

Influential Factors and Interventions to Increase Recycling Behaviours:
A Program Evaluation of the Niagara Region's Residential Curbside Recycling Program

By

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Dedications

I dedicate this MRP to my dad, Bailey. I did it! Thank you for your constant love and support. Happy Birthday.

Abstract

Solid waste generation is continuing to increase both globally, and in our own municipalities here in Ontario, which is contributing to negative environmental impacts. Recycling is one effective way of diverting waste, but the recycling rates for many municipal recycling programs in Ontario, including the Niagara Region's, are levelling off. The purpose of this study was to examine recycling as a pro-environmental behaviour, in order to better understand how recycling rates could be increased in the Niagara Region. A program evaluation was conducted to see if, and to what extent, the region used effective interventions to promote recycling from 2016 to 2021. Based on the content analysis of 128 materials produced by the region, it was ultimately found that the region's program has been designed in a way that is likely to lead to limited effectiveness. Several recommendations for the Niagara Region, as well as for future recycling research are included.

Keywords: Pro-environmental, waste, diversion, blue box, municipal

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Nothing is more true than saying that completing this MRP has been a challenging, emotional rollercoaster of ups and downs. Starting this journey in 2018, I was full of passion and excitement, and wanted to create something that could make a positive difference in the world, however small. Also from the very beginning, I struggled. I struggled to narrow my topic, conceptualize my approach, and find my way through vast bodies of literature that seemed impossible to navigate. I went down plenty of rabbit holes and feared I would never find my way out. I battled procrastination, feelings of hopelessness, and my own mind. I would make positive strides only to fall behind, and this cycle played out several times. It was terrifying and discouraging, but there were also moments of joy, happiness, and praise. Moments of success where I could be proud of my accomplishments. I managed to push through and come out on the other side, and I am so proud of myself for meeting this major milestone.

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1.0 Introduction

In 2016, 2.01 billion tonnes of municipal solid waste were generated globally, and with waste generation continuing to increase both globally and locally at unsustainable rates, this number is expected to reach 3.40 billion tonnes by 2050 (Kaza et al., 2018). While improvements have been made to waste management systems and technologies over time (Kaza et al., 2018), the generation and accumulation of solid waste continues to contribute to the pollution and degradation of our waters, soils, and air (UN Environment, 2019). Solid waste produces significant levels of methane, metals, and persistent organic pollutants, harms local flora and fauna, exacerbates problems in marine habitats, transmits diseases through breeding vectors, increases respiratory problems by being burned, clogs drains and increases flooding, decreases tourism, and dirties our communities (UN Environment, 2019). Therefore, it remains an urgent problem that “requires urgent action at all levels of society” (Kaza et al., 2018, p. 1).

While it is important to prioritize the reduction of global waste production, we must also prioritize the proper management of existing and future waste, since it is unrealistic to expect that waste generation will decrease to a sustainable level in the short-term, as global waste generation is projected to continue to grow in the next ten years, with growth being especially high in low and middle-income countries (Kaza et al., 2018). One important way to manage solid waste is through recycling, and evidence shows us that there is still a lot of room for improvement when it comes to recycling solid waste (eg. Niagara Region, 2019; Kaza et al., 2018; Statistics Canada, 2018). While 99.7% of waste in North America is collected, only 33% is recycled, as the majority either ends up being incinerated or sent to landfills (Kaza et al., 2018). Faring slightly better than the North American average, 37% of generated waste in Canada was diverted in the most recently reported year (Statistics Canada, 2018; Statistics Canada, 2020).

While scientific and technological innovations can be used to address some of the negative impacts associated with waste generation and low levels of recycling, since the phenomenon is human-driven, it is more effective to focus on understanding and

changing the behaviours that are driving these problems in the first place (Steg & Vlek, 2009). Although other behaviours may have more potential to reduce environmental impacts than recycling (Gardner & Stern, 2008; Lacroix, 2018; Tukker & Jansen, 2006), recycling is one of the most commonly engaged in pro-environmental behaviours (Tabi, 2013) and also one of the easiest to modify (Nisa et al., 2019). Additionally, there is some evidence to suggest that recycling can trigger other environmentally significant behaviours (Tabi, 2013; Thøgersen, 1999). Furthermore, positive environmental change can result from behaviours such as recycling if the behaviours are widespread (Larson et al., 2015). Therefore, it is important to understand why people recycle and what factors influence recycling behaviours, since this information can be used as a basis for evaluating the design of recycling programs, with the intention of ultimately increasing recycling rates and reducing the impacts of solid waste generation.

