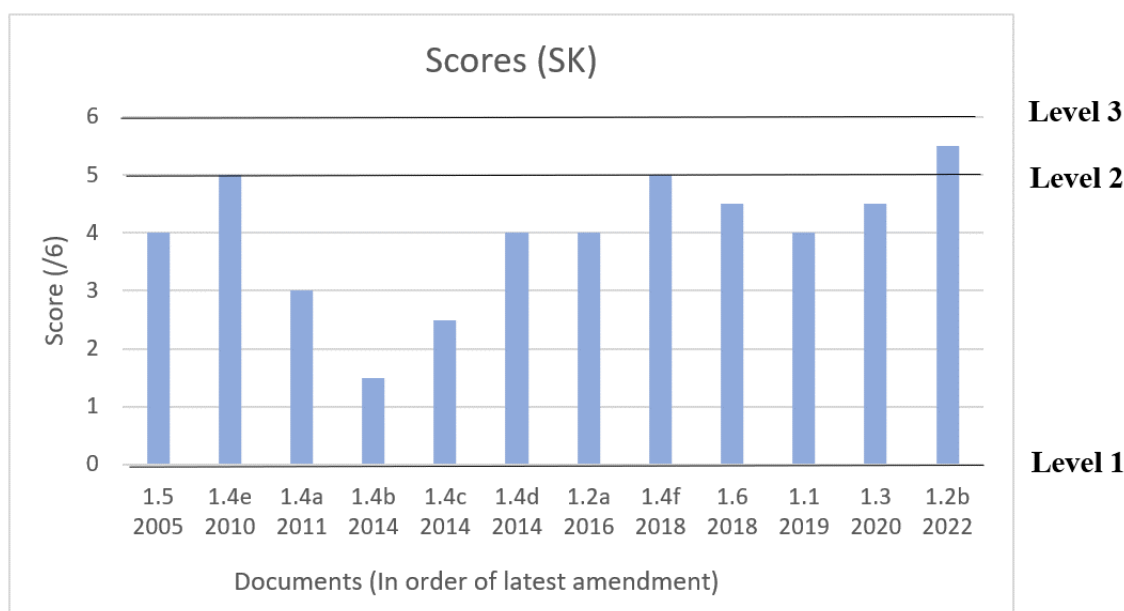


Fig. 3.1 Score per document in Saskatchewan (Dueck, 2023)

To analyze each document's score, I performed a detailed analysis of each measure. The *Objectives* within the Saskatchewan documents are not explicit, resulting in an average score of 0.5 (Figure 3.2). For all except two of the documents (1.3 and 1.4d), a score of 0.5 was given because there was a purpose stated, yet there were no clear targets or goals using numeric levels to maintain accountability. The distinction is evident as document 1.3 scored well (1) because it plans on "reducing waste generated/person by 30% by 2030 and 50% by 2040 from 2014 baseline levels (reducing waste to 589kg/person by 2030 (30%) & 421kg/person by 2040 (50%))" (Government of Saskatchewan, p. 1, 2020). Within the scorecard analysis of the *Scope* (Saskatchewan documents), most have mentioned at least one of the key stakeholders (1.1, 1.2ab, 1.4a-f, 1.5, 1.6) and very few did not hold anyone accountable (1.3). The average score was 0.67. To obtain a score of 1, the documents 1.2b and 1.4adef 'holds every person who has or had possession, charge, management or control of the substance responsible for discharge (1.2b, Section 2w, p. 6)' or 'every person' (1.4a, Section 3, p. 4-5). In contrast, the documents 1.1, 1.2a, 1.4bc, 1.5 and 1.6 only target either industry or the public resulting in a score of 0.5. For the *Integration* measure, the trend continues where most SK documents score well, meaning they are consistent with at least one other document. This measure has received the highest overall average of 0.83. The key difference between a score of 0.5 and 1 was whether the documents that are mentioned have been repealed or not. Documents 1.1, 1.2ab, 1.3, 1.4ef, 1.5, and 1.6 scored 1, whereas documents 1.4abcd scored 0.5.

The trend shifts for the *Budget* measure as the closest to a complete budget and score of 1 is due to the requirement of proof of financial soundness to cover costs (1.4d, 1.5), the inclusion of a plan or delegation of the responsibility for costs (1.4a, 1.5), or a full 'Extended Producer Responsibility' plan (EPR) (1.2b). Generally, most Saskatchewan documents (1.1, 1.2a, 1.3, 1.4e, 1.4f, 1.6) require that a list of the costs that it took to implement the program are included in the annual report; this results in a score of 0.5. This is why the overall average score is 0.58, which was higher than both Ontario and Nova Scotia's average score for this measure. Both documents 1.4b and 1.4c do not acknowledge costs at all and received a score of 0. The average score for the *Implementation*

measure amongst Saskatchewan documents is 0.67 and most have been implemented well. Documents 1.2a, 1.2b, 1.2d, 1.3, 1.4d, 1.4e, 1.4f, 1.6 have been amended several times without being repealed (score: 1), whereas documents 1.1 and 1.5 have not been amended since they were enacted (score: 0.5). Documents 1.4abc have been repealed (score: 0). Lastly, on average most of the SK documents have a *Monitoring* section for everyone within scope and the policymakers. A top-scoring document holds both those within the scope accountable, through either annual reports, permits, or reviews and the policymakers, through a declaration of intent to review the document on an incremental basis such as every 5 or 10 years. The overall score was 0.71 with documents 1.1, 1.2b, 1.3, 1.4c, 1.4e, 1.4f, 1.6 scoring 1 for having both aspects, documents 1.2a, 1.4d, 1.5 scoring 0.5 for having one aspect, and documents 1.4a and 1.4b scoring 0 for having no accountability stated.

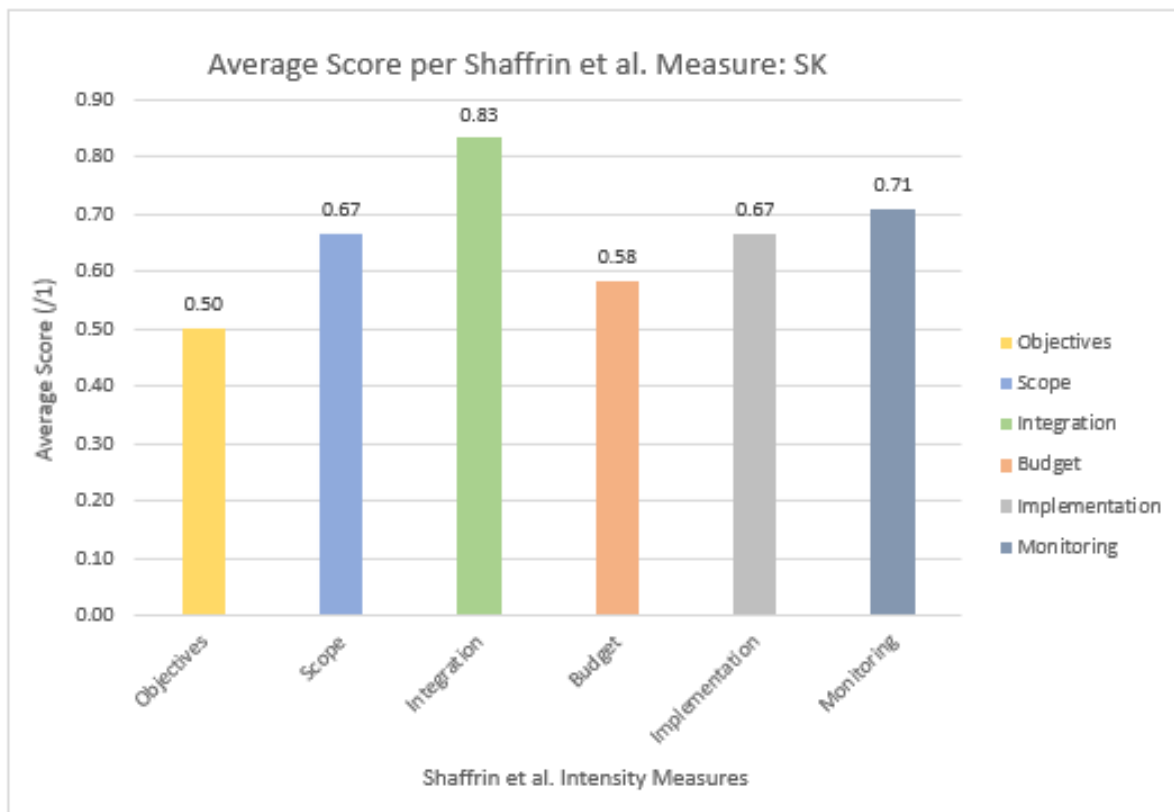


Fig. 3.2 Average score per measure for Saskatchewan documents (Dueck, 2023)

To compliment the scorecard analysis, sentiment analysis resulted in a fairly even split between overall positive (yellow) and overall negative (blue) sentiment for the Saskatchewan documents (Figure 3.3). Seven of the twelve documents that were analyzed were found to be more negative than positive (1.1, 1.4a, 1.4b, 1.4c, 1.4d, 1.4e, 1.4f), whereas five were more positive than negative (1.2a, 1.2b, 1.3, 1.5, 1.6).

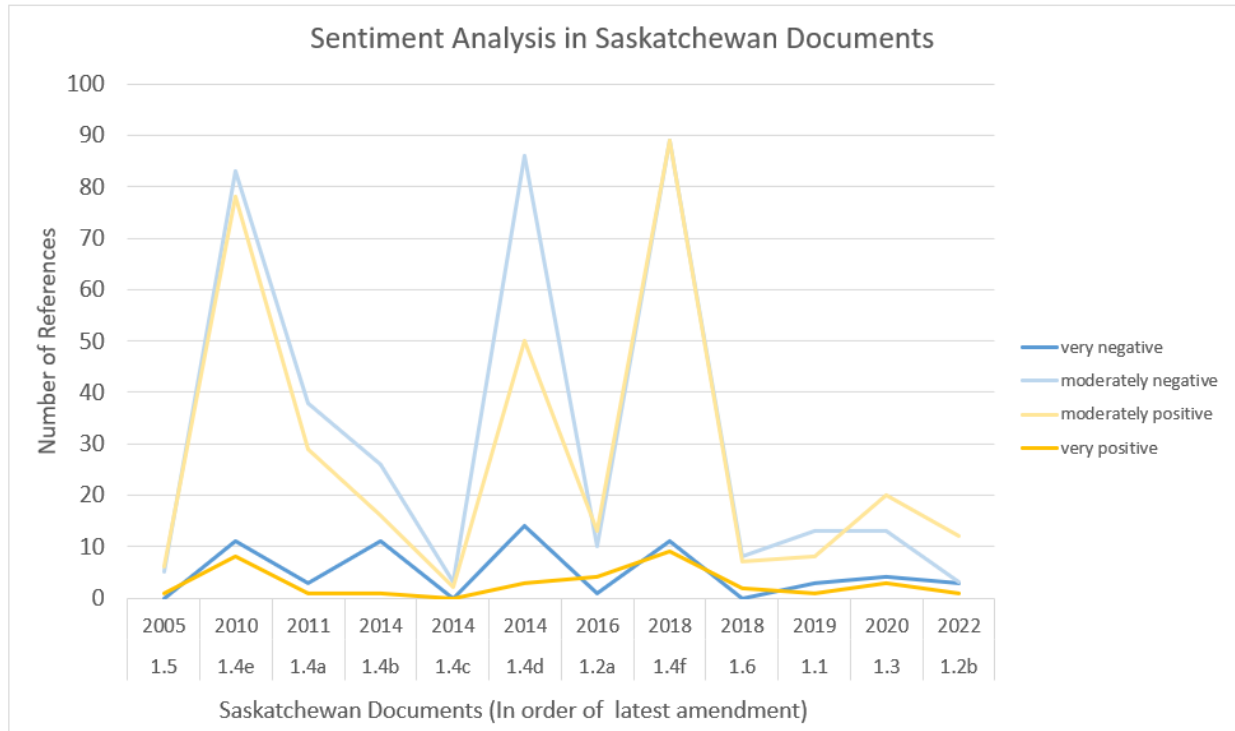


Fig. 3.3 Sentiment analysis in Saskatchewan documents (Dueck, 2023)

Lastly, I reviewed the political state of Saskatchewan over the course of time that the documents related to waste management were enacted. Beginning in 1971, the formal Department of the Environment was established in Canada because of the convergence of the Meteorological Service of Canada, Water Survey of Canada, and the Canadian Wildlife Service (Table 3.2). During this time, the New Democratic Party (NDP), which is further left on the political spectrum, formed a majority government. During the following decade, the only waste management document enacted in Saskatchewan was the Litter Control Act in 1978 (1.4a). Following its enactment, it was amended sixteen times, which is more than any other waste management document in Saskatchewan. It was last amended in 2011 and consisted of a nearly even split between positive and negative sentiment, however had slightly more negative sentiment and scored lower relative to the other documents with a score of 3.

Table 3.2 Political timeline (SK) from 1971-2003 (Duck, 2023)

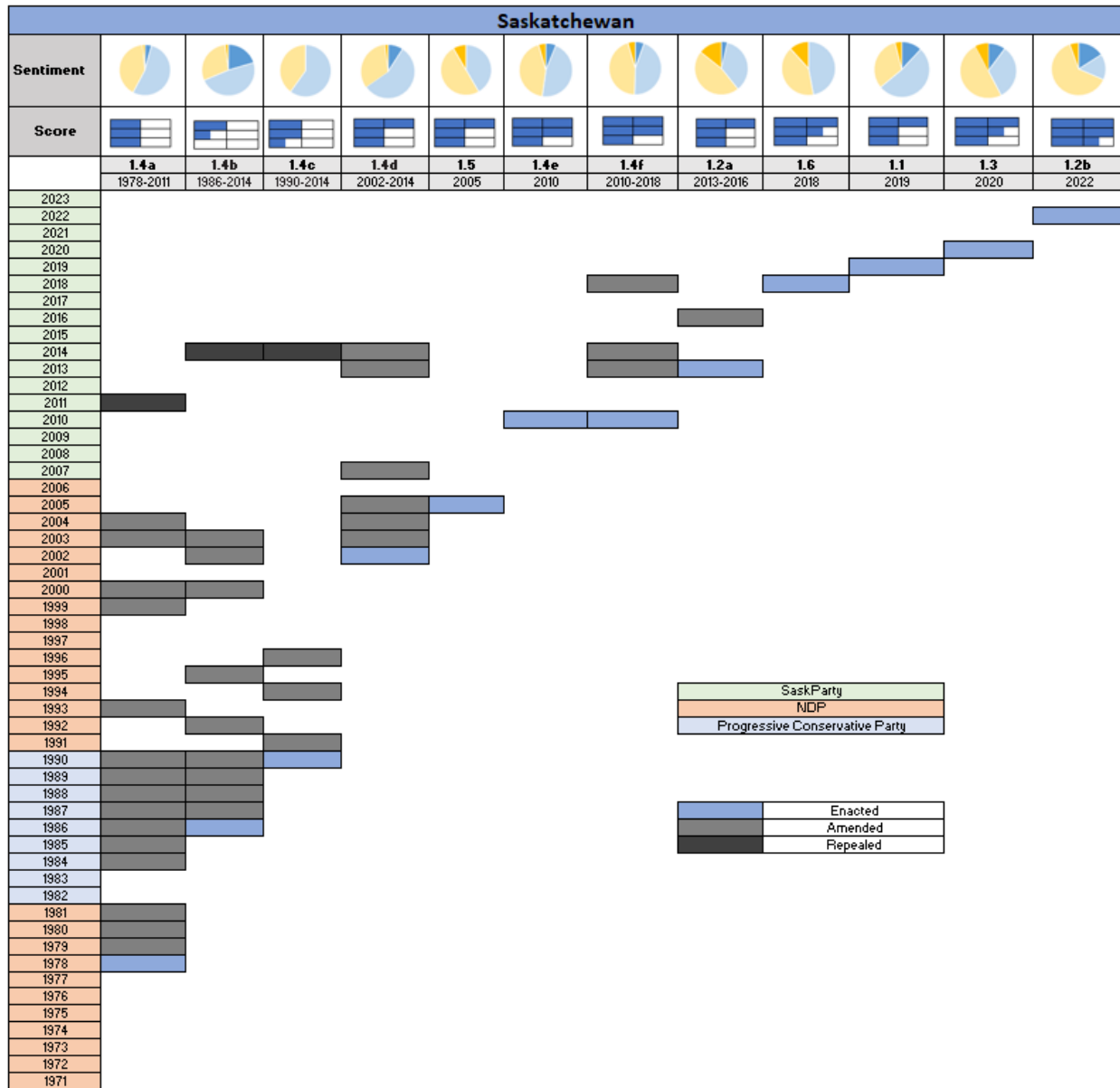
Saskatchewan						
Election Year	Leader	Party Affiliation	Dates in Power	Opposition	Influential Events	Waste Management Documents Enacted
1971	Allan E. Blakeney	NDP majority (45/60)	1971-1975	Lib (15/60)	1971: Department of the Environment established	
1975	Allan E. Blakeney	NDP majority (39/61)	1975-1978	Lib 15 (PCP 7)	1976: SK passed legislation to take over the potash industry	1978-2011; Litter Control Act (1.4a).
1978	Allan E. Blakeney	NDP majority (44/61)	1978-1982	PCP 17	1981: Grasslands National Park established	
1982	Grant Devine	PCP majority (55/64 seats)	1982-1986	NDP (other 9)		
1986	Grant Devine	PCP majority (38/64)	1986-1991	NDP 25 (lib 1)	1987: Canada and 23 other countries signed the Montreal Protocol on Substances that Deplete the Ozone Layer. 1988: The Canadian Environmental Protection Act (CEPA) was passed into law amalgamating existing laws and providing new powers to protect human health and the environment from the risks from pollution.	1986-2014; the Clean Air Act (1.4b) 1990-2014; State of the Env Act (1.4c)
1991	Roy J. Romanow	NDP majority (55/66 seats)	1991-1995	PCP 10 (lib 1)		
1995	Roy J. Romanow	NDP majority (42/58)	1995-1999	1995 - lib 11 (PCP 5) 1997 - SaskParty	1997: Formation of the SaskParty	
1999	Roy J. Romanow	NDP majority (29/58)	1999-2001	SaskParty elected 25 (lib 4)	1999: SK rejected a national accord that would have prohibited the export of fresh water. 1999: The Canadian Environmental Protection Act, review of 23,000 substances by 2006 to determine health/environmental risks.	
2003	Lorne A. Calvert	NDP coalition with Lib to form majority (30/58)	2001-2007	SaskParty elected 28	2005: The Federal Contaminated Sites Action Plan	2002-2014: The Environmental Management and Protection Act (1.4d) 2005: The Waste Paint Management Regulations (1.5)
<div> <div>1.4b: mid-range score (4)</div> <div>1.4c: lower score (3)</div> <div>1.4d: mid-range score (4)</div> <div>1.5: mid-range score (4)</div> </div>						

From 1982-1991, the Progressive Conservative Party (PCP) swept in and formed a majority government. It was not until halfway through their term that another waste management document was produced; the Clean Air Act (1.4b) of 1986. This Act contained the most negative sentiment and scored the lowest (1.5) out of all the Saskatchewan documents. In addition, the PCP did not bring a provincial budget to a vote in the province's Legislature which meant that government's expenditures were financed by special warrants instead. Amongst the last year before the term ended with a constitutionally mandated election, the State of the Environment Act (1.4c) was enacted (1990). This document also contained a high level of negative sentiment (about two thirds) and scored low (2.5). In the end, the PCP lost in the 1991 election and convictions for fraud were held against many members of the PCP Cabinet.

Following the PCP government, the NDP formed a majority government once again. This lasted until 1997 when the SaskParty was formed, changing the level of support within the province. In the 1999 election, the NDP just barely held a majority government with only 29 of the 58 seats, thirteen less than the previous election. The SaskParty became the official opposition and held 25 seats. At this time in Canadian history, the Canadian Environmental Protection Act mandated each province to review 23,000 substances by 2006 to determine the health and environmental risks associated. Not long after, the Saskatchewan government produced the Environmental Protection Act (1.4d, 2002) and the score was higher than any other waste management document so far (4) albeit contained approximately two thirds negative sentiment again. This Act, as well as the last two waste management documents enacted in Saskatchewan (1.4b: the Clean Air Act and 1.4c: the State of the Environment Act), were last amended in 2014. In the 2003 election, the NDP defeated the SaskParty one last time because they formed a coalition with the Liberal party to win 30 out of 58 seats.

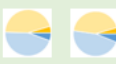


From the 1970s through to the early 2000s, the waste management documents enacted in Saskatchewan (1.4a-d) were regulatory-based and evolved through several amendments (Table 3.3). Document 1.4a was amended sixteen times between 1978 and 2011, document 1.4b was amended ten times between 1986 and 2014, document 1.4c was amended four times between 1990 and 2014, and document 1.4d was amended six times between 2002 and 2014. Amendments like these suggest the theory of patch layering is occurring, where new elements build on parts of existing policies and leave other parts as they are (Howlett and Mukherjee, p. 63, 2014). On the spectrum of layering, patching falls second to the left which is considered a good design practice. In addition, small incremental changes gradually over time may work within the capacity of the province, even with drastic changes within political leadership at the provincial level (Van Der Heijden, p. 10, 2011). Documents 1.4a-c were repealed by Chapter E-10.22 of the Statutes of Saskatchewan in 2010 (1.4e) (effective 2015).

Table 3.3 Amendment table for Saskatchewan (Dueck, 2023)



Shortly after, the Waste Paint Management Regulations (1.5) were created, which also scored four, but was the first waste management document in Saskatchewan to contain slightly more positive than negative sentiment. The defeat of the NDP occurred in the 2007 election when the SaskParty formed a majority government for the first time (Table 3.4). The first waste management documents (1.4e: Chapter E10-22 and 1.4f: The Environmental Protection and Management Act) enacted under the SaskParty government were in 2010. Both documents scored five out of six and contained an even split of positive and negative sentiment. Whereas Chapter E10-22 (1.4e) was never amended, The Environmental Protection and Management Act (1.4f) was amended three times with the third time being in 2018.

Table 3.4 Political timeline (SK) from 2007-2016 (Dueck, 2023)

Saskatchewan							
Election Year	Leader	Party Affiliation	Dates in Power	Opposition	Influential Events	Waste Management Documents Enacted	Outcomes
2007	Brad Wall	SaskParty majority 38/58	2007-2011	NDP 20		2010; Chapter E10-22 (1.4e) 2010-2018; The Env. Management and Protection Act (1.4f)	1.4e: high score (5) 1.4f: high score (5) 
2011	Brad Wall	SaskParty majority (49/58)	2011-2016	NDP 9	2013: Ministry of Environment inspection and critical report of Kindersley landfill (behind). Seen as a wake-up call for municipalities across Saskatchewan and for the provincial government. The Ministry of Environment starts taking landfill inspections more seriously, including commissioning inspectors solely responsible for monitoring landfills. 2014: Perry Bellegarde, former chief of the Federation of SK Indian Nations and SK regional chief of the AFN, elected chief of AFN. 2014: Landfill fire in Katepwa, SK burned for 5 months.	2013-2016; Household Packaging and Paper Stewardship Program Regulations (1.2a)	1.2a: mid-score (4) 
2016	Brad Wall	SaskParty majority (51/61)	2016-2018	NDP 10	2014: Landfill fire in Katepwa, SK burned for 5 months. 2014-2015: 73% of landfills in SK are found non-compliant. Saskatchewan has more landfills than anywhere else in the country. 2017: Saskatoon landfill fire. 2017: SK disappointed Energy East pipeline project is cancelled. 2017: 'Common Landfill Issues and Guidance' document by the Gov of SK. 2017: Saskatoon landfill filling faster than anticipated.	2018: The Used Petroleum and Antifreeze Products Stewardship (1.6) 2019: Household Hazardous Waste Product Stewardship (1.1)	1.6: high score (4.5) 1.1: mid-score (4) 

In contrast to the patterns of the prior documents enacted, two of the three waste management documents enacted between 2005 and 2010 have never been amended (1.5 and 1.4e) and the third document has only been amended three times. While it is possible for these two documents to be amended in the future, a stretch of eighteen and thirteen years, respectively, is a significantly larger period of inactivity than most of the previously enacted documents. Around this time, the government transitioned from the long-standing leadership of the NDP to the newly formed SaskParty. This lack of engagement suggests the occurrence of policy drift, as socioeconomic circumstances changed, but the policies were not maintained (Galvin and Hacker, p. 2, 2019). It may also be policy stretching due to the long periods of time passing without amendments (Howlett and Mukherjee, p. 63, 2014). In this case, aspects of the policy may no longer apply, however are still legislatively effective. Both categories of layering (drift and stretching) fall in the middle of the spectrum of layering, which may not be inherently bad, yet have a higher probability of inflicting issues.