There is still a need for improved diversion rates of solid waste from both residential and non-residential sources across Ontario, as the latest diversion data shows that only about 35% of total generated waste was diverted in 2016 (Statistics Canada, 2018; Statistics Canada, 2020). While it is also essential to address non-residential waste diversion since only 20% was diverted compared to the almost 58% of residential waste diverted, there is still a lot of room for improvement in residential waste diversion, despite widespread curbside recycling programs in municipalities across Ontario (Statistics Canada, 2018; Statistics Canada, 2020). In order to help improve diversion rates in one of these communities, the proposed research focuses on the Niagara Region.

While the Niagara Region increased its solid waste diversion by 19% between 2003 and 2017, and achieved a 57% residential diversion rate in 2017, the diversion rate has levelled off, and there is still a lot of room for improvement (Niagara Region, 2019). The most recent data shows that the Niagara Region produced 201,273 tonnes of solid residential waste in 2017, and has generated the second most solid residential waste per capita since 2012 compared to eleven other urban-regional and large urban cities in Ontario with a population over 250,000 (Niagara Region, 2019). The Niagara Region

recognizes that their solid waste diversion rate has levelled off, and is actively making changes in order to “reduce the amount of recyclables and organic waste going into [its] landfills,” most notably by making changes to their new collection contract that came into effect October 19, 2020 (Niagara Region, n.d.-a, para. 1). Perhaps the most important change in the contract is that solid waste is now being collected biweekly rather than weekly, with recycling still being collected weekly, in an attempt to increase recycling. A communication campaign took place during the summer of 2020 and continued into the fall in order to help people adapt to the new procedures (Niagara Region, n.d.-b). In making these changes to the curbside recycling program, the Niagara Region is hoping to increase participation in the program (Niagara Region, n.d.-a).

The potential for improvement in recycling makes the Niagara Region a good candidate for a program evaluation, because it presents an opportunity to determine why the recycling program’s effectiveness is stalling and what things can be done to improve its recycling rates. Additionally, the Niagara Region is clearly committed to making changes to their diversion programs in order to increase recycling, and so the results of an independent program evaluation are more likely to be utilized and incorporated by this municipality compared to others. As a final reason for conducting a program evaluation of the Niagara Region’s recycling program, since the region is currently putting great effort and funds into making changes to their diversion programs through the new contract, it is a relevant time to assess the region’s waste management efforts, including these new changes, to see if they align with what the literature tells us are the factors that influence recycling and the effective interventions for increasing recycling. This will allow me to provide useful feedback on the effectiveness of their current efforts and make suggestions for the future of the recycling program.

1.1 Purpose and Objectives

The purpose of this study is to examine recycling as a pro-environmental behaviour, in order to better understand how recycling rates can be increased in the Niagara Region.

Objective a) *Use my findings from the literature review on factors that are associated with influencing recycling and the effective interventions that promote recycling behaviours to develop a framework for evaluating the Niagara Region's residential curbside recycling program.*

Objective b) *Use the framework developed in Objective a) to evaluate the Niagara Region's residential curbside recycling program to see if, and to what extent, they have designed the program in a way that will increase recycling.*

1.2 Document Structure

This document will consist of a summary of the literature in the following topic areas: Factors associated with influencing pro-environmental behaviour, factors associated with influencing recycling, effective interventions for increasing pro-environmental behaviour, and effective interventions for increasing recycling. Section 2 will be followed by a methodology in Section 3 where I will describe the methods being used, outline my data collection process, and describe how the data was analyzed. In Section 4, I will present my results, and then elaborate and discuss the implications and meanings of these results in Section 5. I will briefly remind readers of my purpose, methods, and results, as well as provide recommendations for the Niagara Region and future recycling research in Section 6. Finally, I will conclude with a list of references for the sources used in Section 7, and include my coding manual and schedule in the appendices of Section 8.