The SaskParty remained in government in the 2011 election but gained eleven more seats than its previous term (49/58). It was not long before they introduced the “Household Packaging and Paper Stewardship Program Regulations” (1.2a) in 2013. This mid-scoring document (4), with slightly more positive sentiment, came into force around the time that an inspector from the Ministry of Environment visited the Kindersley, SK landfill and issued a critical report that stated that the processes were behind (Leo/CBC, 2013). Two months after the inspection, a landfill fire occurred, which was noted as a wake-up call for municipalities across Saskatchewan. The provincial government also took this event seriously and declared that it has been taking landfill inspections more critically over the past year by commissioning inspectors to be solely responsible for monitoring landfills (Leo/CBC, 2013).

Throughout 2014-2015, a study found that 73% of landfills in Saskatchewan were non-compliant (Laverne-Smith/CBC). Another landfill near Katepwa, SK also caught fire this year, which slow burned for five months (Global News, 2014). Meanwhile, the SaskParty continues to grow its support and held 51 of 61 seats by the 2016 election. The “Household Packaging and Paper Stewardship Program Regulations” (1.2a), enacted in 2013, was also amended for the first time in 2016. While it cannot be linked for sure, the patching of this document may be associated with the province’s goal to take greater action following the numerous events and studies related to landfill disasters within the province, as well as the potential issues that may have resulted from the policy drift and stretching of the previously enacted waste management documents.

In 2017, the Saskatoon, SK landfill caught fire and was found to be filling faster than anticipated, while the Government of Saskatchewan issued a “Common Landfill Issues and Guidance” document (Page/CBC). It was becoming more clear that landfills around Saskatchewan were a long-term issue that needed to be dealt with (Page/CBC). The “Used Petroleum and Antifreeze Products Stewardship” was enacted in 2018. It scored high (4.5) and contained approximately the same amount of positive and negative sentiment. In 2019, the “Household Hazardous Waste Product Stewardship” (1.1) was enacted (score of 4, 2/3 negative sentiment). In addition, both documents enacted during this period (2017-2019) have never been amended, as well as are the second and third documents within Saskatchewan to be formatted as stewardships.

The 2020 election started yet another term led by the SaskParty (Table 3.5). Almost immediately, the SaskParty released their Solid Waste Management Strategy (1.3) in 2020, which was the first waste reduction strategy developed by the province. This thorough document scored well (4.5),

contained only a bit more positive sentiment than negative, and has not been amended yet. In 2021, another landfill fire occurred within the province near the Town of Humboldt, SK (Durling/SaskToday). Once 2022 began, a new version of the “Household Packaging and Paper Stewardship Program Regulations” (1.2b) was released, which not only scored higher than the 2013 version by 1.5 marks, but also scored the highest of all Saskatchewan waste management documents to date (5.5/6). It also contained the most positive sentiment of all Saskatchewan waste management documents to date, which neared three quarters. The enactment of this document is the first time in Saskatchewan that an existing document has been replaced altogether instead of parts being amended. This is known as packaging or pure design, which is the best practice of layering (Howlett and Mukherjee, p. 63, 2014). This may be the output of learned discoveries from the previous version (Howlett and Mukherjee, p. 57, 2014).

Table 3.5 Political timeline (SK) from 2020–present (Dueck, 2023)

Saskatchewan							
Election Year	Leader	Party Affiliation	Dates in Power	Opposition	Influential Events	Waste Management Documents Enacted	Outcomes
2020	Scott Moe	SaskParty majority (48/61)	2018-present	NDP 13	2021: landfill fire by humboldt. 2022: 2nd landfill in a month, moose jaw (cause was lithium ion battery) 2023: SUMA pushes for support with decommissioning landfills. The cost of decommissioning landfills continues to be a barrier for Saskatchewan's municipalities.	2020: Solid Waste Management Strategy (1.3) 2022: Household Packaging and Paper Stewardship Program Regulations (1.2b)	1.3: high score (4.5) 1.2b: highest score (5.

3.4. The Province of Ontario

Below is a list of relevant provincial policy, act, strategy, guideline, and regulation documents produced for Ontario between 1971 and the present. They consist of five regulation documents, four statutes, and one strategy. The “Resource Recovery and Circular Economy Act” (2.1a) informed the “Strategy for a waste-free Ontario – Building the circular economy” (2.1b) and therefore, are clustered within 2.1. The “Waste Diversion Transition Act” (2.2a), “Municipal Hazardous or Special Waste Regulations” (2.2b), “Stewardship Ontario Regulations” (2.2c), “Used Tires Regulations” (2.2d), “Waste Electrical and Electronic Equipment Regulations” (2.2e), and “Blue Box Waste Regulations” (2.2f) are clustered within 2.2 because they fall under the “Waste Diversion Transition Act” (2.2g). The “Environmental Protection Act” (2.3) and “Environmental Assessment Act” (2.4) are standalone.

2.1a (2016-2021) Resource Recovery and Circular Economy Act

2.1b (2017) Strategy for a waste-free Ontario – Building the circular economy

2.2a (2002-2016) Waste diversion transition Act

2.2b (2006-2016) Municipal Hazardous or Special Waste Regulations

2.2c (2008-2016) Stewardship Ontario Regulations

2.2d (2003-2016) Used Tires Regulations

2.2e (2004-2016) Waste Electrical and Electronic Equipment Regulations

2.2f (2002-2016) Blue Box Waste Regulations

2.2g (2016-2021) Waste diversion transition Act

2.3 (1990-2022) Environmental Protection Act

2.4 (1990-2021) Environmental Assessment Act

Like Saskatchewan, the scores of the Ontario documents varied significantly. The scores ranged between two (lowest) and five (highest) out of 6 (Table 3.6).

Table 3.6 Scorecard for Ontario (Dueck, 2023)

Document	Scores of Shaffrin et al. Measures						Total (/6)
	Objectives (/1)	Scope (/1)	Integration (/1)	Budget (/1)	Implementation (/1)	Monitoring (/1)	
2.1a	0.5	0.5	1	1	1	1	5
2.1b	1	0.5	1	0	1	1	4.5
2.2a	0.5	0.5	1	1	0	1	4
2.2b	0	1	1	1	0	0.5	3.5
2.2c	0	1	1	0.5	0	0.5	3
2.2d	0.5	0.5	0.5	1	0	0.5	3
2.2e	0.5	0.5	1	0	0	0.5	2.5
2.2f	0.5	0	1	0	0	0.5	2
2.2g	0.5	0.5	1	1	1	0.5	4.5
2.3	0.5	1	1	0	1	0.5	4

Much like Saskatchewan, only one of Ontario’s documents reached level 2 with the rest within level 1 (Fig. 3.4). Document 2.1a just barely surpassed the level 2 score requirement with a score of 5. No documents scored a level 3.

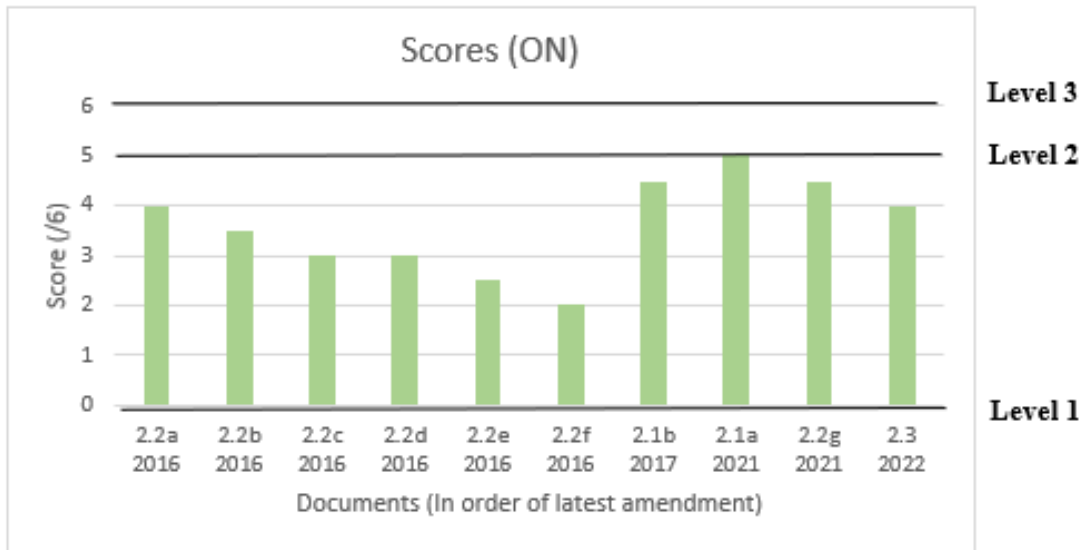


Fig. 3.4 Score per document in Ontario (Dueck, 2023)

In Ontario, there was only one document (2.1b) that explicitly used numerical targets, scoring a one in the *Objectives* measure (Figure 3.5). However, several documents (2.1a, 2.2a, 2.2d, 2.2e, 2.2f, 2.2g, 2.3) had some targets (scored 0.5) and only two documents (2.2b, 2.2c) scored zero. The average was 0.45, which was neither the highest nor the lowest average score per measure. Within the *Scope* measure, most documents have at least one group identified (2.1a, 2.1b, 2.2a, 2.2d, 2.2e, 2.2g; score of 0.5), but a few have more than one group (2.2b, 2.2c, 2.3; score of 1). Only document 2.2f does not mention or hold a specific group accountable. The average score was 0.60. The *Integration* measure scored an average of 0.95 as all but one document (2.2d) are consistent with other policies which yields a score of 1. Document 2.2d scored 0.5 because it mentioned repealed policies. There were no documents with a score of 0. Another measure with mixed results, the *Budget* measure had five documents score 1, one document score 0.5, and four documents score 0. Documents 2.1a, 2.2a, and 2.2g scored 1 because they plan to monitor financial statements and audit, while documents 2.2b and 2.2d scored 1 because they had a plan for who was taking responsibility for the costs. Alternatively, document 2.2c only scored 0.5 because there was just an obligation of fees. Lastly, documents 2.1b, 2.2e, 2.2f, and 2.3 scored 0 because there was no responsibility assigned and no mention of anticipated or spent costs. The average score was 0.55. The *Implementation* measure in Ontario resulted in the lowest average score of all three provinces (0.40). Even though four documents (2.1a, 2.1b, 2.2g, 2.3) have had several amendments (score of 1), six documents (2.2a, 2.2b, 2.2c, 2.2d, 2.2e, 2.2f) have been repealed (score of 0). Lastly, the *Monitoring* measure scored the second highest average per measure in Ontario with a score of 0.65. Three documents (2.1a, 2.1b, 2.2a) have a plan to be reviewed annually by producing reports or permits and through public engagement; documents required both actions to score 1, as the rest of the documents only have plans for one of the options (2.2b, 2.2c, 2.2d, 2.2e, 2.2f, 2.2g, 2.3; score of 0.5). No documents scored zero. Overall, the optimality of a circular economy within the documents produced by the province of Ontario decreased rather than improving upon each other.

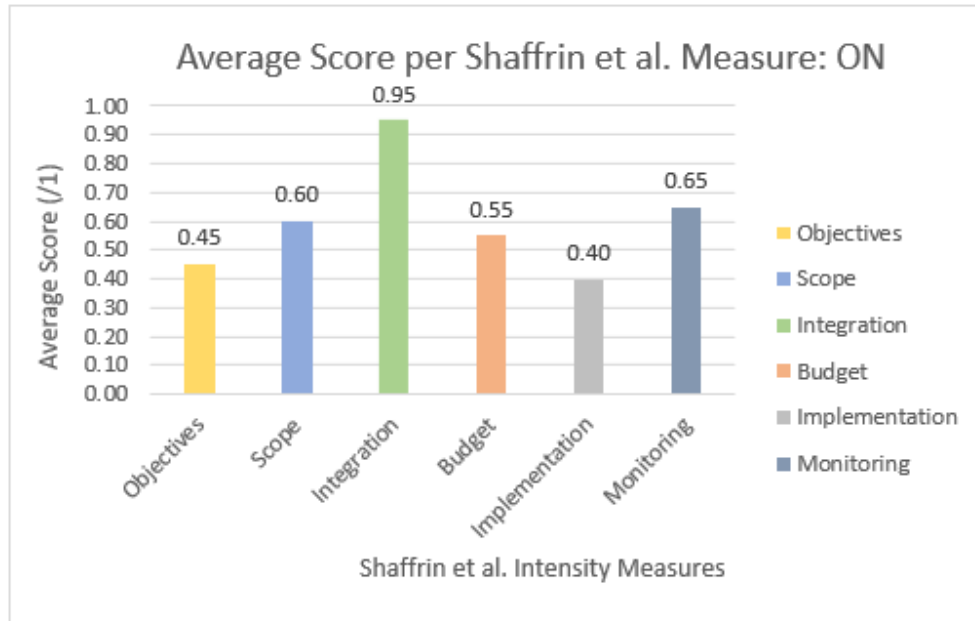


Fig. 3.5 Average score per measure for Ontario documents (Dueck, 2023)

The sentiment in Ontario documents varies from very little to over 400 occurrences, which trends more positive in four of the ten documents (2.1a, 2.1b, 2.2a, 2.2d), but more negative in the other six (2.2b, 2.2c, 2.2e, 2.2f, 2.2g, 2.3) (Figure 3.6).

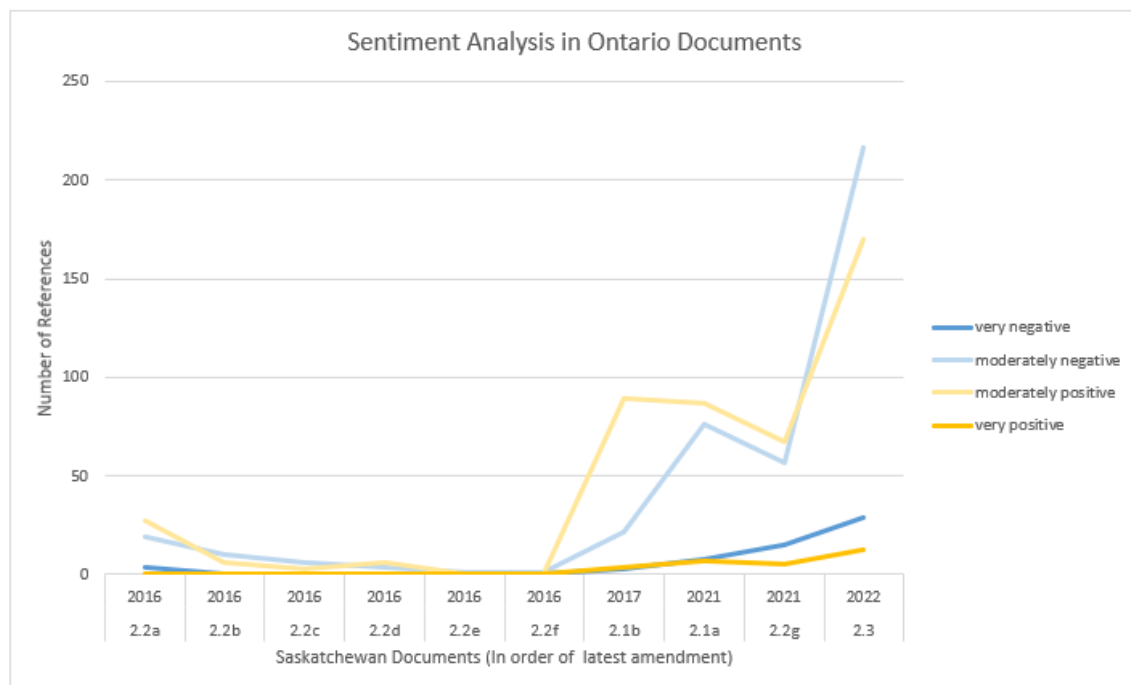


Fig. 3.6 Sentiment analysis in Ontario documents (Dueck, 2023)

My review of Ontario's political context also began in 1971. That year, the Progressive Canadian Party (PCP) won the provincial election and formed a majority government in Ontario (Table 3.7). They managed to maintain power for the next fourteen years, although their majority ended after the 1975 election. Throughout this period the official opposition was primarily the Liberal Party

of Canada except for when the New Democratic Party (NDP) succeeded in gaining two more seats than the Liberal Party, also in 1975. Although there were no waste management documents enacted in Ontario during this time, environmental awareness was growing, and the recycling 'Blue Box' test pilot ran in 1981. The year 1985 marked the end of 42 years of PCP government when the Liberal Party won in 1987.

Table 3.7 Political timeline (ON) from 1971-1987 (Dueck, 2023)

Ontario						
Election Year	Leader	Party Affiliation	Dates in Power	Opposition	Influential Events	Waste Management Documents Enacted
1971	Bill Davis	PCP majority (78/117)	1971-1975	Lib 20 (NDP 19)	1971: Department of the Environment established 1974: First female lieutenant governor in Canada	
1975	Bill Davis	PCP minority (51/125)	1975-1977	NDP 38 (Lib 36)		
1977	Bill Davis	PCP minority (58/125)	1977-1981	Lib 34 (NDP 33)		
1981	Bill Davis	PCP majority (70/125)	1981-1985	Lib 34 (NDP 21)	1981: blue bin began	
1985	Frank Miller	PCP minority (52/125)	1985-1985	Lib 48 (NDP 25)	1985: large tornado destroyed 300 houses, killed 8+, thousands homeless, Barrie, ON 1985: End of 42 years of PCP government	
1987	David Peterson	Lib minority until 1987, then majority (95/130)	1985-1990	Lib 48 (NDP 25) 1987: NDP 19 (Lib 16)	1987: Canada and 23 other countries signed the Montreal Protocol on Substances that Deplete the Ozone Layer. 1988: The Canadian Environmental Protection Act (CEPA) was passed into law amalgamating existing laws and providing new powers to protect human health and the environment from the risks from pollution.	

The leadership of the Liberal Party only lasted one electoral term (1990) before the NDP formed government for the first and only time in Ontario's history with 74 of 130 seats won. Also, this year, the "Environmental Protection Act" (2.3) was enacted, scoring 4 and consisting of slightly more negative sentiment. As was in Saskatchewan, the oldest documents I analyzed have been amended numerous times (Table 3.8). The "Environmental Protection Act" has been amended 24 times between 1990 and 2022, far more often than any of the other waste management documents that have been introduced in Ontario to date. I question whether this may be evidence that the provinces of Saskatchewan and Ontario have learned from another jurisdiction or are emulating a status quo.

Table 3.8 Amendment table for Ontario (Dueck, 2023)

Ontario										
Sentiment										
Score										
	2.3	2.2a	2.2f	2.2d	2.2e	2.2b	2.2c	2.2g	2.1a	2.1b
	1990-2022	2002-2016	2002-2016	2003-2016	2004-2016	2006-2016	2008-2016	2016-2021	2016-2021	2017
2023										
2022										
2021										
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1971										

Progressive Conservative Party

NDP

Liberal



Enacted

Amended

Repealed

When the 1995 election came around, the PCP formed a majority government yet again, however not by much (Table 3.9). They gained 59 of 103 seats and the Liberals became the official opposition. Two waste management documents were enacted in Ontario during just prior to the end of this electoral term. In 2002, the “Waste Diversion Transition Act” (2.2a) and “Blue Box Waste Regulations” (2.2f) were introduced. While the “Waste Diversion Transition Act” (2.2a) scored well (4) and had nearly the same amount of positive and negative sentiment, the “Blue Box Waste Regulations” (2.2f) scored the lowest of all waste management documents enacted in Ontario to date (2) and contained only negative sentiment. While the only amendment between the two documents was in 2008 (“Blue Box Waste Regulations” (2.2f)), both were revoked in 2016.

Table 3.9 Political timeline (ON) from 1990–1999 (Dueck, 2023)

Ontario							
Election Year	Leader	Party Affiliation	Dates in Power	Opposition	Influential Events	Waste Management Documents Enacted	Outcomes
1990	Bob Rae	NDP majority (74/130)	1990–1995	Lib 36 (PCP 20)	1990: Only time NDP formed government in ON	1990-2022: Environmental Protection Act (2.3) 1993-2021: Environment Assessment Act (2.4)	2.3: mid-range score (4) 
1995	Mike Harris	PCP majority (82/130)	1995–1999	Lib 30 (NDP 17, Ind. 1)	1997: Ontario reforms municipalities (drastic changes) 1997: 7/19 nuclear reactors shut down		
1999	Mike Harris	PCP majority (59/103)	1999–2002	Lib 35 (NDP 9)	1999: The Canadian Environmental Protection Act, review of 23,000 substances by 2006 to determine health/environmental risks.		
-	Ernie Eves	PCP majority (59/103)	2002–2003	Lib 35 (NDP 9)	2002: The Securities and Exchange Commission files suit against Waste Management. They alleged that the company inflated profits by 1.7 billion dollars while making millions of dollars for the top executives and defrauding investors out of 6 billion dollars.	2002-2016: Waste diversion transition Act (2.2a) 2002-2016: Blue Box Waste Regulations (2.2f)	2.2a: mid-range score (4) 2.2f: lowest score (2) 

In 2003, Dalton McGuinty and the liberal party formed a majority government and succeeded in enacting several new waste management documents in Ontario (Table 3.10). The first was the “Used Tires Regulations” (2.2d) which scored 3 and contained approximately two thirds positive sentiment. It was amended in 2009 and 2013. In 2004, the “Waste Electrical and Electronic Equipment Regulations” (2.2e) was introduced, but had some flaws, including scoring 2.5 and containing only negative sentiments even after amendments in 2008 and 2009. Lastly, the “Municipal Hazardous or Special Waste Regulations” (2.2b) was released in 2006 containing two thirds negative sentiment and a score of 3 (amended 2008, 2011, and 2012).

There were no changes in political leadership after the 2007 election except for a loss of a single seat and the Liberal Party continued their momentum in waste management, releasing the “Stewardship Ontario Regulations” (2.2c) in 2008 (amended 2009). Document 2.2c, along with documents 2.2b, 2.2d, and 2.2e were all revoked in 2016. McGuinty led one more electoral majority for the Liberal Party from 2011 to 2013, however lost nearly twenty seats. Kathleen Wynne took over and increased the seats slightly, but still barely maintained a majority (58/103) in the 2014 election. Three more waste management documents were enacted, two in 2016 (“Waste diversion transition Act” (2.2g) and “Resource Recovery and Circular Economy Act” (2.1a)) and the third in 2017 (“Strategy for a waste-free Ontario – Building the circular economy” (2.1b)). All three documents scored well with scores of 4.5, 5, and 4.5, respectively. Five is the highest scored achieved by any of the Ontario waste management documents (/6). The first two documents contained nearly equal amounts of positive and negative sentiment, while the third contained more than three quarters positive sentiment. The “Waste diversion transition Act” (2.2g) was amended in 2017, 2018, 2019, and 2021, while the “Resource Recovery and Circular Economy Act” (2.1a) was amended every year between 2016 and 2021. The year 2016 was significant as all documents enacted in Ontario to date were amended. This uniformity across the board may have been an attempt to integrate the waste management documents and renew consistency. The “Strategy for a waste-free Ontario – Building the circular economy” (2.1b) has not been amended.

Table 3.10 Political timeline (ON) from 2003-2014 (Dueck, 2023)

Ontario						
Election Year	Leader	Party Affiliation	Dates in Power	Opposition	Influential Events	Waste Management Documents Enacted
2003	Dalton McGuinty	Lib majority (72/103)	2003-2007	PCP 24 (NDP 7)	2003: widespread power outage due to software glitch in alarm system (2 days) 2005: The Federal Contaminated Sites Action Plan	2003-2016: Used Tires Regulations (2.2d) 2004-2016: Waste Electrical and Electronic Equipment Regulations (2.2e) 2006-2016: Municipal Hazardous or Special Waste Regulations (2.2b)
2007	Dalton McGuinty	Lib majority (71/107)	2007-2011	PCP 26 (10)	2010: earthquake 60km north of Ottawa	2008-2016: Stewardship Ontario Regulations (2.2c)
2011	Dalton McGuinty	Lib majority (53/107)	2011-2013	PCP 37 (NDP 17)	2014: First Indigenous constitution in ON	
2014	Kathleen Wynne	Lib majority (58/107)	2013-2018	PCP 28 (NDP 21)	2014: Elizabeth Dowdeswell, former UN, became lieutenant-gov. previous ADM at Env, Canada 2016: Residential School apology from Provincial government 2017: Landfill fire in Bridgen, ON. Charge under the Environmental Protection Act. 2017: First sixties scoop law suit won in ON 2017: Jagmeet Singh elected 2017: The Supreme Court of Canada ruled that Indigenous peoples do not have the power to veto resource development projects such as pipelines. 2018: Worst defeat of a governing party in Ontario history.	2016-2021: Waste diversion transition Act (2.2g) 2016-2021: Resource Recovery and Circular Economy Act (2.1a) 2017: Strategy for a waste-free Ontario – Building the circular economy (2.1b)
<div> <div>2.2d: lower score (3)</div> <div>2.2e: lower score (2.5)</div> <div>2.2b: mid-range score (3.5)</div> <div>2.2c: lower score (3)</div> <div>2.2g: high score (4.5)</div> <div>2.1a: highest score (5)</div> <div>2.1b: high score (4.5)</div> </div>						

As of the 2018 election, the Liberals lost to the PCP, which was recorded as the worst defeat of a governing party in Ontario history (Table 3.11). However, there is no indication that political party in power has any connection to the optimal waste management policies. Although no more official waste management documents were enacted since 2017, numerous steps that contribute towards waste reduction. In 2018, a “Made-in-Ontario” plan was developed, the Green Party elected their first member of provincial parliament, and the Ontario Ministry of Environment received two reports that analyzed the capacity of Ontario's landfills (Government of Ontario). The reports indicated that Southeastern Ontario had low approved landfill capacity and would run out of space by 2030, while Southwestern Ontario is expected to have space until 2035 (Government of Ontario, 2018). The recommendations highly encouraged planning for new capacity immediately, which includes reducing exports of waste across the border to the states of Michigan and New York (Government of Ontario, 2018). In 2019, the provincial government started working towards implementing an Extender Producer Responsibility (EPR) program, followed by an audit from the Office of the Auditor General of Ontario in 2021 (Government of Ontario). The audit noted that Ontario was not on track to achieve its waste diversion targets and suggested that waste diversion actions were not significant enough. Lastly, in 2022, the PCP remained in majority.

Table 3.11 Political timeline (ON) from 2018–present (Dueck, 2023)

Ontario						
Election Year	Leader	Party Affiliation	Dates in Power	Opposition	Influential Events	Waste Management Documents Enacted
2018	Doug Ford	PCP majority (76/124)	2018-2022	NDP 40, lib 7	<p>2018: Ontario Ministry of Environment received a report from two consultants examining Ontario's landfill capacity needs. The reports concluded Southeastern Ontario would run out of currently approved landfill capacity as early as 2030, and Southwestern Ontario by 2035. The consultants recommended officials begin planning for new capacity immediately. (Ontario exports 1/3 waste to Michigan/New York states).</p> <p>2018: Agreement Reached in Williams Treaties Dispute.</p> <p>2019: Covid-19</p> <p>2019: Started introduction of EPR program</p> <p>2020: Amendment to Environmental Assessment Act holds cities to higher standards.</p> <p>2021: Landfill fire in London, ON</p>	
2022	Doug Ford	PCP majority (83/124)	2018-Incumbent	NDP 31, lib 8	2022: Landfill fire in Thunder Bay, ON	

3.5. The Province of Nova Scotia

Listed below are relevant provincial policy, act, strategy, guideline, and regulation documents produced for Nova Scotia between 1971 and the present. They consist of one regulation document, five statutes, one strategy, four guidelines, and one plan. The “Composting Facility Guidelines” (3.1a), the “Municipal Solid Waste Landfill Guidelines (3.1b), the “Construction Demolition Debris Disposal Guidelines” (3.1c), and the “Grease Trap Waste Guidelines” (3.1d) are all the guidelines within Nova Scotia. As a result, they are clustered within 3.1. The “Solid Waste-Resource Management Regulations” (3.4b) were made under the “Environmental Act” (3.4a) and clustered within 3.4. The “Environmental Goals and Sustainable Prosperity Act” (3.5a; 2007 and 3.5b; 2012) were repealed by the “Sustainable Development Goals Act” (as passed) (3.5c) in 2019, which was eventually repealed by the “Environmental Goals and Climate Change Reduction Act” (3.5d) in 2021. Therefore, 3.5a-d are clustered within 3.5. The “Proposed Greener Economy Strategy” (3.2) and “Electronic Waste Stewardship Plans” (3.3) are standalone.

3.1a (2010) Composting Facility Guidelines

3.1b (1997-2004) Municipal Solid Waste Landfill Guidelines

3.1c (1997-2003) Construction Demolition Debris Disposal Guidelines

3.1d (1997-2007) Grease Trap Waste Guidelines

3.2 (2014) Proposed Greener Economy Strategy

3.3 (2007) Electronic Waste Stewardship Plans

3.4a (1994-2017) Environmental Act

3.4b (1996-2022) Solid Waste-Resource Management Regulations

3.5a (2007) Environmental Goals and Sustainable Prosperity Act

3.5b (2007-2012) Environmental Goals and Sustainable Prosperity Act

3.5c (2019) Sustainable Development Goals Act (as passed)

3.5d (2021) Environmental Goals and Climate Change Reduction Act

Nova Scotia was the only province to achieve a perfect score of 6 in any of its documents (Document 3.5d, Table 3.12). Alternatively, the lowest scoring document was 3.

Table 3.12 Scorecard for Nova Scotia (Dueck, 2023)

Document	Scores of Shaffrin et al. Measures						Total (/6)
	Objectives (/1)	Scope (/1)	Integration (/1)	Budget (/1)	Implementation (/1)	Monitoring (/1)	
3.1a	1	1	1	0	1	0.5	4.5
3.1b	1	1	1	0	0.5	0.5	4
3.1c	1	1	1	0	0.5	0.5	4
3.1d	0.5	0.5	1	0.5	0.5	0	3
3.2	0.5	0.5	1	0.5	0.5	1	4.5
3.3	1	0.5	1	0.5	0.5	0.5	4
3.4a	0.5	1	0.5	0.5	1	1	4.5
3.4b	0.5	1	1	1	1	0.5	5
3.5a	1	1	1	0.5	0	1	4.5
3.5b	1	1	1	0.5	0	1	4.5
3.5c	1	1	1	1	0	1	5
3.5d	1	1	1	1	1	1	6

A score of six classifies the document 3.5d as a level 3 document, the only document in this research to achieve that level (Figure 3.7). Two documents from Ontario fell within the level 2 (3.5c and 3.4b), whereas the remaining are in level 1.

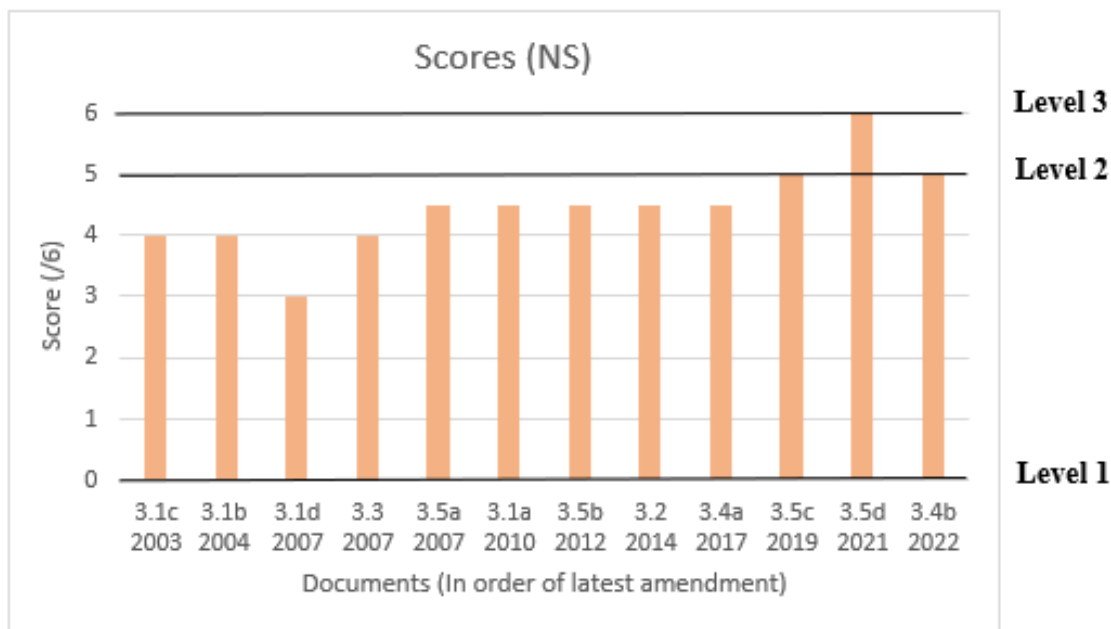


Fig. 3.7 Score per document in Nova Scotia (Dueck, 2023)

The province of Nova Scotia scored well on average for the first three measures compared to Saskatchewan and Ontario (Figure 3.8). All the documents scored either 0.5 (3.1d, 3.2, 3.4a, 3.4b) or 1 (3.1abc, 3.3, 3.5a, 3.5b, 3.5c, and 3.5d) for the *Objectives* measure, resulting in an average score of 0.83 (SK = 0.50 and ON = 0.45). The same occurred for the *Scope* measure, where the average score of 0.92 was significantly higher (SK = 0.67 and ON = 0.60). Documents 3.1d, 3.2, and 3.3 scored 0.5, while documents 3.1a, 3.1b, 3.1c, 3.4a, 3.4b, 3.5a, 3.5b, 3.5c, and 3.5d scored 1. The average scores for the *Integration* measure in each province were much closer and consistently high, however Nova Scotia still had the highest average score (0.96, SK = 0.83 and ON = 0.95). All but one document (3.4a) scored 1. The *Budget* measure not only scored the lowest on average of all the measures for Nova Scotia, but also of the other provinces as well. The average of 0.50 is the result of three documents (3.4b, 3.5c, 3.5d) scoring 1, five documents (3.1d, 3.2, 3.3, 3.4a, 3.5a, 3.5b) scoring 0.5, and three documents (3.1abc) scoring 0. Nova Scotia documents 3.1, 3.4a, 3.4b, and 3.5d scored 1 in *Implementation* while documents 3.1b, 3.1c, 3.1d, 3.2, and 3.3 scored 0.5 and 3.5a, 3.5b, and 3.5c scored 0 for an average of 0.54. Lastly, the *Monitoring* measure had six documents score 1 (3.2, 3.4a, 3.5a, 3.5b, 3.5c, 3.5d), five documents score 0.5 (3.1a, 3.1b, 3.1c, 3.3, 3.4a), and one document score 0 (3.1d). The average score was 0.71.

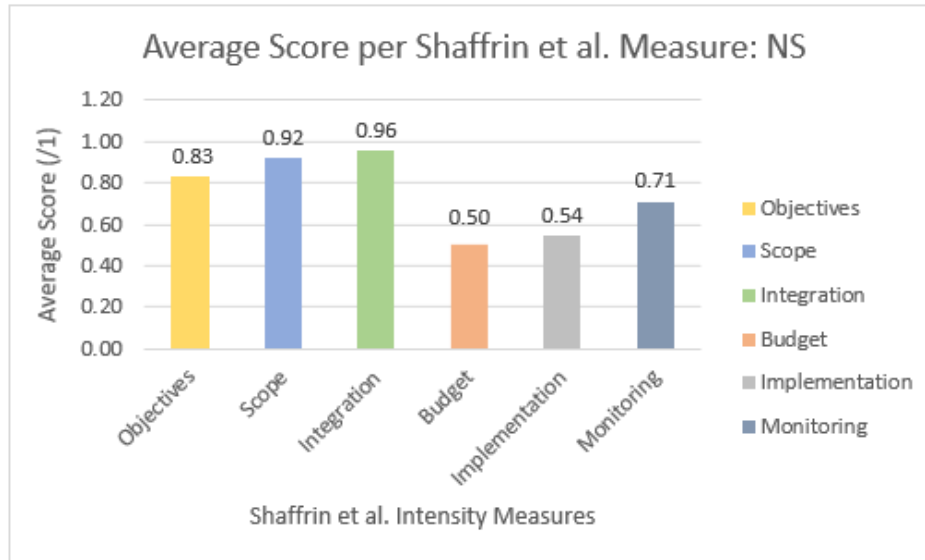


Fig. 3.8 Average score per measure for Nova Scotia documents (Dueck, 2023)

Sentiment in the Nova Scotia documents is balanced (Figure 3.9). Documents 3.1a, 3.1b, 3.1c, 3.1d, 3.4a, and 3.4b are mostly negative, while documents 3.2, 3.3, and 3.5a, 3.5b, 3.5c, and 3.5d are mostly positive. Of the negative documents, 3.1c and 3.1d have a lot of very negative sentiment and of the positive documents, 3.3 is very positive.

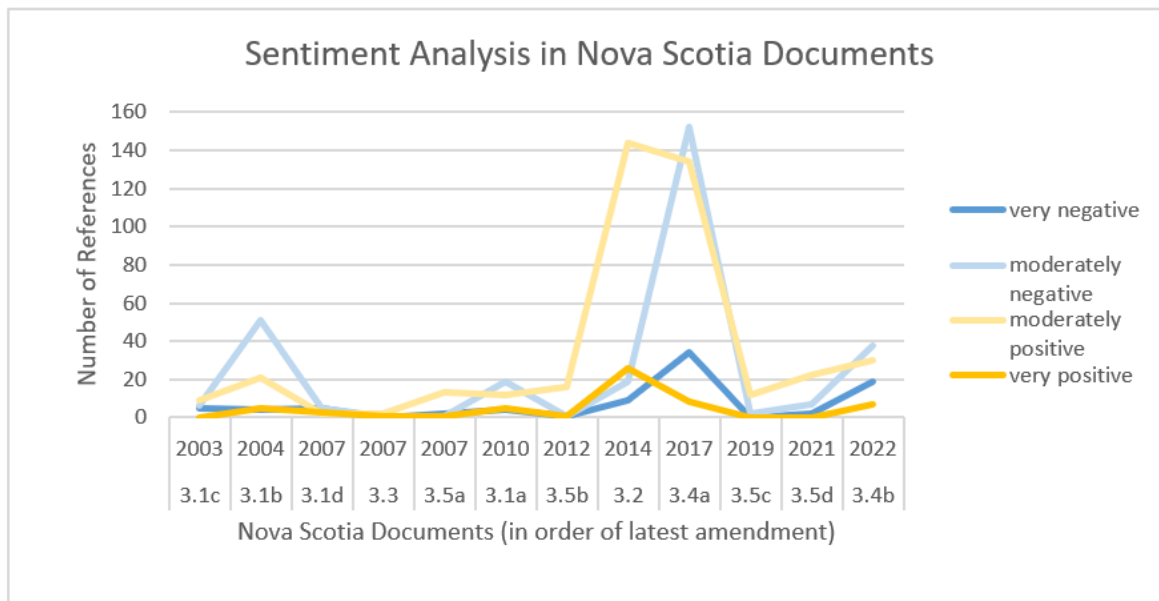


Fig. 3.9 Sentiment analysis in Nova Scotia documents (Dueck, 2023)

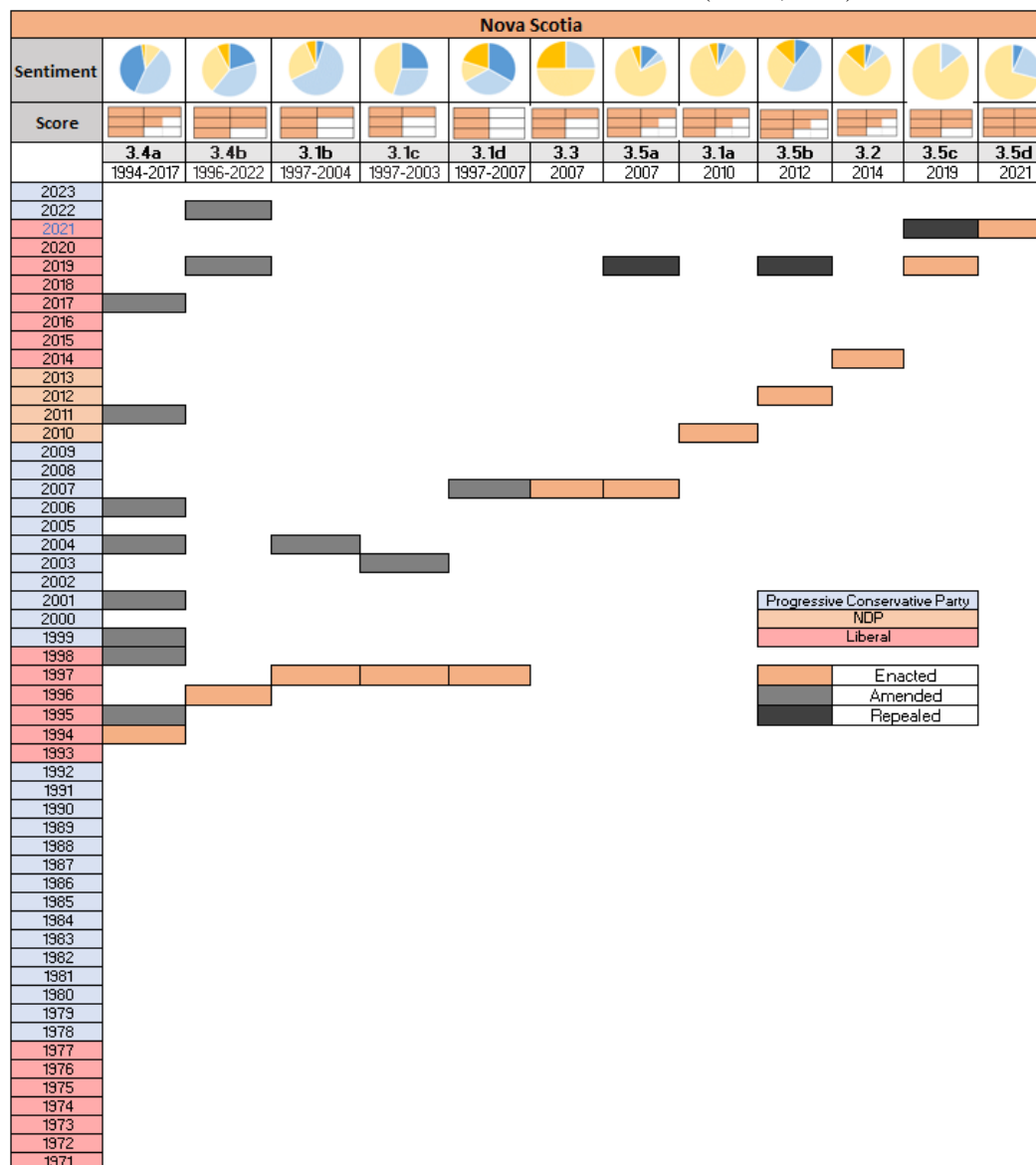
In 1971, the Liberal Party led the province of Nova Scotia officially, but the Progressive Canada Party (PCP) was one seat away from making the majority government a minority (23/46 Liberal, Table 3.13). Despite this close race, the Liberal Party gained some support and remained in power until 1978. The PCP formed government for four straight electoral terms until the power was passed back to the Liberals in the 1993 election.

Table 3.13 Political timeline (NS) from 1970-1988 (Dueck, 2023)

Nova Scotia								
Election Year	Dates in Power	Leader	Party Affiliation	Opposition	Influential Events	Comments	Waste Management Documents Enacted	Outcomes
1970	1970-1974	Gerald Regan	Lib (23/46)	PCP 21 (2 NDP)	1970: Arrow ran aground spilling 10,500 metric tons of oil into the water and beaches 1971: Hurricane Beth 1971: Oil and natural gas were discovered on Sable Island. 1971: Department of the Environment established 1972: The federal government ordered a halt to all whaling operations based out of Canadian ports.			
1974	1974-1978	Gerald Regan	Lib majority (31/46)	PCP 12 (NDP 3)				
1978	1978-1980	John Buchanan	PCP majority (31/52)	Lib 17 (NDP 4)				
1981	1980-1984	John Buchanan	PCP majority (37/52)	Lib 13 (NDP 1)				
1984	1984-1988	John Buchanan	PCP majority (42/52)	Lib 6 (NDP 3)	1987: Canada and 23 other countries signed the Montreal Protocol on Substances that Deplete the Ozone Layer.			
1988	1988-1990	John Buchanan	PCP majority (28/52)	Lib 21 (NDP 2)	1988: The Canadian Environmental Protection Act (CEPA) was passed into law amalgamating existing laws and providing new powers to protect human health and the environment from the risks from pollution.			
	1990-1991	Roger Bacon	PCP					
	1991-1993	Donald Cameron	PCP		1992: 26 miners killed. Plymouth, NS. Blast triggered by the ignition of stray methane led to a chain reaction of lethal methane and coal-dust explosions.			

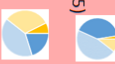

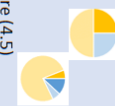
A year later (1994) the “Environmental Act” (3.4a) was passed, scoring 4.5 despite containing mostly negative sentiment, particularly very negative. It was amended eight times, more than any other waste management document enacted in Nova Scotia to date (Table 3.14). This follows the same pattern as was in Saskatchewan and Ontario. In 1996, the “Solid Waste-Resource Management Regulations” (3.4b) were enacted. This document had a score of 5 and contained slightly more negative than positive. There was a large gap without any amendments until 2019 and 2022. In 1997, three waste management documents were enacted in Nova Scotia: the “Municipal Solid Waste Landfill Guidelines” (3.1b), the “Construction and Demolition Debris Disposal Site Guidelines” (3.1c), and the “Guidelines for Grease Trap Waste” (3.1d). All three documents contained appropriately two thirds negative sentiment and the first two scored 4, while the third scored 3, which is the lowest score of all the waste management documents in Nova Scotia to date. Document 3.1b was amended in 2004, document 3.1c was amended in 2003, and document 3.1d was amended in 2007.