2.0 Literature Review

There is a large and varied body of well-documented and reviewed literature that focuses on understanding and promoting pro-environmental behaviour (Kollmuss & Agyeman, 2002; Larson et al., 2015; Steg & Vlek, 2009), and this is the body of literature that I have situated my study within. Pro-environmental behaviour (PEB) has been studied in many different ways with different definitions and under different terms

(Larson et al., 2015), but in this study is defined as a “range of behaviors that benefit the natural environment, enhance environmental quality, or harm the environment as little as possible” (Larson et al., 2015, p. 113). While a great deal of the literature on PEB consists of studies trying to identify factors associated with influencing general PEB, there has also been work done to understand which factors lead to specific PEBs, with the most research being conducted on understanding private sphere conservation lifestyle behaviours including recycling, waste reduction, water conservation, energy conservation, sustainable transportation, and green purchasing (Ertz et al., 2016; Larson et al., 2015). There is also a subset of research that focuses on identifying and testing effective intervention strategies for increasing PEB, and specifically, strategies for increasing recycling behaviours.

While I am specifically interested in the two sub-areas of this literature that focus on understanding how to increase recycling, because studies on recycling largely draw upon prominent findings and models from the more general pro-environmental behaviour literature (Geiger et al., 2019), I first review some of these important findings from this larger body of literature in Section 2.1 in order to provide important context for understanding how to increase recycling. I then review the specific set of literature that looks at factors that influence recycling in Section 2.2, followed by a summary of interventions that are effective at increasing PEB, included for contextual purposes in Section 2.3. Finally, I review interventions that are effective at increasing recycling behaviours in Section 2.4. The findings are later used to develop a framework for evaluating the Niagara Region’s residential curbside recycling program, thereby meeting Objective a).

2.1 Factors Associated with Influencing Pro-Environmental Behaviour

Overall, researchers agree that increasing PEB is an effective means of protecting the natural environment from harmful human actions (De Groot & Steg, 2007; De Groot et al., 2008; Gatersleben et al., 2014; Larson et al., 2015; Nav et al., 2013; Steg & Vlek, 2009; Stern, 2000). Since most environmental problems are caused by human behaviour

to begin with, it makes sense that these harmful impacts can be minimized by changing these behaviours (Steg & Vlek, 2009). While technology and innovation can offer some solutions to environmental issues, societies based on excessive consumption on a planet with limited resources means that making technical changes will not be a sufficient solution on its own (Steg & Gifford, 2005; Steg & Vlek, 2009). Additionally, since technical changes require buy-in from humans, it is vital that human behaviours are understood and changed to reflect an increase of PEBs (Steg & Vlek, 2009).

With this goal in mind, starting in the 1970's and continuing on into the present, there has been a great deal of work done on identifying general patterns and factors associated with influencing PEB (Kollmuss & Agyeman, 2002; Larson et al., 2015; Steg & Vlek, 2009). Most of the original models framed PEB as a linear linkage between environmental knowledge, pro-environmental attitudes, and behaviours, operating under the assumption that behaviour could be changed simply by educating people (Kollmuss & Agyeman, 2002). This was proven to be false, as the interactions between knowledge, attitude, and behaviour have been found to be more complex (Heberlein, 2012). While knowledge can influence attitudes, attitudes are also shaped by other factors including beliefs, values, and norms (Akenji, 2014), and while having positive environmental attitudes can make someone more likely to consider sustainable solutions and changes with an open mind, there are also many other variables that determine whether or not PEBs are engaged in (Akenji, 2014; Heberlein, 2012).

Many models, frameworks, and approaches have since been used to understand the factors that influence PEB, but three important frameworks include the Theory of Planned Behaviour (Ajzen, 1991), the Norm Activation Model (Schwartz, 1977), and the Value-Belief-Norm Theory (Stern et al., 1999; Stern, 2000). The Theory of Planned Behaviour postulates that intentions to engage in behaviours are explained by the attitude toward the behaviour, social norms, and perceived behavioural control, and that intentions along with perceived behavioural control explain a lot of the variance in behaviour (Ajzen, 1991). The theory has been shown to be good at explaining specific intentional individual-level behaviours, especially those motivated by self-interest

(Bamberg & Moser, 2007) or that are associated with high costs or constraints (Steg & Vlek, 2009). The Norm Activation Model was developed to explain behaviours that are morally motivated and has been shown to be good at explaining pro-socially motivated behaviours (Bamberg & Moser, 2007). Finally, the Value-Belief-Norm Theory was developed by combining Schwartz' work on values (1992, 1994) and norms (1973, 1977) in order to better explain attitude formation (Stern et al., 1995). Both the Norm Activation Model and Value-Belief-Norm Theory have been shown to be good at explaining low cost behaviours and intentions to behave (Steg & Vlek, 2009).