Table 3.14 Amendment table for Nova Scotia (Dueck, 2023)



In the 1998 election, the Liberal party and the New Democratic Party (NDP) each won 19 of 52 seats (Table 3.15). The Liberals were able to form a minority government with the support of the Progressive Conservative Party (PCP). During the same year, organic waste was banned from the landfill. The leadership of the Liberal government in Nova Scotia ended in the 1999 election as the PCP formed a majority with the NDP as official opposition. This remained the same in the 2003 and 2006 electoral terms as well, however by 2006 it became a minority government. A year later (2007), the “Electronic Waste Stewardship Plans” (3.3) and the “Environmental Goals and Sustainable Prosperity Act” (3.5a) were enacted. The “Electronic Waste Stewardship Plans” (3.3) had a score of 4, was three quarters positive sentiment with a large portion very positive, and has never been amended. Alternatively, the “Environmental Goals and Sustainable Prosperity Act” (3.5a) has a score of 4.5, more than three quarters positive sentiment, and was repealed in 2019.

Table 3.15 Political timeline (NS) from 1993-2006 (Dueck, 2023)





Nova Scotia								
Election Year	Dates in Power	Leader	Party Affiliation	Opposition	Influential Events	Comments	Waste Management Documents Enacted	Outcomes
1993	1993-1997	John Savage	Lib majority (40/52)	PCP 9 (NDP 3)	1997: Mi'kmaq Education Agreement, self-gov		1994-2017, Environmental Act (3.4a) 1996-2022, Solid Waste-Resource Management Regulations (3.4b)	3.4a: mid-range score (4.5) 3.4b: mid-range score (5) 
1998	1997-1999	Russell MacLellan	Liberal and NDP tied with 19/52 each. Liberal minority gov with support from PCP	PCP 14	1998: banned organic waste in landfills 1999: Mi'kmaq Fishing Rights Upheld 1999: The Canadian Environmental Protection Act, review of 23,000 substances by 2006 to determine health/environmental risks.		1997-2004: Municipal Solid Waste Landfill Guidelines (3.1b) 1997-2003: Construction and Demolition Debris Disposal Site Guidelines (3.1c) 1997-2007: Guidelines for Grease Trap Waste (3.1d)	3.1b: lower score (4) 3.1c: lower score (4) 3.1d: lowest score (3) 
1999	1999-2003	John F. Hamm	PCP majority (30/52)	NDP 11 (lib 11)	1999: The construction of three offshore platforms off Sable Island was completed and the first natural gas began to flow through a submarine pipeline to mainland Nova Scotia.			
2003	2003-2006	John F. Hamm	PCP majority (25/52)	NDP 15 (lib 12)	2005: The Federal Contaminated Sites Action Plan			
2006	2006-2009	Rodney MacDonald	PCP minority (23/52)	NDP 20 (lib 9)			2007: Electronic Waste Stewardship Plans (3.3) 2007: Environmental Goals and Sustainable Prosperity Act (3.5a)	3.3: lower score (4) 3.5a: mid-range score (4.5) 

In 2009, the NDP formed government for the first time ever in an Atlantic Province (Table 3.16). They held a majority with 31 of 52 seats and enacted two waste management documents during their term. The first document was the “Composting Facility Guidelines” (3.1a) in 2010, which scored 4.5 and contained slightly more negative sentiment than positive. It has not been amended or repealed. The second document was a new version of the “Environmental Goals and Sustainable Prosperity Act” in 2012 (3.5b), in which the first version was initially released in 2007. It scored 4.5, which is the same score as the 2007 document, however it contained more positive sentiment than the previous version. It was eventually amended in 2019.

Come the 2013 election, the NDP did not maintain their power and the Liberal Party formed a majority government once again. Momentum continued and in 2014 the “Proposed Greener Economy Strategy” (3.2) was introduced (score of 4.5 and more than three quarters positive sentiment). Even though the documents have been trending towards high scores and large amounts of positive sentiment, two landfill fires occurred in 2016 and there was an order for non-compliance with several terms and conditions of approval, nonetheless. Another landfill fire occurred in 2018, shortly after the 2017 election, also won by the Liberal party.

In 2019, the “Sustainable Development Goals Act” (3.5c) was passed. Although it scored 5 and contained almost entirely positive sentiment, it still may not be sufficient. The same year a report, ordered by the provincial government and produced by AECOM Canada, called for more provincial co-ordination and an Extended Producer Responsibility (EPR). It was deemed that the current condition is “a patchwork quilt of collection guidelines and a generally inefficient waste management system” (Gorman, 2019). The report also stated that at the time (2019) there was little incentive for municipalities to plan and act regionally or provincially even though it was needed. In 2021, the PCP took on leadership of the province once again with a majority government. The same year the “Environmental Goals and Climate Change Reduction Act” (3.5d) was released, which repealed the previous document. It is the highest scoring document in all my analysis as it scored the perfect score of 6 according to the rubric set up. It contained nearly three quarters positive sentiment and has not been amended.

Table 3.16 Political timeline (NS) from 2009-present (Dueck, 2023)

Nova Scotia								
Election Year	Dates in Power	Leader	Party Affiliation	Opposition	Influential Events	Comments	Waste Management Documents Enacted	Outcomes
2009	2009-2013	Darrell Dexter	NDP majority (31/52)	Lib 11 (PCP 10)	2009: NDP formed government for the first time in NS and in an Atlantic Province 2013: landfill fire		2010: Composting Facility Guidelines (3.1a) 2012: Environmental Goals and Sustainable Prosperity Act (3.5b)	3.1a: mid-range score (4.5) 3.5b: mid-range score (4.5) 
2013	2013-2017	Stephen McNeil	Lib majority (33/51)	PCP 11 (NDP 7)	2016: two landfill fires. Order for non-compliance with a number of terms and conditions of approval. 2018: landfill fire		2014: Proposed Greener Economy Strategy (3.2)	3.2: mid-range score (4.5) 
2017	2017-2021	Stephen McNeil	Lib majority (27/51)	PCP 17 (NDP 7)	2019: Report calls for more provincial co-ordination, extended producer responsibility. A patchwork quilt of collection guidelines and a generally inefficient waste management system. There is little incentive for municipalities to plan and act regionally or provincially, but there is a need. 2019: DivertNS		2019: Sustainable Development Goals Act (as passed) (3.5c)	3.5c: higher score (5) 
-	2021-	Iain Rankin	Lib					
2021	2021-incumbent	Tim Houston	PCP majority (31/55)	Lib 17 (NDP 6)	2021: landfill fire		2021: Environmental Goals and Climate Change Reduction Act (3.5d)	3.5d: highest score (6) 

3.6. Summary

Approximately eleven waste management documents were retrieved for each province, of which consisted of a variety of types. The documents included are either statutes, regulations, guidelines, plans, or strategies. The document with the highest score is document 3.5d, 2021, from Nova Scotia that scored 6 out of 6, whereas the document with the lowest score is document 1.4b, 2014, from Saskatchewan that scored 1.5 out of 6 (Figure 3.10). As the documents evolved throughout time, about one third of Saskatchewan's documents' scores decrease from 2005-2014, but then increase from there on. The highest score in Saskatchewan was 5.5 (1.2b, 2022), while the lowest score was 1.5 (1.4b, 2022). In Ontario, the first half of the scores, all amended last in 2016, decrease, but then increase significantly in the documents from 2017-2022. The highest score in Ontario was 5 (2.1a, 2021) and the lowest was 2 (2.2f, 2016). Lastly, all the Nova Scotia documents scored approximately 4.5, but increased slightly over time. The highest score was 6 (3.5d, 2021) and the lowest score was 3 (3.1d, 2007). Overall, only one document from Nova Scotia (3.5d) scored within an optimal circular economy design (level 3, score of 6/6), however six more documents between all the provinces were close with scores of 5 or 5.5.

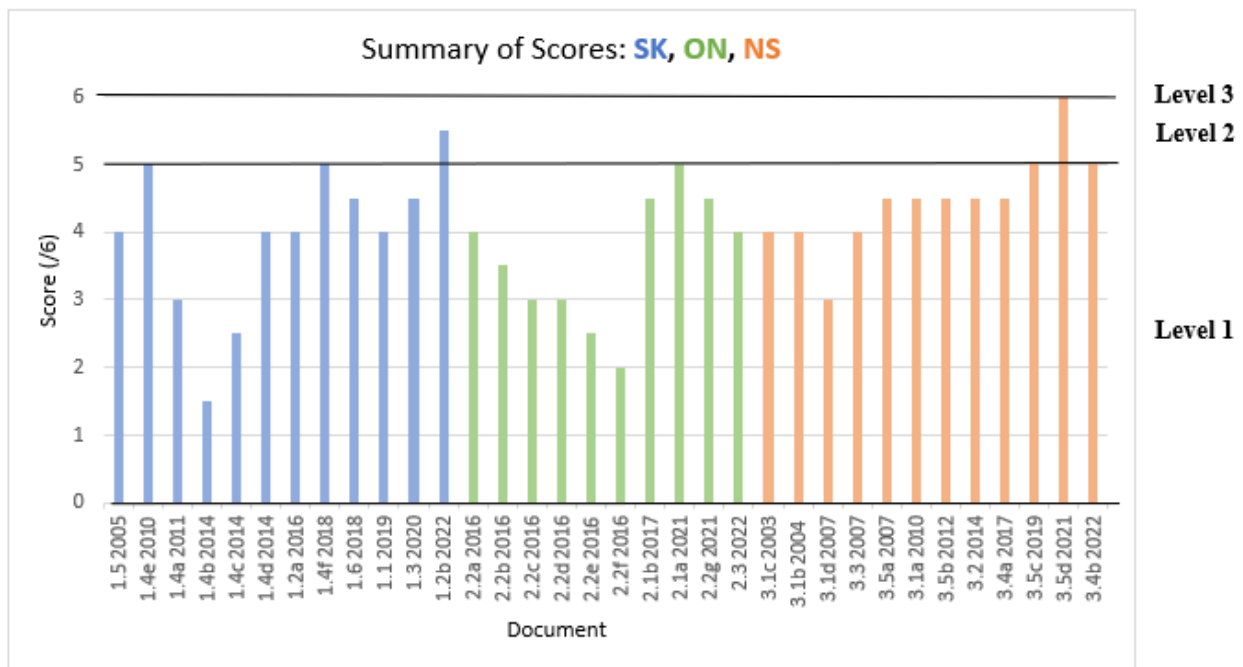


Fig. 3.10 Summary of scores per document for SK, ON, NS (Dueck, 2023)

When each of the province's documents' scores are averaged, the province of Nova Scotia scored the best, followed by Saskatchewan, then Ontario (Figure 3.11). While many aspects of the three province's documents scored quite well, they remain in level 1. However, improving each measure a little bit, especially the budget and implementation measures, could raise them into level 2 and eventually level 3, ideally.

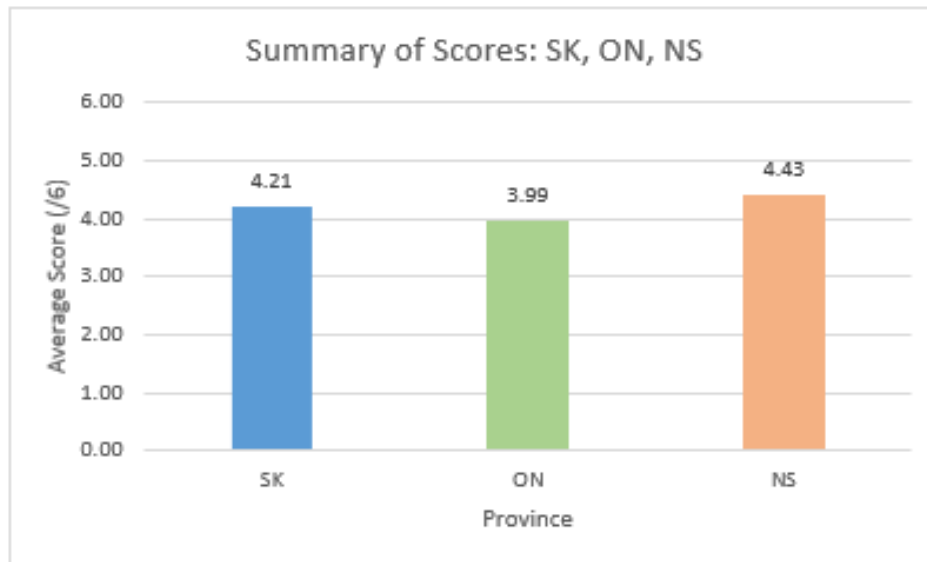


Fig. 3.11 Summary of average scores overall per province (Dueck, 2023)

When the average documents score per measure of each province is averaged, the measure with the most content is the integration measure (0.91), while the budget and implementation measures tied for the least content (0.54, Figure 3.12).

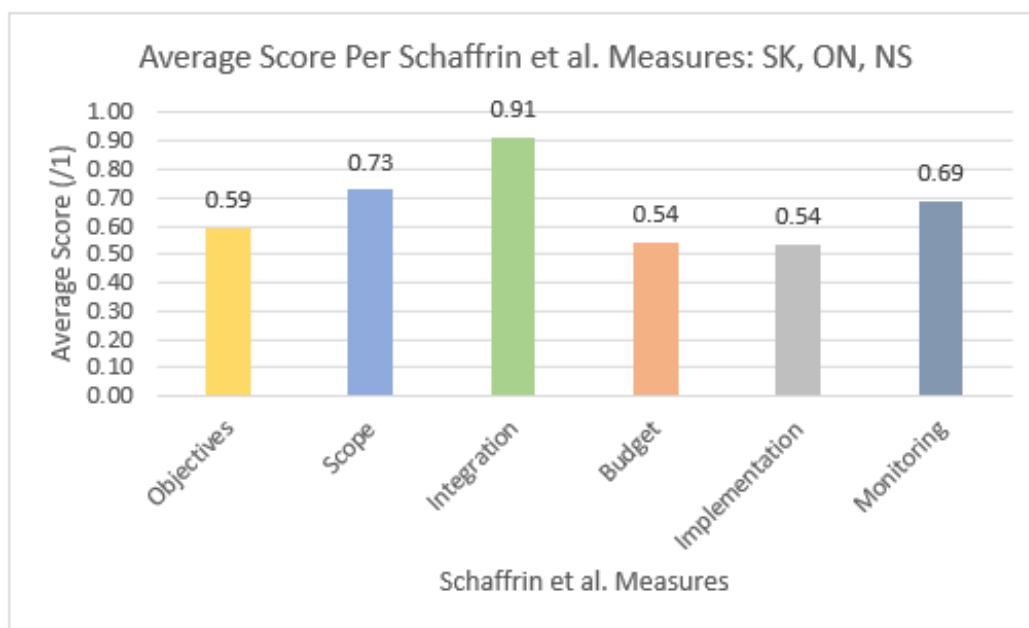


Fig. 3.12 Average score per measure in all the provinces (Dueck, 2023)

As the documents of each province evolved over time, a common theme remained that all documents contained low references of very positive and very negative, but rather higher instances of simply positive or negative. In all provinces, slightly more documents contained more negative than positive sentiment, but it remained nearly balanced.

All three provinces vary significantly in terms of political leadership, however, follow some trends of layering. Since 1971, the New Democratic Party (NDP) led Saskatchewan for the most years and the Progressive Conservative Party (PCP) led the least, but the SaskParty has been in power

since 2007. In Ontario, the PCP was in power the most with three separate periods, followed by the Liberal party that led during two periods of time. The NDP only had leadership for a short time from 1990-1994. The trend in Ontario also occurred in Nova Scotia, but the periods of time that each party was in power is not identical between the two provinces.

The first waste management related document from Saskatchewan was enacted in 1978 and the latest in 2022, yet Ontario and Nova Scotia did not enact any until the 1990s and last implemented a new document in 2017 and 2021, respectively. The older documents in Saskatchewan and Nova Scotia were amended numerous times, demonstrating the patching type of layering, whereas newer documents were recreated altogether (packaging). This trend also occurred in Ontario until 2016, where the province repealed all existing documents except for one and implemented two new documents. The two new documents were amended nearly every year after for five years, which was the only re-introduction of patching in recent years between all documents. Ontario also enacted one document in 2017 that was never amended.

CHAPTER FOUR: Recommendations and Conclusion

4.1. Policy Recommendations

Based on the results and analysis of this research and thesis, I recommend introducing new statutes, regulations, guidelines, plans, and strategies (packaging) when possible, rather than updating or amending current legislation (patching). As seen in the amendment tables of the political timeline analysis, the provinces of Saskatchewan and Nova Scotia have continuously amended older documents (patching) in the past, but they have begun to create new documents altogether (packaging) more recently. Alternatively, the province of Ontario has maintained both approaches until recently. Given that Ontario scored the lowest on average overall, I recommend following the example of the other two provinces.

In addition, I recommend increasing the number of items with a refundable deposit. It would operate such that refund is available upon return of containers to an appropriate recycling depot. This would form the basis of a new policy package and would contribute to improving the budget and implementation measures, which were the two lowest scoring measures on average amongst all three provinces. This places the responsibility on the consumer. Alternatively, I recommend developing a circular economy tax to fund incentive programs and funding opportunities. The tax would apply to various types of materials and resources to incentivise the producer to integrate the circular economy principles into their business models and strategize ways to phase out the linear model. This does not need to be developed from scratch as most jurisdictions are working to develop and implement an ‘Extended Producer Responsibility’ (EPR) plan if they have not already. This is a common environmental policy approach that places the responsibility (physically and/or economically; fully or partially) of a post-consumer product on the producer and away from the municipalities, which incentivizes producers to consider environmental and social factors when designing their products (Bhadra and Mishra, p. 430, 2021).

4.2. Conclusion

Managing waste is a task for every jurisdiction in Canada, which is increasingly becoming more challenging as landfills fill up and maintenance costs increase. Historically, waste management strategies include options such as incinerating, landfilling, and recycling, but also consisted of multi-material products with components that are very difficult to separate meaning they primarily end up in the landfill (Krzysztof and Krzysztof, p. 783, 2010; Ashton et al., p. 268-269, 2016). With concerns of pollution levels impacting the environmental and socio-economic structures of society, ways to reduce the generation of waste have emerged such that product components can be separated to each be recycled, repurposed, or reused in useful ways (Ashton et al., p. 269, 2016). While these approaches may work in the short-term, exploring the bigger picture and establishing long-term methods and goals to achieve sustainability should be a priority. One way is through the circular economy, which is a design framework that creates new products with a waste-conscious, economically-sound end-of-life solution in mind. To achieve complete circularity, the current linear business model and attitude towards product development and use must be re-imagined. While many countries, industries, and advocacy organizations have already implemented some circular policies, little is known about an optimal design. In this research, I explored what policy instruments have been used to generate the circular economy at the Canadian provincial level by examining a province/territory in each region of Canada – West (Saskatchewan), East (Ontario), Atlantic (Nova Scotia), and North (insufficient documents available) and whether the evolution of

waste management to waste reduction to circular economy involves a classic paradigm shift or is merely a function of capacity and time.

My main conclusion is that the evolution of provincial waste management policies in Canada is relatively independent of the political context, but rather continually emerges from a process of endogenous change inside the waste management policy subsector. This is why layering is observed, as well as an increase in overall positive sentiments, scores, and documents, regardless of external factors such as the values and ideologies of the political party in power, the geographical size and population, the resource availability, or the economic state of the province. Content analysis did not demonstrate any further patterns in the progression of the idea of circular economy in waste reduction.

Answering the Key Research Questions

Question 1: What policy instruments have been used to implement and develop the circular economy at the provincial level in Canada?

To complete this research, I gathered several policy documents (statutes, regulations, guidelines, plans, and strategies) from the three provinces (SK, ON, NS) that were related to waste management. What resulted was a variety of different types of documents at different points in time, as opposed to consistent documents across the board (Table 4.1). Saskatchewan enacted six statutes, five regulations, and one strategy; Ontario enacted four statutes, five regulations, and one strategy; and Nova Scotia enacted five statutes, one regulation, four guidelines, one plan, and one strategy.

Table 4.1 Total number of documents for all three provinces (Dueck, 2023)

	Statutes	Regulations	Guidelines	Plans	Strategies	Total
Saskatchewan	6	5	0	0	1	12
Ontario	4	5	0	0	1	10
Nova Scotia	5	1	4	1	1	12

Even though the types and frequency of documents varied, there were some general themes that can be observed in each of the three provinces (Tables 4.2-4.4). From 1971 (when the Ministry of the Environment was established) to about the mid-nineties, waste management policy documents were statutes that were amended on a continuous basis every year or so. This is a very regulatory-based approach to policy development which is known as patching, a type of policy layering that improves existing policies by modifying parts that are found to be insufficient and leaving other parts untouched. It is important to note that none of the Ontario or Nova Scotia documents that were patched have been repealed, whereas all three patched documents in Saskatchewan were.

Table 4.2 Amendment table for Saskatchewan (Dueck, 2023)

Saskatchewan												
Sentiment												
Score												
	1.4a	1.4b	1.4c	1.4d	1.5	1.4e	1.4f	1.2a	1.6	1.1	1.3	1.2b
	1978-2011	1986-2014	1990-2014	2002-2014	2005	2010	2010-2018	2013-2016	2018	2019	2020	2022
2023												
2022												
2021												
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1979												
1978												

SaskParty

NDP

Progressive Conservative Party

Enacted

Amended

Repealed

Table 4.3 Amendment table for Ontario (Dueck, 2023)

Ontario										
Sentiment										
Score										
	2.3	2.2a	2.2f	2.2d	2.2e	2.2b	2.2c	2.2g	2.1a	2.1b
	1990-2022	2002-2016	2002-2016	2003-2016	2004-2016	2006-2016	2008-2016	2016-2021	2016-2021	2017
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Progressive Conservative Party

NDP

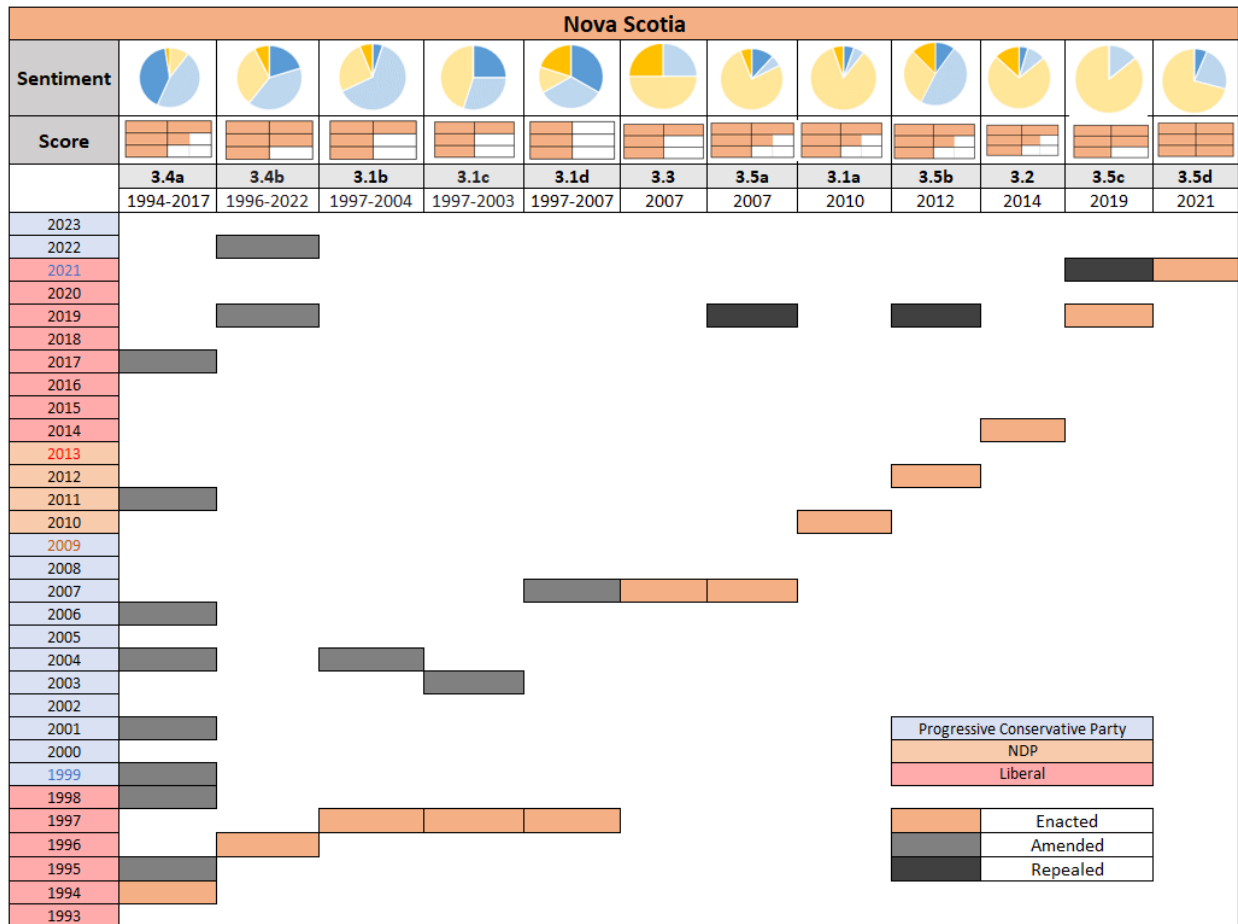
Liberal

Enacted

Amended

Repealed

Table 4.4 Amendment table for Nova Scotia (Dueck, 2023)



As of the late 1990s, we don't really see patching occurring anymore, except for one policy document enacted in Saskatchewan in 2002 (1.4d) and two documents enacted in Ontario in 2016 (2.2g and 2.1a). Instead, other policy layering processes, drift and stretching, appear to begin as many years pass with very little amendments and often end up being repealed. Policy drift and stretching are types of layering where the meaning of a policy begins to change or cover areas that it was not originally intended to such that the policy can start to contradict itself (Howlett and Mukherjee, p. 63, 2014). While this sounds ineffective, I questioned whether there was a clear difference between the different types of layering/policy development processes. This leads me to my second question.