While the Theory of Planned Behaviour, Norm Activation Model, and Value-Belief-Norm Theory are important for explaining parts of PEB in certain contexts, PEB is multidimensional and complex, and so no one model is sufficient for fully explaining the wide range of PEBs (Kollmuss & Agyeman, 2002; Larson et al., 2015). Many studies have taken the different variables within these models and attempted to better understand the interactions between them in different contexts (eg. Bamberg & Moser, 2007; Kaiser & Gutscher, 2003; Steg et al., 2011). This has led to the finding that there are many important factors, determinants, and correlates of PEB, including problem awareness (Bamberg & Moser, 2007), attitudes (Kaiser & Gutscher, 2003), environmental concern (Dunlap et al., 2000), social and personal norms (Bamberg & Moser, 2007; Kaiser & Gutscher, 2003), values (De Groot & Steg, 2007; De Groot et al., 2008; Steg et al., 2011; Van Riper et al., 2019), identity (Gatersleben et al., 2014; Landon et al., 2018; Stryker & Burke, 2000), perceived behavioural control (Ajzen, 1991), and ascription of responsibility (Bamberg & Moser, 2007). While these models and most of the studies focus primarily on individual motivational factors associated with influencing PEB, many researchers have shown that contextual and socio-demographic determinants that facilitate or constrain behaviours (Steg & Vlek, 2009) also play an important role in the activation of PEB (eg. Akenji, 2014; Ertz et al., 2016; Hadler & Haller, 2011; Kollmuss & Agyeman, 2002; Köhl et al., 2009; Larson et al., 2015; Nav et al., 2013; Pirani & Secondi, 2011; Steg & Vlek, 2009).

2.2 Factors Associated with Influencing Recycling

While many studies have focused on PEB as a unitary concept, it has become clear that PEB is multidimensional and complex, and that people do not engage in all PEBs to the same extent (Larson et al., 2015; Steg & Vlek, 2009). Because behaviours require varying levels of effort to complete due to situational and sociocultural barriers (Kaiser, 1998), to some extent, the factors driving PEB depend on the specific behaviour in question. Therefore, if the ultimate goal is to understand and promote pro-environmental behaviours, it is most effective to focus on a specific behaviour or set of related behaviours and then identify the associated and underlying factors (Steg & Vlek, 2009).

When selecting a behaviour to target for behavioural change, it is important to choose one that has significant positive impacts on the environment, but that is also feasible to change and is viewed as having acceptable outcomes by the public (Steg & Vlek, 2009). Many studies from all over the world have focused on understanding and explaining individual-level recycling behaviours because it is a relatively simple behaviour that is economically feasible and easy to engage in (Huffman et al., 2014). The research on recycling has evolved multiple times since its beginnings in the early 1970's (Miafodzyeva & Brandt, 2013).

From around 1970 to 1980, researchers tended to focus on identifying the socio-demographic factors and economic incentives that predicted recycling behaviours. The second phase lasting from about 1980 to 1993 consisted of researchers focusing on social and psychological determinants, as they were seen as the key to making long-term changes to behaviours. From the 1990's onwards, studies have continued to try and determine relevant determinants of recycling by testing a diverse set of variables in different contexts, with the variables of focus depending on the discipline and theoretical approach taken by the researchers (Miafodzyeva & Brandt, 2013).

The majority of studies on recycling either consider individual motivational, socio-demographic, or other contextual factors associated with recycling, and while some studies may combine factors from two of these categories, relatively few combine variables from all three areas (Miafodzyeva & Brandt, 2013). Of these three areas,

individual motivational factors are most commonly studied, with most of the variables being drawn from important theories within the general PEB literature (Geiger et al., 2019), particularly from the Theory of Planned Behaviour (Culiberg, 2014). Many studies use the Theory of Planned Behaviour by adding variables to the original model and testing how well the various variables predict recycling behaviours (Botetzagias et al., 2015). The framework has been shown to be better at explaining specific behaviours such as recycling compared to general behaviours (Kaiser & Gutscher, 2003), and adapted models have been found to explain anywhere from 20% to 40% of recycling intentions (Al Mamun et al., 2018; Botetzagias et al., 2015; Mannetti et al., 2004).