Question 2: At the provincial level in Canada, does policy layering cause low intensity circular economy policy?

The short answer is no. According to my research results from scorecard analysis, the scores generally increase over time (Figures 4.1, 4.3, 4.5). This may indicate that policy drift and stretching are more effective than policy patching, however there are several outliers that do not confirm or deny this statement. In addition, sentiment analysis compliments the scorecard because it shows an overall decrease in negative sentiment overtime, however it is unclear whether

sentiment proves the circular economy is being implemented through waste management policy (Figures 4.2, 4.4, 4.6).

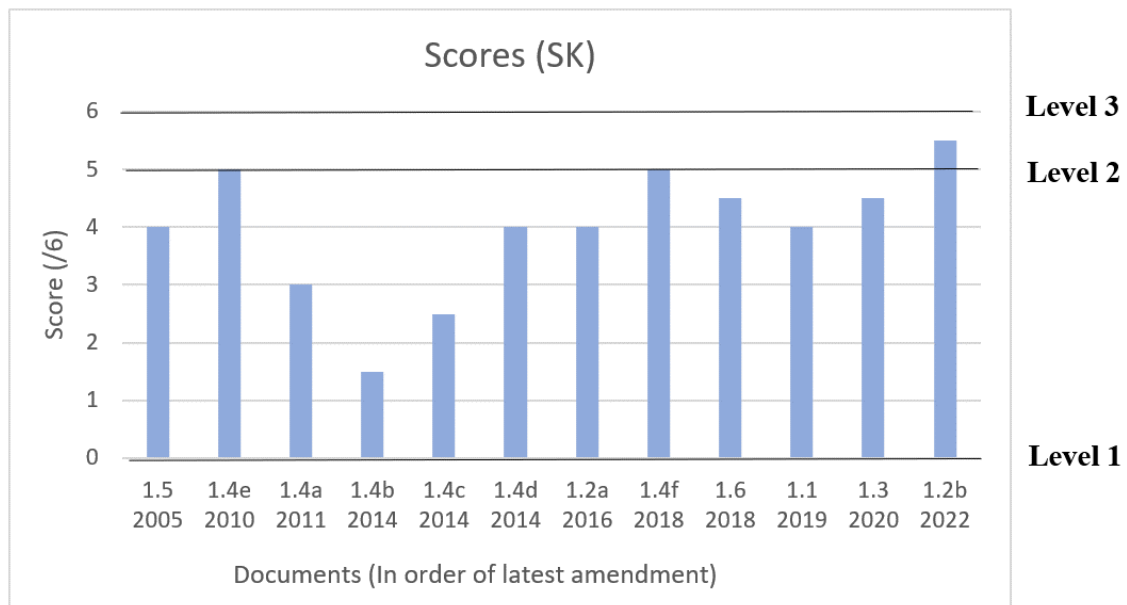


Fig. 4.1 Score per document for Saskatchewan (Dueck, 2023)

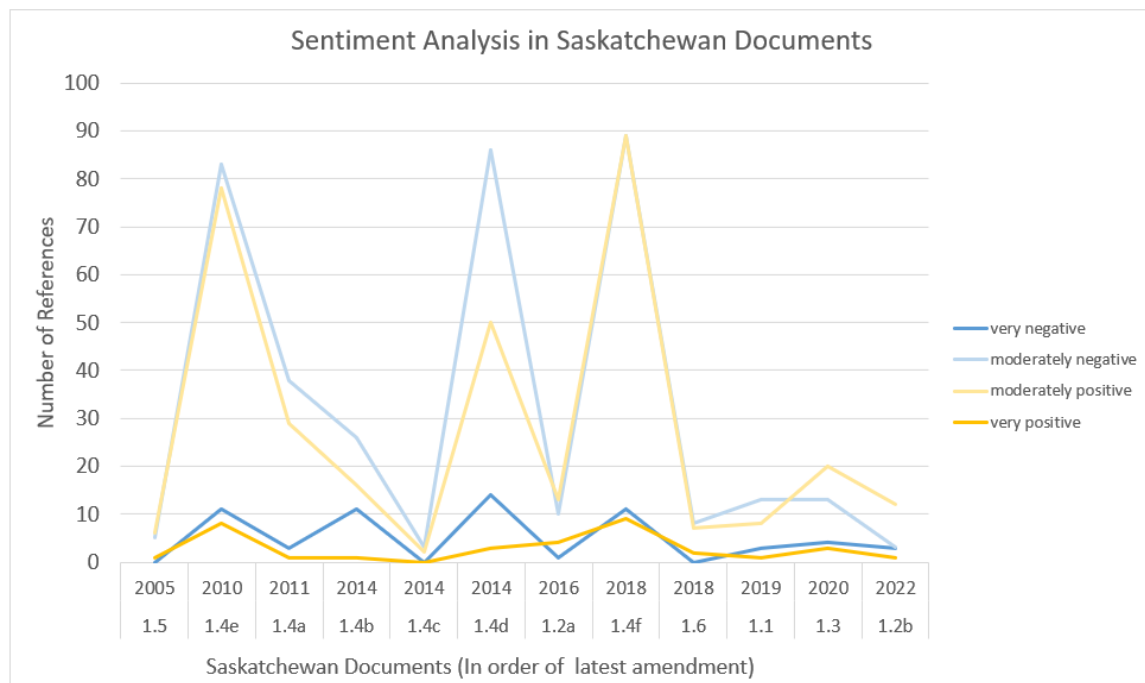


Fig. 4.2 Sentiment analysis for Saskatchewan (Dueck, 2023)

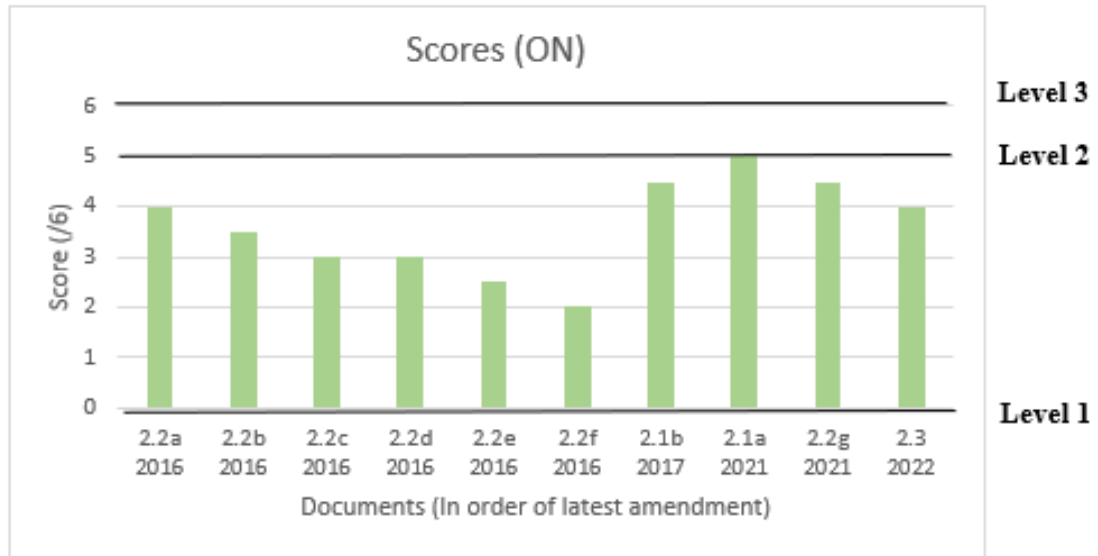


Fig. 4.3 Score per document for Ontario (Dueck, 2023)

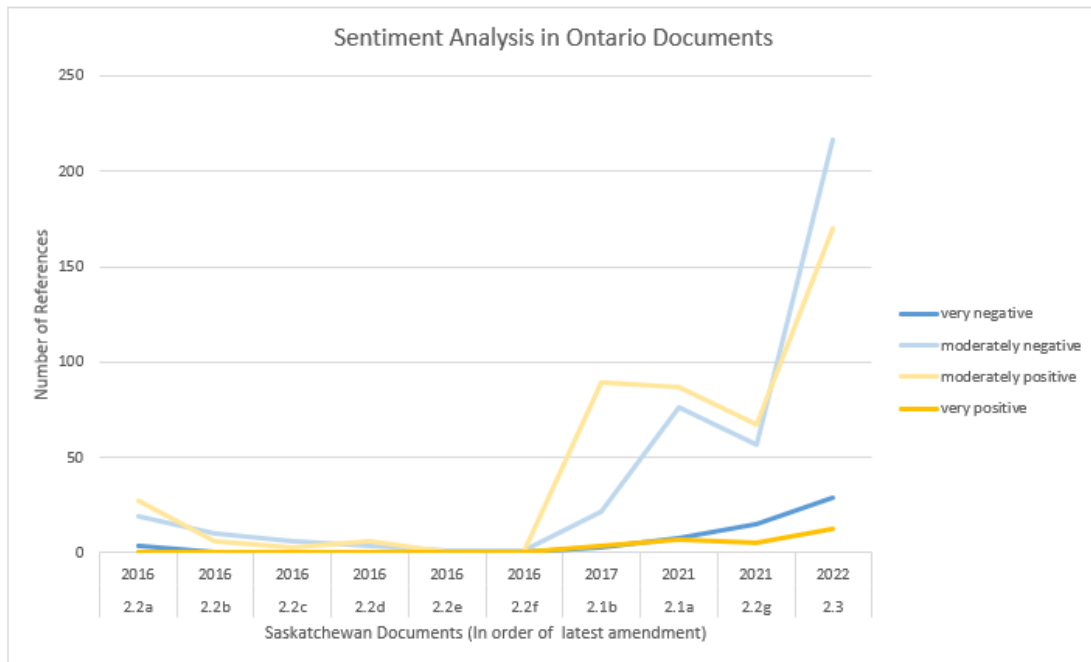


Fig. 4.4 Sentiment analysis for Ontario (Dueck, 2023)

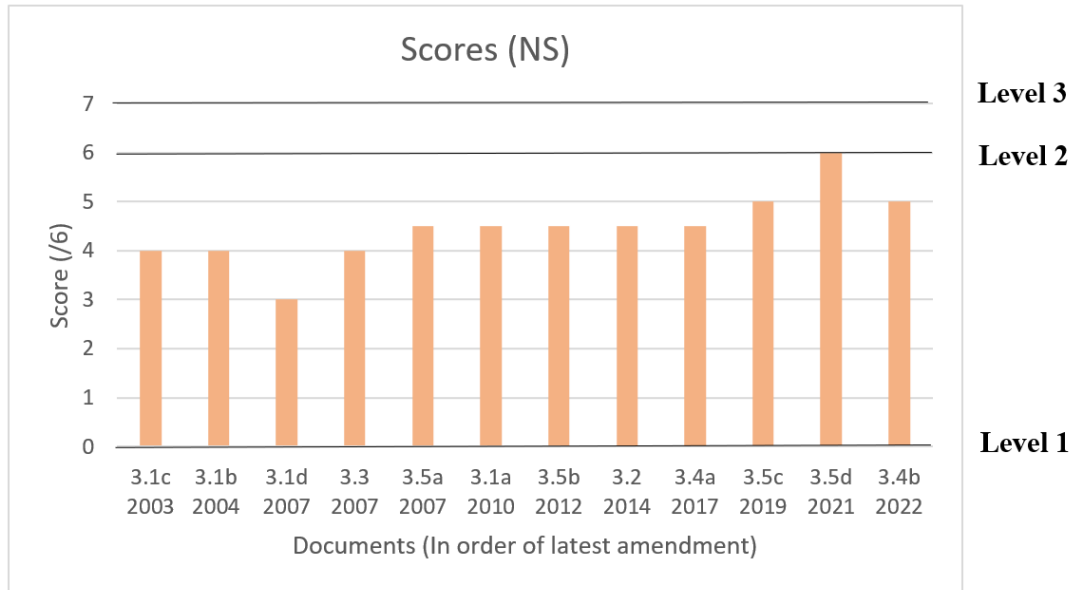


Fig. 4.5 Score per document for Nova Scotia (Dueck, 2023)

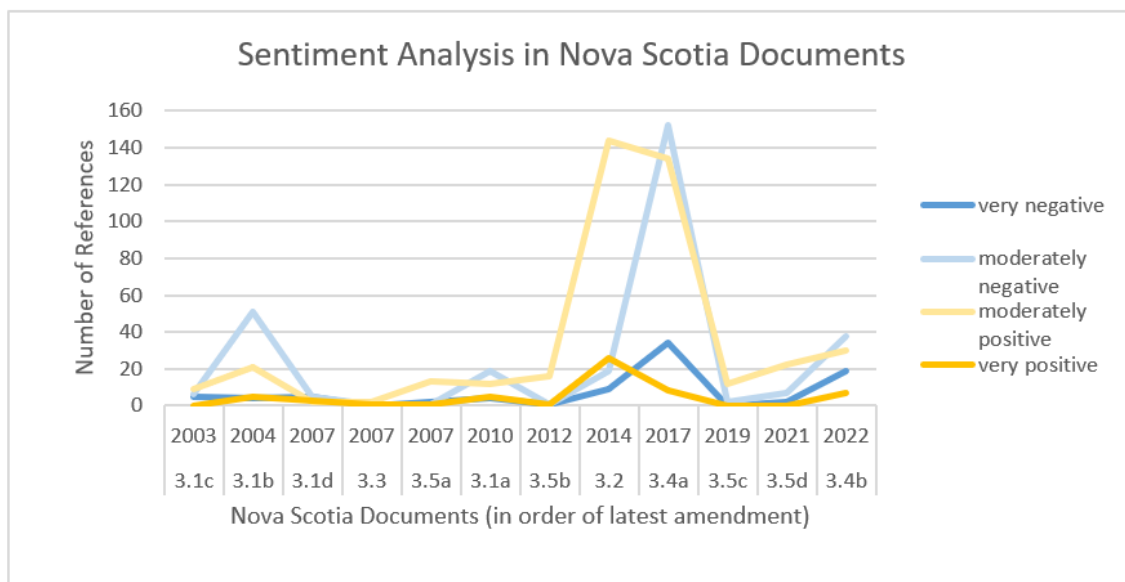


Fig. 4.6 Sentiment analysis for Nova Scotia (Dueck, 2023)

Question 3: What outputs (processes and methods) best design circular economy policy?

The higher the score, the closer to an optimal circular economy policy. Breaking down the six scorecard measures, optimal circular economy policy includes measurable objectives, allocated responsibility in scope, coherent and consistency with other policies, an established budget, prompt, thorough, and continuous implementation (never repealed), and accountability through regular monitoring (both for the actions implemented and the policy itself).

The top-scoring documents from Saskatchewan are the “Household Packaging and Paper Stewardship Program Regulations” (1.2b, 2022, score of 5.5), “Chapter E10-22” (1.4e, 2010, score of 4.5), and “The Environmental Management and Protection Act” (1.4f, 2010-2018, score of 4.5; Table 4.5). They all scored well (1) in the scope, integration, implementation, and monitoring

measures, while falling short in the objectives and budget measures (except for 1.2b in budget). This was because each of these documents placed responsibility on all stakeholders (*ie. "industry" ("brand owner" & "producer") & citizens ("end user")*), mentioned several other documents (*ie. The Environmental Management and Protection Act, 2010 - Sections 46 & 98 (p. 1), The Waste Paint Management Regulations, The Used Petroleum and Antifreeze Products Stewardship Regulations, or The Household Hazardous Waste Products Stewardship Regulations (Section 2c, p. 4)*), were clearly enacted and never repealed, and were monitored on a steady basis (*ie. "Annual progress reports. Will be reviewed every 5 years = 2025"*).

Table 4.5 Justification of scores for SK documents 1.2b, 1.4e, and 1.4f (Dueck, 2023)

1.2b 2022	0.5	1	1	1	1	1	
Justification	Requirements are listed, but there is no goal or specific target (Section 5, p. 5)	Industry ("brand owner" & "producer") & citizens ("end user") (Section 2.1 & 3a-d, p. 2 & 4)	The Environmental Management and Protection Act, 2010 - Sections 46 & 98 (p. 1), The Waste Paint Management Regulations, The Used Petroleum and Antifreeze Products Stewardship Regulations, or The Household Hazardous Waste Products Stewardship Regulations (Section 2c, p. 4)	Independently audited financial statements required in annual report (Section 10.3c & j, p. 10-11)	Most recent version stemming from the 2013 version (1.2a). Dated May 11, 2022.	Operator annual reports (Section 10, p. 9-11). Review of the program every 5 years = 2027 (Section 7, p. 8)	5.5
1.4e 2010	0.5	1	1	0.5	1	1	
Justification	Goals, but no targets (Section 3.2, p. 8-9)	Every person (Section 12, p. 14-15 and more)	Repealing The Clean Air Act, The Environmental Management and Protection Act, 2002, The Litter Control Act and The State of the Environment Report Act and making consequential amendments to certain Acts (p. 1)	No budget, but some cost deliniation (i.e., Orphaned Environmentally Impacted Sites Fund) (Section 90, p. 56)	Effective 2010. Repealed several Acts and led to The Environmental Management and Protection Act, 2010 (Sections 99-103 & 105 p. 65-66)	State of the environment report prepared every 2 years by the minister (Sections 5-7, p. 11-12). Permits must be obtained (Sections 24-27, p. 20-22). Control orders.	5
1.4f 2010 - 2018	0.5	1	1	0.5	1	1	
Justification	Goals, but no targets (Section 3.2, p. 9-11)	Every person (Section 44, p. 34 and more)	Repealing The Clean Air Act, The Environmental Management and Protection Act, 2002, The Litter Control Act and The State of the Environment Report Act and making consequential amendments to certain Acts (p. 5)	No budget, but some cost deliniation (i.e., Orphaned Environmentally Impacted Sites Fund) (Section 90, p. 64)	Most recent version stems from the 2002 version (1.4a). Enacted 2010 (effective 2015), amended 2013, 2014, 2018.	State of the environment report prepared every 2 years by the minister (Sections 5-7, p. 12). Permits must be obtained (Sections 24-27, p. 22-24). Control orders.	5

In Ontario, the top-scoring documents are the "Waste Diversion Transition Act" (2.2g, 2016-2021, score of 4.5), "Resource Recovery and Circular Economy Act" (2.1a, 2016-2021, score of 5), and "Strategy for a waste-free Ontario – Building the circular economy" (2.1b, 2017, score of 5; Table 4.6). Just like in Saskatchewan, the integration and implementation measures contribute to the high score, whereas the scope and monitoring do not consistently score well within each of these high-

scoring documents. In 2.2g, it is the budget that also scores 1, while in 2.1a it is the budget and monitoring. In 2.1b, it is the objectives and the monitoring.

Table 4.6 Justification of scores for ON documents 2.2g, 2.1a, and 2.1b (Dueck, 2023)

2.2g - 2016	0.5	0.5	1	1	1	0.5	
Justification	Has a purpose statement, but no clear targets (Section 1 & 5, p. 2-3)	Board of directors with various representatives, but not citizens (Section 4, p. 2-3)	Resource Recovery and Circular Economy Act, 2016 (Section 71, p. 27).	Determine the amount of money required to carry out the responsibilities under this Act' (Section 51, p. 4). Audited financial statements for annual report (Section 22, p. 5). Funds (Section 30.2.3, p. 12).	Enacted in 2016, amended in 2017, 2018, 2019, 2021	Annual reports (Section 6 & 30, p. 4, 12). Audit (Section 29, p. 12). No review set	4.5
2.1a - 2016	0.5	0.5	1	1	1	1	
Justification	Strategy with general interests but lacks specific targets (Sections 1.2-1.3 & 2, p. 4).	Consultation of representatives of municipalities, of persons engaging in resource recovery activities and waste reduction activities, of environmental organizations, of public, and such other persons as the Minister considers advisable (Section 11, p. 6)	City of Toronto Act (2006), Condo. Act (1998), Consumer Protection Act (2002), Env. Assessment Act, Env. Protection Act, Municipal Act (2001), Nutrient Management Act (2002), Ontario Water Resources Act, Planning Act (Section 2.12.2, p. 7). Amendments to ensure consistency with policy statements (Section 14, p. 6)	Financial statements are monitored each year & fees will appropriately adjusted or defrayed through the Minister's contribution (Sections 40-44, p. 17-18)	Enacted in 2016, amended 1+ times every year following up to & including 2021. Amendments to ensure consistency with policy statements (Section 14, p. 6)	Annual audit (Section 42-44, p. 18). At least once every 5 years, the Minister shall prepare a report with a list of actions taken & progress made. Strategy shall be reviewed every 10 years (sections 1.3.3 & 1.5, p. 5).	5
2.1b - 2017	1	0.5	1	0	1	1	
Justification	Strategy, vision, goals, and targets (p. 10)	Producers (brand holders and/or others with a commercial connection to designated products and packaging in Ontario, such as first importers, wholesalers, retailers and e-tailers (p. 8).	The Resource Recovery and Circular Economy Act, 2016, The Waste Diversion Transition Act, 2016 (p. 8-9) "Will need to be consistent with any applicable resource recovery and waste reduction policy statements" (p. 15)	Needs to improve understanding of the costs and benefits of resource recovery (p. 17)	2017 (p. 1). Implementation strategy (p. 38-40)	Comprehensive data and sound performance metrics will help to evaluate and assess our performance against targets (p. 17). Measuring & evaluating (p. 41)	4.5

Lastly, Nova Scotia's top-scoring documents are the "Solid Waste-Resource Management Regulations" (3.4b, 1996-2022, score of 5), the "Sustainable Development Goals Act (as passed)" (3.5c, 2019, score of 5), and the "Environmental Goals and Climate Change Reduction Act" (3.5d, 2021, score of 6; Table 4.7). The first document scored well in each measure except for objectives

and monitoring, while the second document scored well in each measure except for implementation. The third document was the only document of all provincial documents to score a perfect 6.