While models based on the Theory of Planned Behaviour partially explain recycling behaviours, it has been argued that the choice to engage in recycling is not simply based on a rational consideration of individual benefits and consequences, but rather, is based on morality (Culiberg, 2014; Thøgersen, 1996). While fewer studies approach recycling with an ethical perspective, recycling is a moral issue since it has consequences for others, individuals have control over the behaviour, and the decision to act is ethically relevant for others (Culiberg, 2014). Moral norms were initially included in the Theory of Planned Behaviour but were removed due to concerns that they were too closely correlated with intention (Botetzagias et al., 2015). One of the most common criticisms of the theory is that it excludes moral norms, but there still remains uncertainty as to whether moral norms have direct or indirect effects on recycling behaviours (Botetzagias et al., 2015).

Botetzagias et al. (2015) found moral norms to be the second most important predictor of recycling after perceived behavioural control, with moral norms having a direct effect on recycling intentions, and Culiberg (2014) found moral obligation to be a direct predictor of recycling intention, and also that moral intensity has an indirect effect on intentions through attitudes. It is also suggested that moral norms can become more important than social norms by the latter being internalized into moral norms (Schwartz, 1977). Other important individual motivational variables that have been

shown to be important predictors of recycling include recycling identity and past recycling behaviour (Geiger et al., 2019; Mannetti et al., 2004).

While there has been a great deal of focus on individual motivational predictors, there has been less focus on socio-demographic predictors of recycling, and even fewer studies considering the interactions between socio-demographic and individual motivational factors, such as those within the Theory of Planned Behaviour (Botetzagias et al. 2015). The most common socio-demographic factors considered in studies are age, income, education level, gender, and dwelling type (Miafodzyeva & Brandt, 2013). While certain socio-demographic variables such as income, type of house, house ownership, age, education level, and place of residence have been shown to be predictors of recycling (Ebreo & Vining, 2001; Geiger et al., 2019; López-Mosquera et al., 2015; Miafodzyeva & Brandt, 2013; Taberner et al., 2015), the results of these studies are often ambiguous, and overall, it appears that these factors are only weakly correlated to recycling behaviour (Miafodzyeva & Brandt, 2013). In addition to socio-demographic factors, some work has been done on identifying important external or contextual predictors of recycling. There is some evidence that the number of inhabitants in a city (Taberner, et al., 2015), the possession of a recycling bin (Geiger et al., 2019), and the convenience of the recycling facility (Miafodzyeva & Brandt, 2013) significantly affect recycling behaviours.

While the literature supports the existence of multiple important factors that influence recycling behaviours, it is difficult to know how to increase recycling simply by understanding the factors that have an influence on it. Because socio-demographic factors have been found to have minimal effects on recycling compared to other individual motivational and contextual factors, these types of factors are not very helpful in understanding how to increase recycling (Miafodzyeva & Brandt, 2013). While several individual motivational factors have been found to have significant effects on increasing recycling, in many cases, the overall findings are ambiguous due to studies using different variables, approaches, and methodologies, which means that researchers are still trying to determine how, and to what extent, these factors influence recycling

across different contexts, and what the effects of interactions between these factors are (Geiger et al., 2019; Hornik et al., 1995; Miafodzyeva & Brandt, 2013). These often incomplete and conflicting findings imply that the relationship between recycling and the factors that lead to them is complex, and therefore, it is challenging to know the relative importance of each factor (Geiger et al., 2019; Hornik et al., 1995; Miafodzyeva & Brandt, 2013).

It has also been argued that the “question of what shapes pro-environmental behavior is such a complex one that it cannot be visualized in one single framework or diagram” and that any attempt to would be so “complicated that it would lose its practicality and probably even its meaning” (Kollmuss & Agyeman, 2002, p. 48), and this holds true for recycling as well, as it is a complex and diverse pro-environmental behaviour (Miafodzyeva & Brandt, 2013). Furthermore, while the literature has shown us that many of these individual motivational factors are important for recycling, there is still a lot of uncertainty as to how these factors can be utilized or changed in order to increase pro-environmental behaviours including recycling (eg. Heberlein, 2012; Horcea-Milcu et al., 2019). For many of these factors, there are entirely separate bodies of literature that are focused on answering these types of questions, and the findings are often complex and ambiguous, and some studies argue that it might not even be possible to purposefully shift factors such as values or attitudes to cause behavioural change (eg. Manfredo et al., 2016).