Table 4.7 Justification of scores for NS documents 3.4b, 3.5c, and 3.5d (Dueck, 2023)

3.4b	0.5	1	1	1	1	0.5	
Justification	Goals but no targets (Part 1, Section 4, p. 5)	"residential, commercial, institutional and industrial" (Part 1, Section 2, p. 4)	Recycling Act, Resource Recovery Fund Regulations (Part 1, Section 4.2, p. 5)	Expenditures outlined (Part 1, Section 8, p. 7)	1994-1995. Effective 1996. Amended 2019, 2022 (as of 2023). (p. 1)	Approval application required (Division 2, Section 32, p. 27). No review of policy scheduled.	5
3.5c	1	1	1	1	0	1	
Justification	Percent reduction targets (Section 7, p. 3)	Local government, business, non-government organizations, Nova Scotians (Section 5b, p. 2-3).	Environment Act (Section 2fg, p. 2). Climate Change Plan for Clean Growth (Section 8, p. 3).	Sustainable Communities Challenge Fund established to be managed and used in accordance with the regulations to create opportunities for climate change mitigation and adaptation efforts (Section 9, p. 3)	Enacted 2019 (p. 1). Repealed by Environmental Goals and Climate Change Reduction Act 2021.	Annual reports (Section 12, p. 4). Premier shall meet with the Round Table annually (Section 10, p. 3). Review the Act every 5 years (Section 13, p. 4).	5
3.5d	1	1	1	1	1	1	
Justification	Percent reduction targets (Section 6, p. 3. Section 7ijl, 9b, 10a, p.4.)	Local government, business, non-government organizations, Nova Scotians (Section 5.2e, p. 3).	Environment Act (Section 2jk, p. 2). Climate Change Plan for Clean Growth (Section 8, p. 4).	Sustainable Communities Challenge Fund established to be managed and used in accordance with the regulations to create opportunities for climate change mitigation and adaptation efforts (Section 18, p. 6)	Enacted 2021 (p. 1).	Risk assessment in 2022, 2025, and every 5 years after (Section 7a, p. 3). Annual reports (Section 8.2, p. 4). Premier shall meet with the Round Table annually (Section 19, p. 6). Review Act every 5 years (Section 22, p. 6).	6

Overall, there were not any measures that averaged a score of 0 or 1, but SK and NS each averaged 0.5 once (Table 4.8). Nova Scotia was significantly stronger when it came to objectives as most of their waste management documents contained numerical targets or percentages. Nova Scotia also scored substantially higher than the other two provinces for the scope measure by directing the policy to all waste producers. The integration measure was strongly accounted for within all three provinces, suggesting they have all made efforts to be politically consistent. On the other hand, all

three provinces do not explicitly outline clear responsibility for budgets in the policy documents but face the expenses regardless. For the implementation measure, Saskatchewan scored the highest on average because not very many documents have been repealed. Lastly, the monitoring measure was similar in all three provinces with Ontario scoring the lowest of the three provinces. Most required at least consistent reporting, while exceptional documents also established a set timeline for review with possibility of amendment.

Table 4.8 Average score per measure per province (Dueck, 2023)

	Objectives	Scope	Integration	Budget	Implementation	Monitoring
SK	0.50	0.67	0.83	0.58	0.67	0.71
ON	0.45	0.60	0.95	0.55	0.40	0.65
NS	0.83	0.92	0.96	0.50	0.54	0.71

In addition, a decrease in negative sentiment occurrences in waste management policy documents may contribute to an optimal circular economy policy design, but this thesis does not prove one way or another. Considering these three provinces each have several high-scoring documents, it is too early to consider one province a leader in this area. It is a given that the design of policy is naturally top-down by nature of using regulatory measures to hold producers of waste accountable and setting parameters for waste management, however this is only one piece of the puzzle. As raw materials become more expensive to create, motivation to reuse materials and products (like in a circular economy) will become more common out of primarily economic self-interest, however it will also introduce social and environmental challenges. This will inherently drive the markets, which are highly influential themselves. Overall, optimal circular economy policy design for the communities, provinces, and territories in Canada should include shared elements that are generally accepted as good practice, while allowing for autonomy to respond to local needs.

4.3. Future Research

Canada is a long way from a complete shift from the standard linear economy to a circular economy at a legislative level and many unknowns remain about effective policy directions in this area. In this research, I was limited by the logistics of content and sentiment analysis and Nvivo's capacity; these methods may be more extensively analyzed using a different software, such as Artificial Intelligence (AI) platforms. In addition, I did not use any interview or focus group methods, however interest in the principles of the circular economy is growing and individual opinions from a variety of backgrounds may be useful in strengthening this research by creating a sense of understanding and trust. Since only documents dating between 1971 and the current date (2023) were analyzed in the political timeline, other waste management documents in SK, ON, and NS before and in the future may indicate further aspects of the layering spectrum. This research may also be supplemented through additional comparison of other jurisdictions' waste management documents, such as other Canadian provinces and territories or other countries, or through an analysis of Indigenous-led waste management and traditional circular protocols.

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APPENDICES

A. Preliminary Research

The following section contains a summary of preliminary research of policy documents and projects related to the circular economy for each province and territory in Canada, as well as at the Federal and Indigenous levels, and an initial score of each (Table A.1).

Initial Scoring System

3: several regulations/acts and projects in place

2: few regulations/acts in place; working on developing them further. Projects ongoing.

1: no regulations/acts in place, working on developing new regulations/acts. Projects may be ongoing.

Table A.1 Initial document research and score (Dueck, 2023)

Circular Economy Relevance	
Acts & Regulations	Projects (Councils, start-ups, reports, webinar series, etc.)
British Columbia - 3	
<ul style="list-style-type: none"> • 2004 (Last amended Feb. 1, 2022): Recycling Regulation (Environmental Management Act), (0 mentions of Circular Economy, 0 EPR) • June 2020: Approved amendments to the deposit-refund system and single-use and more packaging products (<i>mentions: 0 circular economy, 0 EPR, 0 Extended Producer Responsibility</i>) and explanatory notes (<i>mentions: 0 circular economy, 0 EPR, 1 Extended Producer Responsibility</i>) • Sept. 2020: Recycling Regulation – Policy Intentions Paper (<i>Mentions: 1 circular economy, 17 EPR, 2 Extended Producer Responsibility</i>) • March 2021: Response/feedback report to the policy intentions paper (<i>mentions: 8 circular economy, 85 EPR, 14 Extended Producer Responsibility</i>) 	<ul style="list-style-type: none"> • 2016: National Zero Waste Council/UBC report (<i>mentions: 60 circular economy, 0 EPR, 0 Extended Producer Responsibility</i>) • March 2017: Jurisdictional Scan for Circular Economy (<i>mentions: 439 circular economy, 8 EPR, 4 Extended Producer Responsibility</i>) • Launched in 2019/ongoing: Project Zero incubator program (<i>mentions: 4 circular economy, 0 EPR, 0 Extended Producer Responsibility</i>) • Launched in 2021/ongoing: Project Greenlight assists with new circular ventures/startups (<i>mentions: 0 circular economy, 0 EPR, 0 Extended Producer Responsibility</i>) • Sept-Nov 2021: free webinar series (<i>mentions: 11 circular economy, 0 EPR, 0 Extended Producer Responsibility</i>) • October 13, 2021: Framework for achieving a just circular economy of food, Vancouver (<i>mentions: 99 circular economy, 0 EPR, 1 Extended Producer Responsibility</i>) • October 15, 2022: the City of Vancouver Council unanimously passed the motion, <i>Improving the Circularity in Vancouver's Economy</i> (<i>mentions: 13 circular economy, 5 circularity, 0 EPR, 0 Extended Producer Responsibility</i>), with much support from industry and non-profits. VEC will work with City of Vancouver staff to report annually on progress and track global best practices (<i>mentions: 20 circular</i>

	<p>economy, 7 circularity, 0 EPR, 0 Extended Producer Responsibility)</p> <ul style="list-style-type: none"> • Notable CE Companies in Vancouver: Anaconda Systems, Chop Value, Fabcycle, FoodMesh, Goodly Foods, Quadrogen, Susgrainable, Unbuilders • 2021-2026: Extended Producer Responsibility (EPR) Five-Year Action Plan (10 pages) (<i>mentions: 10 circular economy, 42 EPR, 13 Extended Producer Responsibility</i>).
Alberta - 2	
<ul style="list-style-type: none"> • December 2021: Bill 83: <i>Environmental Protection and Enhancement Amendment Act</i> – extended producer responsibility (EPR) framework that shifts the physical and financial responsibilities of recycling waste to industry product and packaging producers and away from local governments and taxpayers. (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • The Gov. of AB website states that its current legislation/regulations for waste management/recycling have not kept pace with other Canadian jurisdictions, such as BC. (Only province without EPR systems, even though AB sends the most kg/person to the landfill annually in Canada (1034kg AB vs 710kg national avg.) Implementation planned for 2022. 	<ul style="list-style-type: none"> • 2022: Emissions Reductions Alberta is committing \$50 million through its new Circular Economy Challenge (funding/grant opportunity) (<i>mentions: 14 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2022: Environment Lethbridge holding repair cafes with tools, guidance, etc. to fix items. Banff food rescue and Calgary's Leftovers programs pick up food that would normally be thrown away and dispense it to people and organizations in need. • <i>Recycling Council of Alberta's</i> Circular Communities 5-year (2018-2022) plan (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). - EPR Key Principles - March 2021: EPR discussion paper - April 2022: Municipal EPR transition webinar. - Jan 2022: EPR workshop and consultation/what we heard report
Saskatchewan - 2	
<ul style="list-style-type: none"> • 2019: The 'Household Hazardous Waste Product Stewardship' Regulations came into effect (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2022: Gov. of SK 'Household Packaging and Paper Stewardship Program Regulations and Multi-Material Recycling Program' report (one mention of circular) (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). But the summary of proposed changes report (<i>mentions: 0 circular economy, 0 circularity, 4 EPR, 3 Extended Producer Responsibility</i>). 	<ul style="list-style-type: none"> • January 2020: Government of Saskatchewan released its Solid Waste Management Strategy (<i>mentions: 1 circular economy, 0 circularity, 6 EPR, 3 extended producer responsibility</i>) • March 2022: Saskatchewan Polytechnics new Sustainability-Led Integrated Centre of Excellence - SLICE (<i>mentions: 3 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • April 2022: Sask Waste Reduction Council Waste ReForum and webinar (<i>mentions: 2 circular economy, 1 circularity, 0 EPR, 0 Extended Producer Responsibility</i>).
Manitoba - 3	
<ul style="list-style-type: none"> • May 2021, updated May 2022: WRAP Act: Waste Reduction and Prevention Act. Stewardship regulations: (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 1 Extended Producer Responsibility</i>). 	<ul style="list-style-type: none"> • March 31, 2021: 'Manitoba Waste Diversion and Recycling Framework Review' Final Report (<i>mentions: 155 circular economy, 0 circularity, 469 EPR, 26 Extended Producer Responsibility</i>).

<ul style="list-style-type: none"> - 1997: Used oil, oil filters, and containers - 2006: tires - 2008: packaging and printing paper - 2010: Household Hazardous Material and Prescribed Material - 2010: Electrical and electronic equipment 	<ul style="list-style-type: none"> • Circular Economy Club non-profit (<i>mentions: 8 circular economy, 0 circularity, 469 EPR, 26 Extended Producer Responsibility</i>). • 2020: Manitoba Industry-Academia Partnership (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • Sept. 2021: Manitoba government is providing \$8.7 million to municipalities, companies and organizations for waste reduction and recycling support (Gov. of Manitoba) (<i>mentions: 2 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • Began December 2019, last meeting in March 2022: Winnipeg Metropolitan Region mandated by the Gov. of Manitoba to develop a 30-year draft regional plan. 20to50 – policy areas: integrated communities & infrastructure, one environment, resource management, investment & employment, collaborative governance (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>).
Ontario - 3	
<ul style="list-style-type: none"> • 2016: Resource Recovery and Circular Economy Act (<i>mentions: 6 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • Resource Productivity & Recovery Authority, RPRA. Regulator mandated by Gov. of ON to enforce CE laws (<i>mentions: 9 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2016: Waste diversion transition act (<i>mentions: 14 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). 	<ul style="list-style-type: none"> • June 2013: Ontario Waste Management Association (OWMA) EPR Policy Paper Series (<i>mentions: 0 circular economy, 0 circularity, 34 EPR, 8 Extended Producer Responsibility</i>). • Feb 2017: Strategy for a waste-free Ontario – Building the circular economy (45-page report) (<i>mentions: 90 circular economy, 0 circularity, 0 EPR, 1 Extended Producer Responsibility</i>). • Recycling Council of Ontario (<i>mentions: 19 circular economy, 1 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2022: Smart Prosperity Institute (<i>mentions: 9 circular economy, 0 circularity, 0 EPR, 1 Extended Producer Responsibility</i>). • Circular Materials, non-profit. Blue bin recycling. (<i>Mentions: 2 circular economy, 0 circularity, 7 EPR, 1 Extended Producer Responsibility</i>).
Québec – 3	

<ul style="list-style-type: none"> • October 2021: Draft EPR regulations (<i>mentions: 1 circular economy, 0 circularity, 11 EPR, 4 Extended Producer Responsibility</i>). • Updated Dec. 2021: Environmental Quality Act and Sustainable Development Act. (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 4 Extended Producer Responsibility</i>). 	<ul style="list-style-type: none"> • 2019: Quebec circulaire – platform/tool that the public can subscribe to. Offers free services: <ul style="list-style-type: none"> - Monitor circular economy news and identify opportunities - Value your company on a local & international scale - Join the stakeholders and be active in the network - Build partnerships and integrate project communities - Have access to implementation tools and methodologies - Benefit from experience feedback and make your achievements visible (<i>mentions: 13 circular economy, 1 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • March 2018: Circular Economy strategy report (77 pages) (<i>mentions: 247 circular economy, 20 circularity, 0 EPR, 31 Extended Producer Responsibility</i>). • 2018: Eco Entreprises Quebec (company) (<i>mentions: 17 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • June 2021: the circularity gap (30-page report). CGRI (<i>mentions: 63 circular economy, 187 circularity, 0 EPR, 1 Extended Producer Responsibility</i>).
New Brunswick - 2	
<ul style="list-style-type: none"> • 1992: Beverage Container Act – deposit/refund system (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 1996: Tire regulation (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2002: Used oil regulation (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2008, updated Nov. 2021: Designated Materials Regulation - Clean Environment Act 	<ul style="list-style-type: none"> • Oct. 2019: announced plans to put in place a new EPR program. Set to be running by spring 2023 (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 3 Extended Producer Responsibility</i>). Already has an EPR for oil/glycol, paint, electronics. Recycle NB (<i>mentions: 2 circular economy, 0 circularity, 6 EPR, 4 Extended Producer Responsibility</i>). • Jan. 2022: Green Economy launches – resource for businesses (<i>mentions: 1 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • Circular Materials, non-profit. Blue bin recycling. (<i>mentions: 2 circular economy, 0 circularity, 7 EPR, 1 Extended Producer Responsibility</i>).
Nova Scotia - 2	
<ul style="list-style-type: none"> • 2007, Updated 2019: Bill 213 - Environmental Goals and Sustainable Prosperity Act. (<i>mentions: 3 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2019: Sustainable Development Goals Act. Passed but never took effect. (<i>mentions: 5</i> 	<ul style="list-style-type: none"> • 2016: Awareness summit – Divert (<i>mentions: 13 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2018: R&G startup – CE infrastructure (<i>mentions: 6 circular economy, 2 circularity, 0 EPR, 0 Extended Producer Responsibility</i>).

<p><i>circular economy, 0 circularity, 5 EPR, 3 Extended Producer Responsibility).</i></p> <p>● 2021: Environmental Goals and Climate Change Reduction Act (<i>mentions: 3 circular economy, 0 circularity, 0 EPR, 2 Extended Producer Responsibility).</i></p>	<p>● 2019: study of plastic film (<i>mentions: 4 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility).</i></p>
Newfoundland & Labrador - 2	
<p>● 2003: Waste Management Regulations, under the Environmental Protection Act. (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 2 Extended Producer Responsibility).</i></p>	<p>● 2002: Solid Waste Management Strategy.</p> <p>- 2019: Finishing What we started, 148-page report (<i>mentions: 1 circular economy, 0 circularity, 0 EPR, 10 Extended Producer Responsibility).</i></p> <p>● 2019: Memorial University two-day event/discussion. (<i>mentions: 2 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility).</i></p> <p>● 2021: Planeet Consulting produced a 4-blog series about zero waste and circularity for businesses and organizations (<i>mentions: 6 circular economy, 2 circularity, 0 EPR, 0 Extended Producer Responsibility).</i></p>
Prince Edward Island - 3	
<p>● Sept 2021: A change to regulations under Prince Edward Island's (PEI's) <i>Environmental Protection Act</i> means a new program will be in place in the province to collect and recycle agricultural plastics. PEI will be the first province in the Atlantic region with a regulated extended producer-responsibility program (EPR) for agricultural plastics. PEI is a national leader in programs for recycling and the diversion of waste from landfills," said PEI's Minister of Environment, Energy and Climate Action, Steven Myers. Also implemented successful programs for electronics, paint, and lamp products. (<i>mentions: 3 circular economy, 0 circularity, 5 EPR, 2 Extended Producer Responsibility).</i></p>	<p>● Lots of information about the CE on the Charlottetown website (<i>mentions: 5 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility).</i></p> <p>● PEI Environment and Sustainability fund (<i>mentions: 1 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility).</i></p> <p>● Recycling twine pilot project – cleanfarms (<i>mentions: 1 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility).</i></p>
Yukon - 2	
<p>● 2014: Environment Act, Solid Waste Regulations (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility).</i></p> <p>● Two stewardship programs: Beverage Container Regulation (BRC) and Designated Materials Regulation (DMR). What can I recycle and where? (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 1 Extended Producer Responsibility).</i> Recycling in Whitehorse (<i>mentions: 0 circular economy, 0</i></p>	<p>● 2019: Zero Waste Yukon (<i>mentions: 13 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility).</i></p> <p>● 2021: Extended Producer Responsibility (EPR) in the Yukon: exploration and implementation considerations (7-page report; one mention of circular economy). No EPR yet. – <i>mentions: 1 circular economy, 0 circularity, 31 EPR, 7 Extended Producer Responsibility).</i></p>

<i>circularity, 8 EPR, 3 Extended Producer Responsibility).</i>	<ul style="list-style-type: none"> • What goes where app (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>).
Northwest Territories - 2	
<ul style="list-style-type: none"> • 2004, updated last in 2017: Waste reduction and recovery act (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2004, updated last in 2017: Environmental Protection Act (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2005, updated last in 2015: beverage container regulations (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2015, updated last in 2018: electronic regulations (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2010, updated last in 2020: single-use retail bags regulations (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2003, updated last in 2015: used oil and waste fuel management regulations (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). 	<ul style="list-style-type: none"> • CDETNO: pilot project, subscription. (<i>mentions: 7 circular economy, 2 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • Some general info on the government website (<i>mentions: 4 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2019: Waste resource management strategy and implementation plan, 17 mentions of CE (<i>mentions: 17 circular economy, 0 circularity, 9 EPR, 6 Extended Producer Responsibility</i>).
Nunavut - 1	
<ul style="list-style-type: none"> • 2013: Environmental Protection Act (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). 	<ul style="list-style-type: none"> • Solid waste management report (<i>mentions: 0 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>).
Federal - 2	
<ul style="list-style-type: none"> • Government of Canada initiatives, Federal-Provincial-Territorial initiatives, international initiatives supported by the Government of Canada, Canadian success stories (<i>mentions: 13 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • Feb. 2022: Minister of Environment and Climate Change Canada has launched a consultation process on the development of new regulations that will set minimum percentage recycled content requirements for certain items made of plastic. (<i>mentions: 3 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). 	<ul style="list-style-type: none"> • 2018: Circular Economy Leadership Canada - network of corporate leaders, non profit think tanks, and academic researchers (<i>mentions: 29 circular economy, 1 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • October 2020: Circular plastics taskforce (<i>mentions: 7 circular economy, 0 circularity, 0 EPR, 0 Extended Producer Responsibility</i>). • 2021: Circular economy solution series (<i>mentions: 0 circular economy, 28 circularity, 9 EPR, 1 Extended Producer Responsibility</i>).
Indigenous - 3	

- **2021:** The linear economy reinforces systems of exclusion, colonization, and consumerism, for example through the siting of landfills near racialized communities (Environment and Climate Change Canada and SITRA, 2021).
- **2021:** circularity has been a way of life for millennia for Indigenous peoples worldwide. They are economies centred around holistic approaches, where one process or action feeds into another, fostering resilience, reciprocity and respect between people and nature. Economies that are restorative by design, or rather, default. (UNDP, 2021).

A Summary of the Findings:

Saskatchewan (SK) has some acts and regulations, but they do not mention ‘circular economy’ or ‘circularity’ more than once (Government of SK, 2020). Saskatchewan Polytechnic school has a new ‘Sustainability-Led Integrated Centre of Excellence’ (SLICE) and the Saskatchewan Waste Reduction Council holds a ReForum conference and webinars.

Ontario (ON) has already undertaken several measures to implement the circular economy, including a ‘Resource Recovery and Circular Economy Act (Government of Ontario, 2016)’ and a ‘Waste Diversion Transition Act (Government of Ontario, 2016)’. In addition, the provincial government has created the ‘Resource Productivity & Recovery Authority’ (RPRA) to enforce circular economy laws (RPRA, 2022). In 2017, ON wrote a ‘Strategy for a waste-free Ontario – Building the circular economy’ (Government of Ontario, 2017).

In October 2021, **Quebec (QB)** drafted their EPR regulations and updated their ‘Environmental Quality Act and Sustainable Development Act’ two months later (Recycling Council of Alberta, web). Quebec also has two strategy reports about the circular economy; the first, titled ‘Circular Economy in Quebec: Economic Opportunities and Impacts’ is 77 pages long and mentions ‘circular economy’ 247 times (CPQ, CPEQ, EEQ, 2018). The second is a 30-page report, titled ‘The Circularity Gap’, that has 63 mentions of ‘circular economy’ and 187 of ‘circularity’ which essentially mean the same (CGRi, 2021).

Prince Edward Island (PEI) appears to be the most advanced province in the Maritimes because its ‘Environmental Protection Act’ entails a program that collects and recycles agricultural plastics, which also has an EPR plan (Vitello, web, 2021). **New Brunswick (NB), Nova Scotia (NS), and Newfoundland and Labrador (NFLD/LAB)** all have their own acts in place, but none of them have been updated since 2021. In 2019, NB announced a new EPR program, which is set to be running by 2023 (Government of New Brunswick, web, 2021). NS has a start-up that is committed to building circular economy infrastructure (Chaisson, web, 2018). NFLD/LAB has a 4-blog series about zero waste and circularity for businesses and organizations (Planeet Consulting, web, 2021).

The **Federal** Government of Canada has set out the Federal-Provincial-Territorial initiatives and the international initiatives that they support, as well as Canadian success stories (Government of Canada, 2021). In February of 2022, the Minister of Environment and Climate Change Canada launched a consultation process on the development of new regulations that will set minimum percentage recycled content requirements for certain items made of plastic, thus ensuring that less materials are sent to the landfills (Environment Journal, web). In general, it appears as though emphasis on implementing the circular economy is not at the federal level, but at the provincial and territorial levels.

B. Defining “Circular Economy”

This section contains glossary of definitions for ‘circular economy’ that were sourced from peer-reviewed and grey literature (Table B.1).

Table B.1 Initial definition analysis (Dueck, 2023)

Definer	Definition
Nova Scotia’s Environmental Goals and Climate Change Reduction Act (bill 57) and bill 213	“ Circular economy ” means an economy in which resources and products are kept in use for as long as possible, with the maximum value being extracted while they are in sue and from which, at the end of their service life, other materials and products of value are recovered or regenerated .
Canada’s circular economy lab <ul style="list-style-type: none"> Used by: Gov. of BC EPR 5-year plan 	A circular economy is: <ul style="list-style-type: none"> A regenerative economy that thrives within nature’s limits Circular products and materials designed for multiple lives and repeated profitable cycles of reuse, repair and recycling. Efficient production and consumption powered by closed-loop manufacturing, renewable resources and low-carbon energy.
Vancouver Economic Commission (link)	The circular economy is an economic model that extends the life cycle of products. Throughout this process, waste is eliminated through the reduction, reuse, repair, and recycling of materials to limit inefficiencies and close gaps within the system. It aims to effectively design out waste.
World Economic Forum <ul style="list-style-type: none"> Used by: City of Vancouver council <p>PACE 2019 report (p.16)</p>	<p>A circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the end-of-life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse and return to the biosphere, and aims for the elimination of waste through the superior design of materials, products, systems, and business models.</p> <p>A circular economy is a system in which all materials and components are kept at their highest value at all times, and waste is designed out of the system. It can easily be thought of as the opposite of today’s linear economy. It can be achieved through different business models including product as a service, sharing of assets, life extension and finally recycling. To build a circular economy for electronics there are different aspects to consider.</p>
Ellen Macarthur Foundation <ul style="list-style-type: none"> Used by: BC’s jurisdictional scan for circular economy, p. 14, 2017 	CIRCULAR ECONOMY A systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution. It is based on three principles, driven by design: eliminate waste and pollution, circulate products and materials (at their highest value), and regenerate nature . It is underpinned by a transition to renewable energy and materials. Transitioning to a circular economy entails decoupling economic activity from the consumption of finite resources. This represents a systemic shift that builds long-term resilience, generates business and economic opportunities, and

<ul style="list-style-type: none"> • Recycling Council of Alberta • The circularity gap QB, CGPi, p. 11, 2021. • Zero waste Yukon • Waste resource management strategy and implementation plan, 17 mentions of CE, p. 31, 2019. NWT • Federal Circular economy solution series, (p. 6, 2021) • Emissions Reductions Alberta 	<p>provides environmental and societal benefits. (Ellen Macarthur Foundation)</p> <ul style="list-style-type: none"> • “A circular economy is one that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles.” (BC) • “A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems. It is a new way to design, make, and use things within planetary boundaries. Shifting the system involves everyone and everything: businesses, governments, and individuals: our communities, our products, and our jobs. By designing out waste and pollution, keeping products and materials in use, and regenerating natural systems we can reinvent everything.” (AB, Yukon, NWT, federal). • A circular economy is designed to significantly reduce waste and pollution, keep products and materials in use, and regenerate natural systems. Product lifecycles are extended by reuse, recycling, upcycling, resource recovery, and low-impact design. Circular Economy is a cradle-to-cradle approach improving material repurposing, reuse, recovery, and regeneration within supply chains, helping to reduce extraction and consumption of virgin materials in favour of waste recovery and recycling. It is a complex challenge that requires systemic change; innovations in technologies, products, and process; and cross-sector collaboration. (ERA)
<p>National Zero Waste Council/UBC (p. 5, 2016).</p>	<p>The circular economy is an evolving economic model predicated on a systems-based approach to eliminate waste. This paradigm marks the movement away from the conventional “take-make-dispose” model of production and consumption to one based on continuous use, resource efficiency and regenerative design.</p>
<p>Manitoba’s waste diversion and recycling framework review (p. viii, 2021)</p>	<p>A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which resources are kept in use for as long as possible, extract and retain the maximum value from resources and products whilst in use, then recover and regenerate products and materials at the end of each product service life</p>
<p>Strategy for a waste-free Ontario – Building the circular economy (p. 4, 2017)</p>	<p>A circular economy aims to eliminate waste, not just from recycling processes, but throughout the lifecycles of products and packaging. A circular economy aims to maximize value and eliminate waste by improving the design of materials, products, and business models. A circular economy goes beyond recycling. The goal is not just to design for better end-of-life recovery, but to minimize the use of raw materials and energy through a restorative system. In a circular economy, the value of products and materials is maintained for as long as possible. Waste is minimized and resources</p>

	are kept within the economy when a product has reached the end of its life, to be used again to create further value.
Resource Recovery and Circular Economy Act, p. 3, 2016. ON	<p>“circular economy” means an economy in which participants strive,</p> <ul style="list-style-type: none"> (a) to minimize the use of raw materials, (b) to maximize the useful life of materials and other resources through resource recovery, and (c) to minimize waste generated at the end of life of products and packaging; (“économie circulaire”)
Turning Point, CCA/CAC. Expert panel on circular economy in Canada (p. xxix, 2021).	A systemic approach to production and consumption for living within planetary boundaries that conserves material resources, reduces energy and water use, and generates less waste and pollution.

C. Content Analysis

This section contains a pathway visualization of the document contents that have not been used in the text, such as content analysis text and visuals. A summary of the content tallied for Saskatchewan is in Table C.1.

Table C.1 Content analysis of SK documents (Dueck, 2023)

Shaffrin et al. Measures	Word	SASKATCHEWAN												Total/ word	Total/ measure
		2019	2013-2022	2022	2020	1978-2011	1986-2014	1990-2014	2002-2014	2010	2010-2018	2005	2018		
		1.1	1.2a	1.2b	1.3	1.4a	1.4b	1.4c	1.4d	1.4e	1.4f	1.5	1.6		
Objectives	goal	0	0	0	14	0	0	0	0	0	0	0	0	14	48
	target	0	0	3	9	0	0	0	0	0	0	0	0	12	
	objective	0	0	1	0	0	0	0	3	1	3	0	0	8	
	circular-economy	0	0	0	1	0	0	0	0	0	0	0	0	1	
	circularity	0	0	0	0	0	0	0	0	0	0	0	0	0	
	waste-reduction	0	0	0	13	0	0	0	0	0	0	0	0	13	
Scope	industry	0	1	0	5	0	36	0	24	33	33	0	0	132	524
	government	0	1	0	27	5	2	1	37	27	33	0	0	133	
	public	10	11	16	13	3	8	1	25	34	38	7	10	176	
	businesses	2	3	2	3	2	1	1	1	3	8	0	1	33	
	companies	0	0	0	2	7	0	0	0	0	0	0	0	9	
	organizations	0	2	10	13	3	0	0	6	3	4	0	0	41	
Integration	policy	2	1	2	3	2	0	0	2	1	1	0	2	16	692
	regulations	17	20	35	15	57	36	2	108	129	167	12	27	625	
	strategy	1	1	2	40	0	0	0	0	1	1	1	2	49	
	joined-up	0	0	0	0	0	0	0	0	0	0	0	0	0	
	coordination	0	0	0	1	1	0	0	0	0	0	0	0	2	
Budget	budget	0	0	0	0	0	0	0	0	0	0	0	0	0	212
	costs	1	5	1	9	0	5	0	26	30	30	1	1	109	
	expenditures	0	1	0	0	0	0	0	0	0	0	0	0	1	
	funding	2	6	3	5	17	0	0	2	19	19	2	2	77	
	fees	1	4	3	0	1	2	0	3	4	5	1	1	25	
Implementation	implement	0	1	2	15	2	0	0	0	3	4	0	0	27	138
	success	0	0	2	4	0	0	0	0	0	0	0	0	6	
	begin	0	0	0	0	0	0	0	0	0	0	0	0	0	
	start	0	0	0	0	0	0	0	0	0	0	0	0	0	
	enacted	0	0	0	0	4	0	0	2	8	8	0	0	22	
	revoked	0	0	0	0	0	1	0	1	1	1	0	0	4	
	repealed	0	1	2	0	11	7	1	18	20	16	0	3	79	
Monitoring	reports	6	7	5	6	4	3	33	40	67	72	6	6	255	700
	milestones	0	0	0	0	0	0	0	0	0	0	0	0	0	
	audit	1	1	3	1	2	0	0	0	7	11	1	1	28	
	permit	0	0	0	0	2	52	0	130	39	39	0	0	382	
	review	3	0	2	20	0	0	0	1	3	3	0	3	35	

Summing together the totals of each keyword occurrence per document produced a total keyword occurrence per Shaffrin et al. measure. These totals ranged significantly from 48 (objectives) to

700 (monitoring) text search results overall per measure (Figure C.1). The totals for the scope (524) and integration (692) were also quite high, whereas for the budget (212) and implementation (138) were lower.

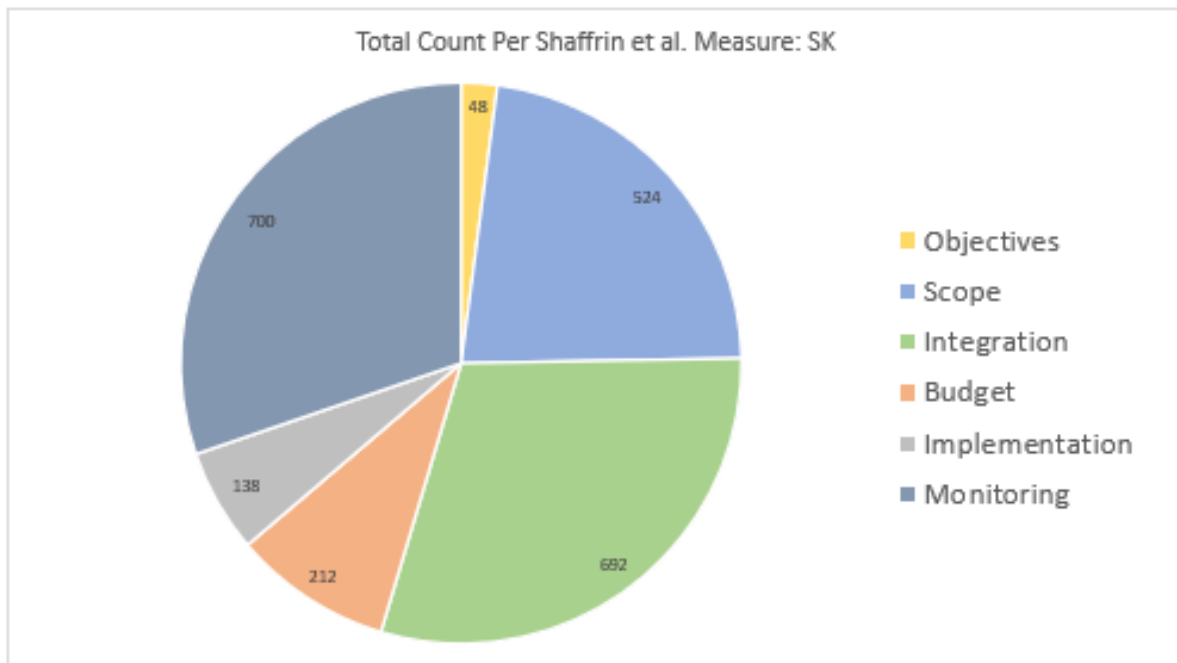


Fig. C.1 Content Analysis for SK in a Pie Chart

Breaking the content analysis down further, the keyword totals also varied from 0 ('circularity' in *Objectives*, 'joined-up' in *Integration*, 'budget' in *Budget*, 'begin' and 'start' in *Implementation*, and 'milestones' in *Monitoring*) to 625 ('regulations' in *Integration*) (Figure C.2). The most common keyword was 'regulations' in the *Integration* measure (625), followed by 'permit' (382) and 'reports' (255) within the *Monitoring* measure and their associated stemmed words. Within the other four Shaffrin et al. measures, other words that were used a lot were 'industry' (132), 'government' (133), and 'public' (176) from the *Scope* measure, and 'costs' from the *Budget* measure (109).

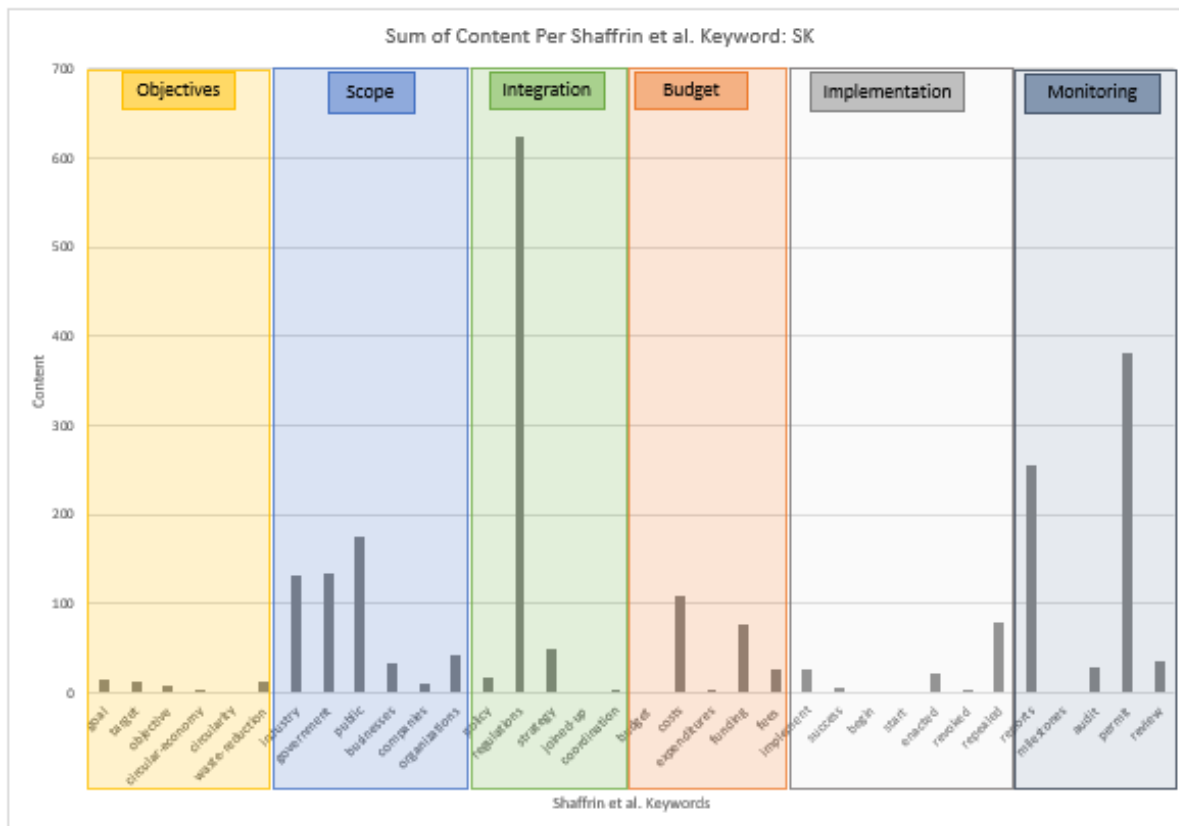


Fig. C.2 Summary of content per measure in SK documents

The document that contains the most content is 1.4f (556), followed by 1.4e (499) and 1.4d (429) (Figure C.3).

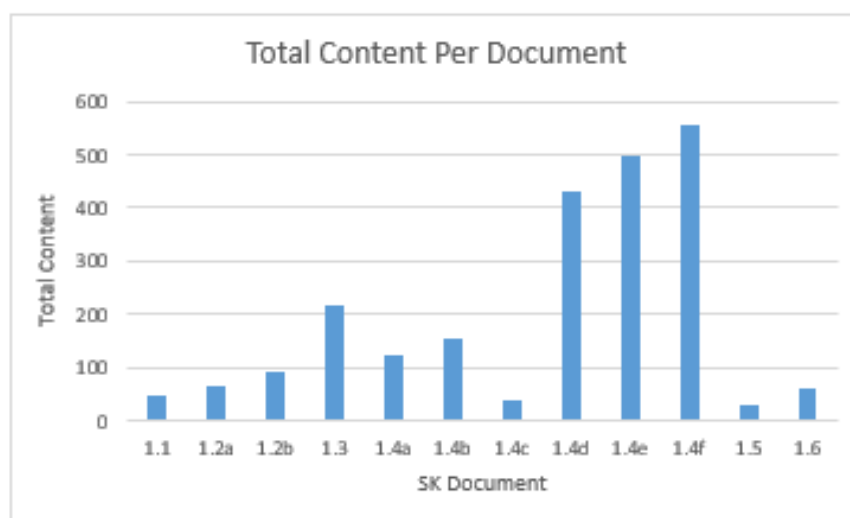


Fig. C.3 Content totals per SK document

Notably, the content analysis does not match the rank of scored measures for any measures except the *Objectives* measure which had the lowest content and score overall (Figure C.4). Document 1.3 (2020) was the only document to mention ‘circular economy’ (1) and ‘waste management’

(13) yet it only had a mid-range score of 4.5. Within the cluster 1.2, 1.2b is a significantly newer document (2022) compared to 1.2a (2013), however its very positive sentiment decreased (4 to 1) and the very negative sentiment increased (1 to 3). Even though this is the opposite to what we would expect, the proportion of positive to negative is quite similar between the two documents and they consistently remained positive (approximately 2:1). Document 1.4b, which scored the lowest of all the Saskatchewan documents, also contained the most very negative sentiment and negative sentiment overall. We see a reciprocal trend for the highest scoring document, 1.2b, that contains the most very positive sentiment and positive sentiment overall out of all the Saskatchewan documents. These results correlate with the content analysis, in which the objectives key words were mentioned the least number of times compared to the other five Shaffrin et al. measures. No documents failed to refer to other documents, which suggests that the provincial government has maintained consistency. This is also supported by the results of the content analysis as the integration key words had the second highest total/measure with 692. This is also supported by the results of the content analysis as the *monitoring* key words had the highest total/measure with 700. As could be expected, the documents that have been amended recently (1.2a and 1.2b in 2022) have scored the highest on average (4.75), whereas those that were last amended almost ten years ago (1.4a-e in 2010-2014) have scored the lowest on average (3.5). The highest scoring documents are the 1.2ab Household Packaging and Paper Stewardship Program Regulations which includes the blue bin recycling system that is very common and well-received in Saskatchewan.

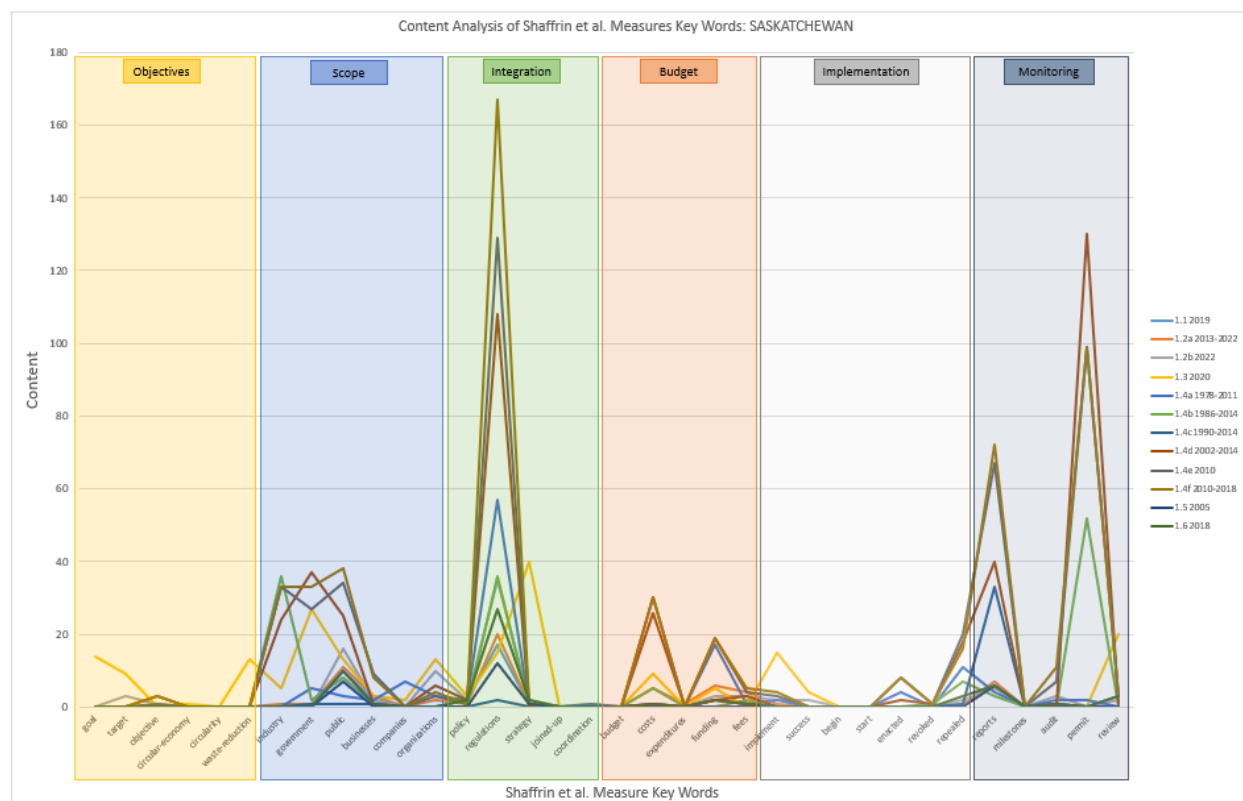


Fig. C.4 Content per measure for Saskatchewan

A summary of the content tallied for Ontario is in Table C.2.

Table C.2 Content in Ontario documents

		ONTARIO										Total/ word	Total/ measure
Shaffrin et al. Measure	Word	1990	2002	2002	2002	2002	2002	2002	2002	2016	2016	2017	
Objectives	goal	0	0	0	0	0	0	0	0	5	28	33	303
	target	0	0	0	0	0	0	0	0	4	9	13	
	objective	6	9	0	0	0	0	0	4	27	12	58	
	circular-economy	2	0	0	0	0	0	0	14	6	92	114	
	circularity	0	0	0	0	0	0	0	0	0	0	0	
	waste-reduction	0	0	0	0	0	0	0	0	42	43	85	
Scope	industry	93	64	2	3	2	5	2	165	0	41	377	1065
	government	3	6	0	0	0	0	0	13	29	20	71	
	public	17	20	0	0	0	1	0	22	53	26	139	
	businesses	42	8	0	0	0	0	0	7	17	25	99	
	companies	1	0	0	0	0	0	0	0	0	4	5	
	organizations	66	72	2	0	2	3	2	166	3	58	374	
Integration	policy	0	4	0	0	0	0	0	0	57	45	106	789
	regulations	214	48	17	9	9	8	3	82	155	56	601	
	strategy	0	0	0	0	0	0	0	0	24	43	67	
	joined-up	0	0	0	0	0	0	0	0	0	0	0	
Budget	coordination	0	0	0	0	0	0	0	0	1	14	15	521
	budget	0	0	0	0	0	0	0	0	0	0	0	
	costs	0	13	2	0	22	0	0	34	32	15	118	
	expenditures	0	0	0	0	0	0	0	0	0	1	1	
	funding	0	70	2	0	2	2	2	145	0	17	240	
Implementation	fees	3	25	23	4	45	0	0	31	31	0	162	247
	implement	5	18	0	0	0	0	0	22	10	65	120	
	success	0	0	0	0	0	0	0	0	0	11	11	
	begin	1	0	2	0	7	0	0	0	3	15	28	
	start	2	0	0	0	1	0	0	0	0	0	3	
	enacted	0	1	0	0	0	0	0	1	2	1	5	
	revoked	41	1	2	3	1	2	1	5	6	0	62	
	repealed	3	1	0	0	0	0	0	8	6	0	18	
Monitoring	reports	41	33	2	0	0	0	0	42	50	24	192	352
	milestones	0	0	0	0	0	0	0	0	0	0	0	
	audit	0	5	0	0	0	0	0	4	23	7	39	
	permit	36	0	1	0	0	0	0	7	7	1	52	
	review	1	5	0	0	0	0	0	4	44	15	69	

Content analysis results in Ontario varies from a total of 247 (*Implementation*) to 1065 (*Scope*). The *Objectives* (303) and *Monitoring* (352) measures consist of lower content, while *Budget* (521) and *Integration* (789) have much more (Figure C.5).

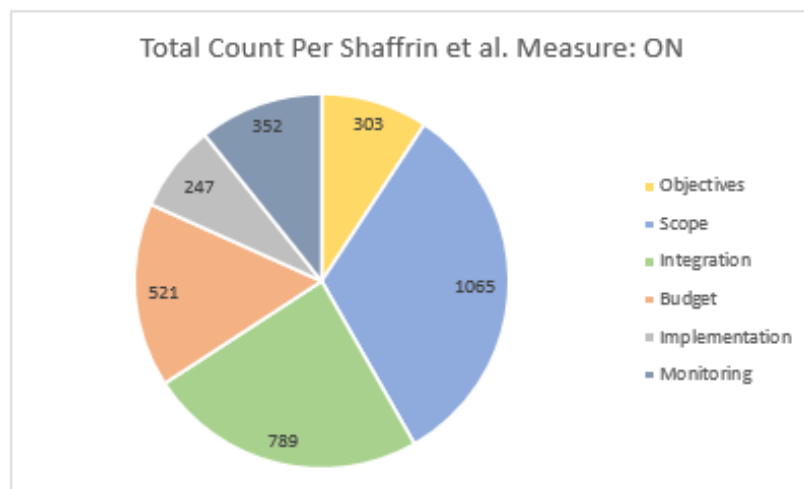


Fig. C.5 Pie chart of Ontario content

Looking at the keyword totals in more detail, they range from 0 (‘circularity’ in *Objectives*, ‘joined-up’ in *Integration*, ‘budget’ in *Budget*, and ‘milestones’ in *Monitoring*) to 601 (‘regulations’ in *Integration*) (see figure). The *Scope* measure had the second and third most occurring words, ‘industry’ (377) and ‘organizations’ (374). Other common keywords include ‘funding’ in *Budget* (240) and ‘reports’ in *Monitoring* (192) (Figure C.6).

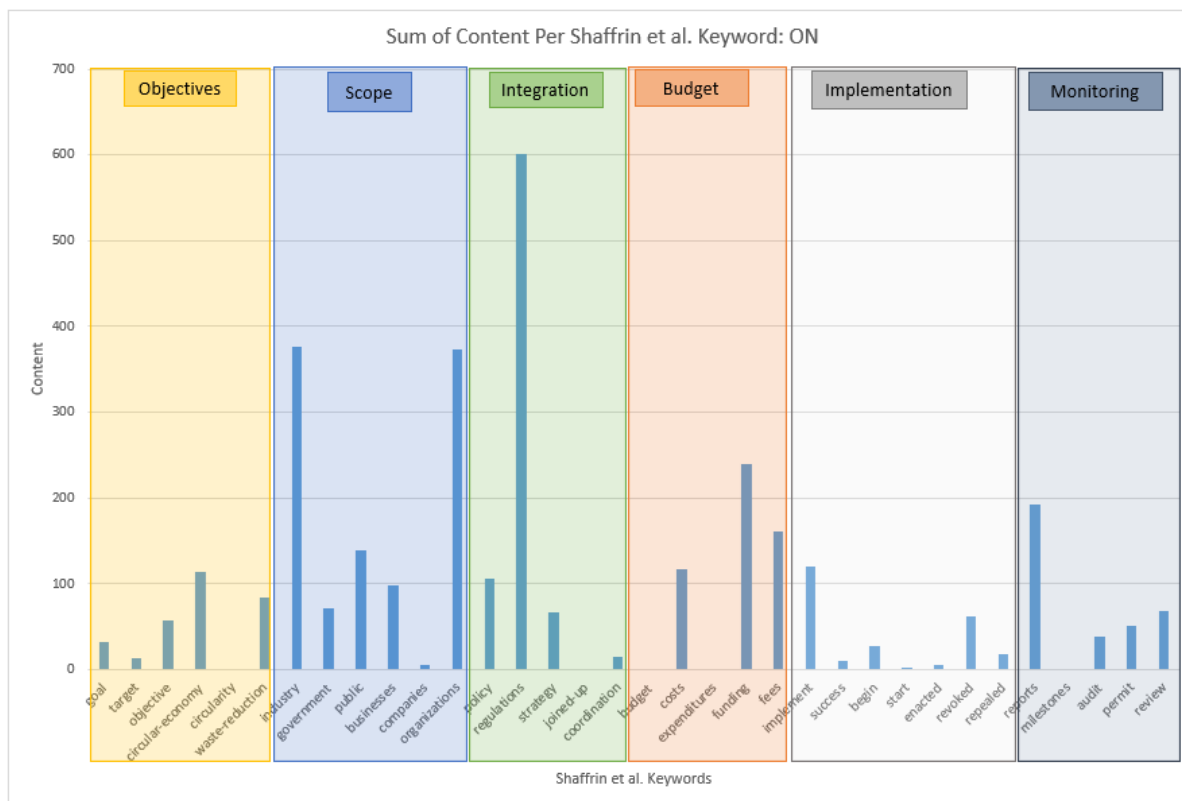


Fig. C.6 Content from ON documents per measure

Documents 2.2g, 2.1a, 2.1b, 2.3, and 2.2a contain much more content than 2.2b, 2.2c, 2.2d, 2.2e, and 2.2f (Figure C.7).

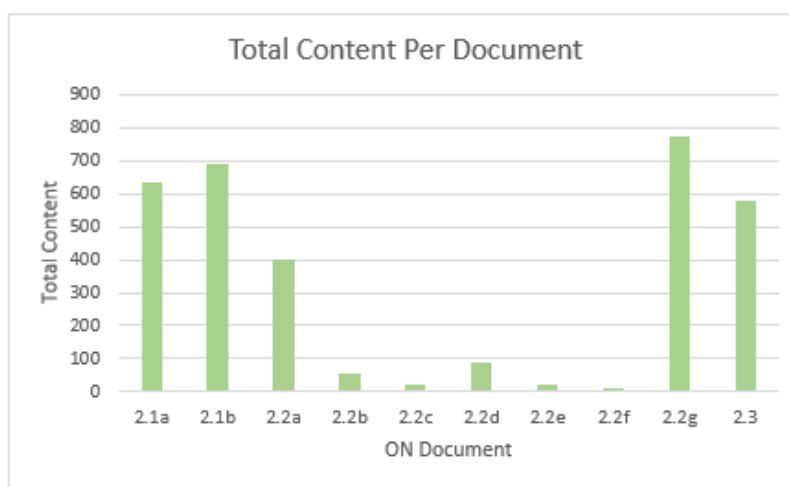


Fig. C.7 Content per ON document

A summary of the content tallied for Nova Scotia is in Table C.3.

Table C.3 Content in Nova Scotia documents

Shaffrin et al. Measure	Word	NOVA SCOTIA												Total/ word	Total/ measure
		1997	1997	1997	2007	2007	2010	2012	2014	2017	2019	2021	2022		
3.1a	3.1b	3.1c	3.3	3.5a	3.1d	3.5b	3.2	3.4a	3.5c	3.5d	3.4b				
Objectives	goal	0	0	0	0	29	0	31	35	13	16	52	3	179	304
	target	0	0	0	1	11	0	11	13	15	1	7	2	61	
	objective	2	1	0	1	3	1	7	12	9	3	6	2	47	
	circular-economy	0	0	0	0	0	0	0	0	0	3	4	0	7	
	circularity	0	0	0	0	0	0	0	0	0	0	0	0	0	
Scope	waste-reduction	0	0	0	0	0	0	0	0	5	0	0	5	10	657
	industry	6	4	7	0	1	0	1	27	13	0	0	21	80	
	government	0	0	0	0	15	0	16	41	73	9	25	2	181	
	public	1	0	1	0	5	1	6	10	39	2	3	19	87	
	businesses	0	0	0	2	0	0	0	114	8	1	10	4	139	
	companies	0	6	0	3	0	3	0	53	0	0	0	1	66	
	organizations	23	5	6	1	0	11	0	27	17	1	1	12	104	
Integration	policy	0	0	0	13	2	2	2	24	28	0	2	1	74	763
	regulations	6	6	8	9	25	3	27	47	286	16	11	152	596	
	strategy	1	1	1	0	3	0	5	61	9	0	3	2	86	
	joined-up	0	0	0	0	0	0	0	0	0	0	0	0	0	
	coordination	0	0	0	0	0	0	0	7	0	0	0	0	7	
Budget	budget	0	1	0	0	0	0	0	0	0	0	0	0	1	277
	costs	0	0	0	0	0	1	0	38	46	0	0	4	89	
	expenditures	0	0	0	0	0	0	0	0	0	0	0	8	8	
	funding	0	0	0	2	2	0	2	43	37	6	9	53	154	
	fees	0	0	0	0	1	0	1	13	0	0	0	3	25	
Implementation	implement	4	2	0	2	3	0	10	19	9	0	3	17	69	184
	success	0	2	0	0	0	0	0	15	0	0	0	0	17	
	begin	0	1	0	0	0	0	0	2	0	0	0	0	3	
	start	0	3	0	0	0	0	0	2	0	0	2	0	7	
	enacted	0	0	0	0	1	0	1	1	20	1	0	0	24	
	revoked	0	0	0	0	0	0	0	0	5	0	0	1	6	
	repealed	0	0	0	0	0	0	0	33	1	6	18	58	58	
Monitoring	reports	9	13	9	0	7	0	9	25	103	4	8	26	213	356
	milestones	0	0	0	0	0	0	0	0	0	0	0	0	0	
	audit	0	0	0	0	0	0	0	2	5	0	0	16	23	
	permit	1	2	0	0	0	1	0	0	18	0	0	4	26	
	review	2	1	0	1	3	1	5	8	60	1	8	4	94	

Notes:

- **Content Analysis:** Integration > scope > monitoring > objectives > budget > implementation (NS)
- **Scorecard:** Integration > scope > objectives > monitoring > implementation > budget
- 2/12 documents have mentions of circular economy

D. Sentiment Analysis

This section contains figures used to visualize sentiment analysis that are not included in the text. The pie charts are another way to illustrate and compare the positive and negative sentiment in each document (Figures D.1-D.9).

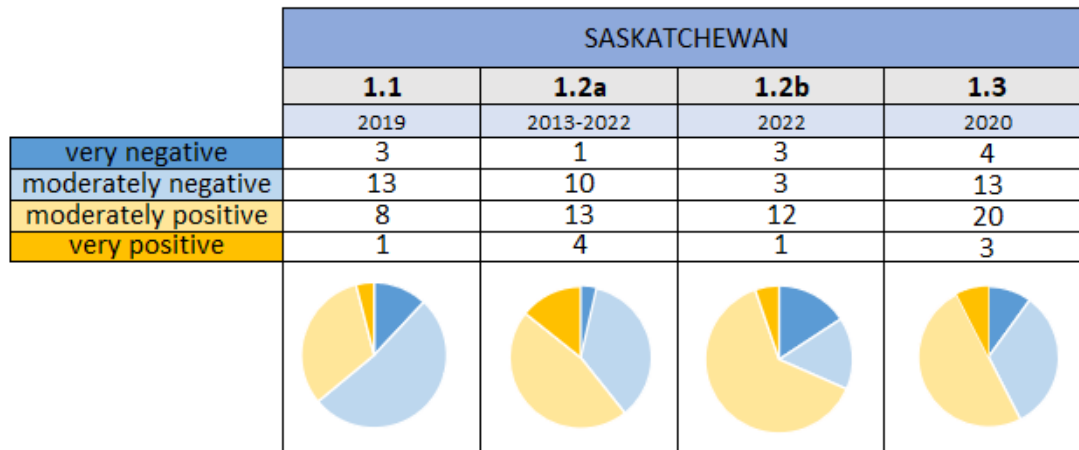


Fig. D.1 Sentiment analysis of SK documents 1.1, 1.2a, 1.2b, and 1.3

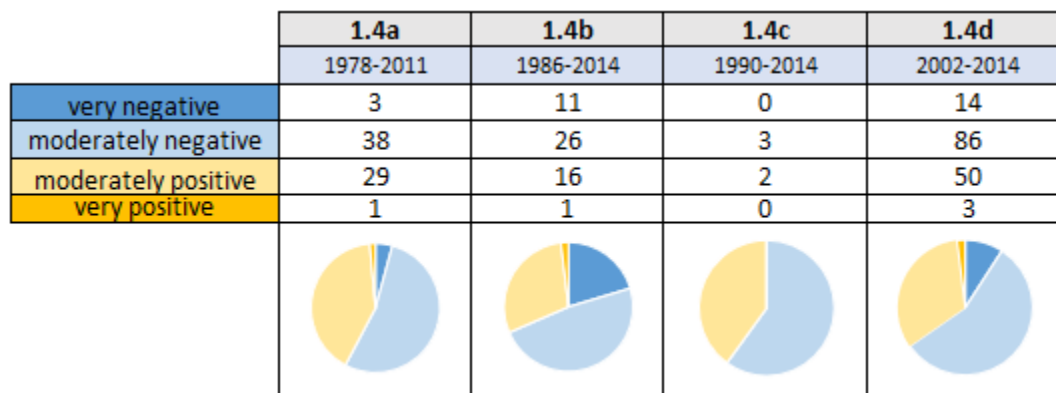


Fig. D.2 Sentiment analysis of SK documents 1.4a, 1.4b, 1.4c, and 1.4d

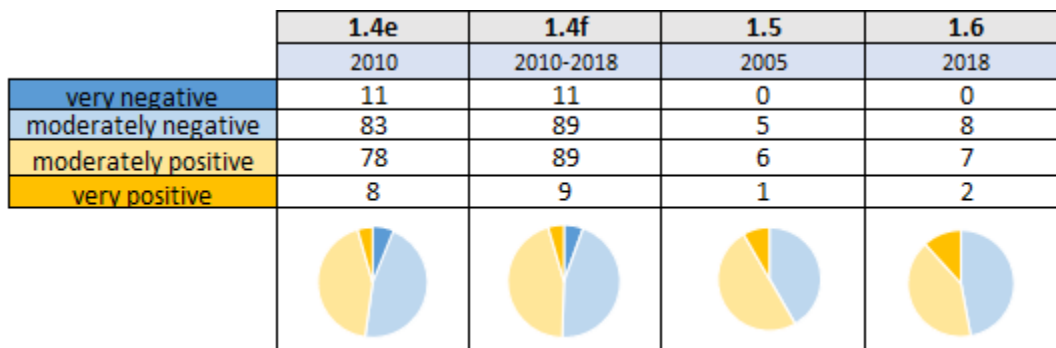


Fig. D.3 Sentiment analysis of SK documents 1.4e, 1.4f, 1.5, and 1.6

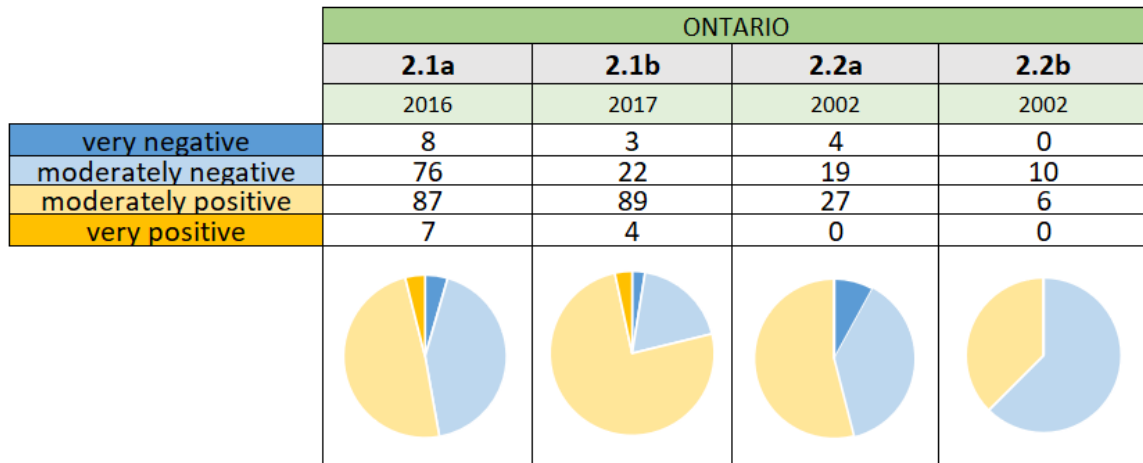


Fig. D.4 Sentiment analysis of ON documents 2.1a, 2.1b, 2.2a, and 2.2b

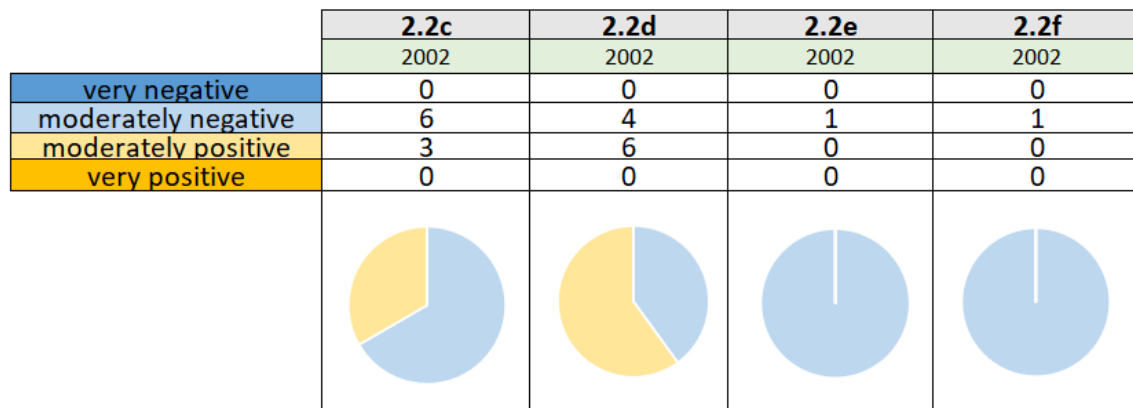


Fig. D.5 Sentiment analysis of ON documents 2.2c, 2.2d, 2.2e, and 2.2f

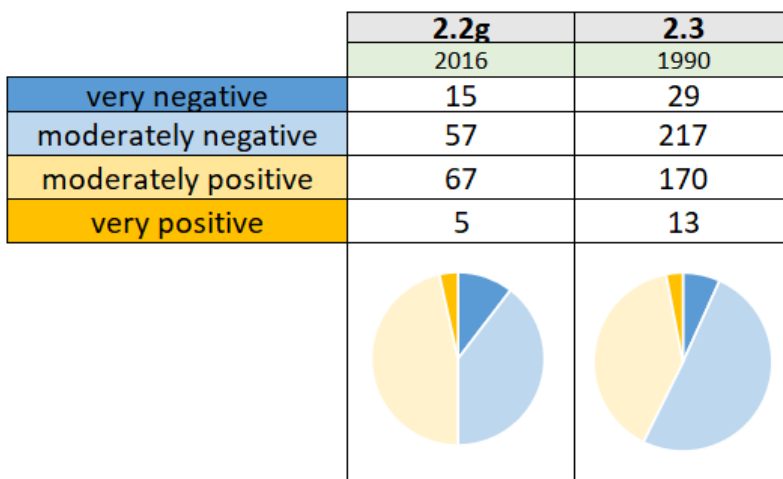


Fig. D.6 Sentiment analysis of ON documents 2.2g and 2.3

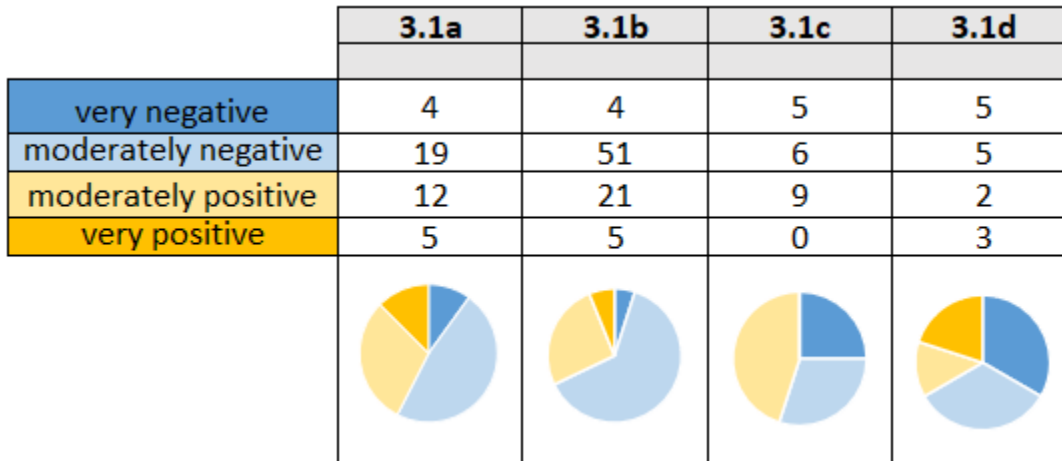


Fig. D.7 Sentiment analysis of NS documents 3.1a, 3.1b, 3.1c, and 3.1d

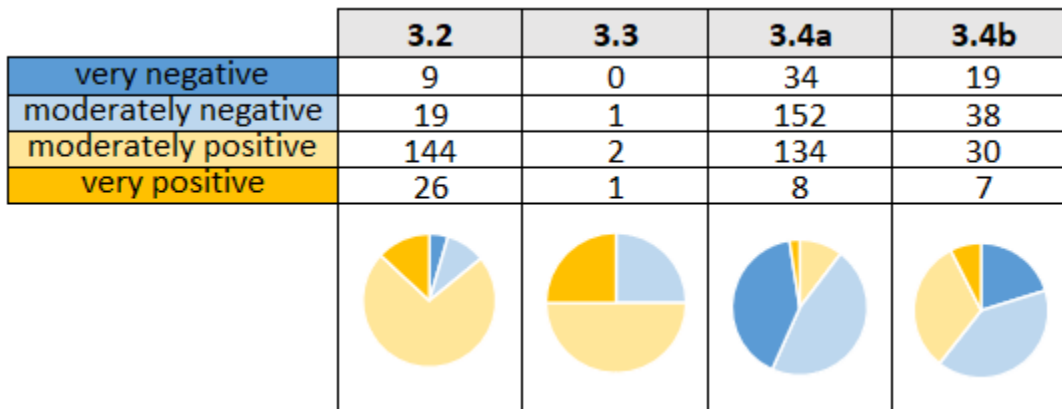


Fig. D.8 Sentiment analysis of NS documents 3.2, 3.3, 3.4a, and 3.4b

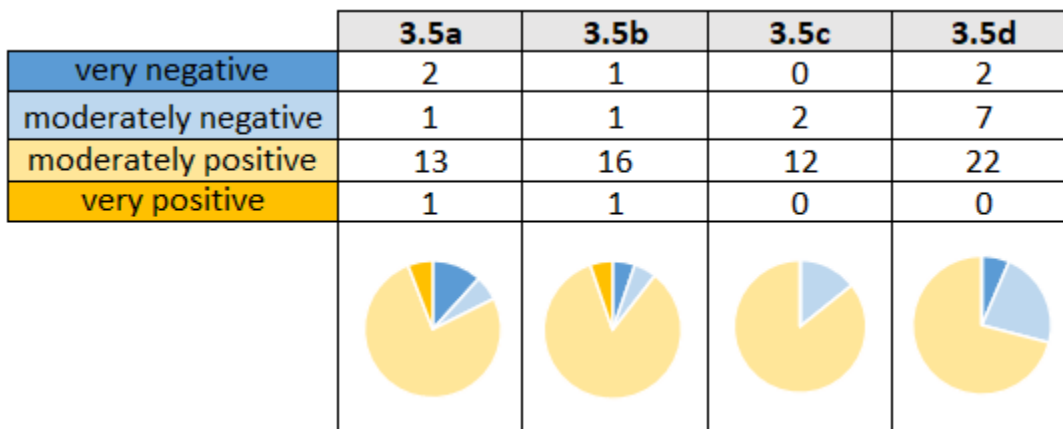


Fig. D.9 Sentiment analysis of NS documents 3.5a, 3.5b, 3.5c, and 3.5d