Due to the limitations of using these factors to understand how to increase recycling, one alternative way of determining how to increase recycling is to take a more practical approach, by looking at the sub-area of PEB literature that focuses on determining and testing various effective interventions for increasing PEB, and in particular, recycling. Also referred to as strategies for behaviour change, behavioural intervention strategies, and treatments, interventions can be defined as the “employment of some type of behaviour modification technique aimed at increasing the incidence of a particular target behaviour” (Hines et al., 1987, p. 6). The research on interventions has mostly taken place in parallel, but separately, from the literature on

factors associated with recycling, as most studies on underlying determinants, factors, and correlates have not indicated effective interventions to change the behaviours, and most studies on interventions have not referenced theory or underlying factors (Varotto & Spagnoli, 2017).

Despite this unfortunate gap, behaviour change has been found to be more effective when interventions are matched carefully to a specific behaviour of interest (Osbaldiston & Schott, 2012; Schultz, 2014; Steg & Vlek, 2009), and so focusing on interventions is an effective way to understand how to increase recycling. Because the contextual factors that have been found to have significant effects on recycling are based on the external conditions in which people recycle, these important factors can still be utilized to increase recycling by drawing upon interventions that focus on making environmental alterations. Therefore, it makes sense to review the literature on effective interventions for increasing recycling, in order to better prepare myself to achieve my research objectives. Similarly to how the literature on underlying factors of recycling draws upon the findings and framings of the more general PEB literature on influential factors for increasing PEB, research on recycling interventions has evolved closely with the studies focusing on interventions for more general PEB. Therefore, I will summarize some key studies and findings from the general PEB intervention studies before reviewing the studies that specifically focus on interventions for increasing recycling.

2.3 Effective Interventions for Increasing Pro-Environmental Behaviour

The intervention literature relies heavily on experimental studies where at least one intervention is tested and compared to a control group in order to see the effect on a targeted behaviour (Osbaliston & Schott, 2012). By the late 1980's, a lot of research from several different academic perspectives had been conducted on factors that influence PEB, but there had been no attempts to make connections between the various factors (Hines et al., 1987). This gap in the PEB literature led to Hines et al. conducting a meta-analysis in 1987 in order to bring the multiple variables found to be

associated with PEB together to test which ones were the most important, with factors from 128 studies from the previous decade being assessed (Hines et al., 1987).

While this study focused most heavily on individual motivational factors and socio-demographic characteristics, the study does include one paragraph and table summarizing findings on the effectiveness of interventions, including appeals, Information, incentives, and feedback. Based on tests of correlation, the authors found that, overall, these interventions are effective at increasing general PEB (Hines et al., 1987). However, when looking at the correlations more closely, it is evident that while incentives and appeals have a moderate to strong relationship with PEB, information has a small relationship, and feedback with an extremely weak relationship with PEB. Furthermore, while they noted that most of the included studies on interventions focused on energy use and littering, the authors did not identify which studies were used, how they were chosen, or how the analysis was conducted, which limits the usefulness of the findings (Osbaldiston & Schott, 2012).

In 2012, Osbaldiston and Schott conducted an updated meta-analysis testing the findings of a newer set of studies, in order to come up with some significant findings on which interventions were most effective at promoting PEB. The authors identified ten interventions which they organized into the groups of convenience, which includes the interventions of making it easy and providing prompts, information, which includes justifications and instructions, monitoring, which includes feedback and rewards, and social-psychological processes, which includes social modelling, cognitive dissonance, commitment, and setting goals (Osbaldiston & Schott, 2012). While they found certain interventions to be more effective than others for promoting PEB, they also found that when looking at specific behaviours, there was not one intervention that was most effective for all types of behaviours. On the contrary, different interventions seemed to be more effective for different behaviours, and certain interventions were more effective when combined with other interventions (Osbaldiston & Schott, 2012).

There has also been some work done on developing frameworks that can be used to help choose effective interventions in particular times and cases. For example,

Schultz (2014) argues that community-based social marketing is an effective framework for promoting positive changes in a community. The framework includes the steps of identifying a target behaviour, identifying structural and personal barriers and benefits of the behaviour, developing a program that aims to reduce the barriers and increase the benefits, running a pilot test of the program on a small scale so that modifications can be made, and finally, implementing and evaluating the intervention program (Schultz, 2014). Schultz (2014) developed four combinations of benefits and barriers, and based on the meta-analysis by Osbaldiston and Schott (2012), hypothesized effective interventions for each case. While these interventions need to be tested further, this work serves as an important first step for knowing when to use particular interventions. Similarly, Chatterton and Wilson (2014) tested and refined the Four Dimensions of Behaviour (4DB) Framework, which identifies broad and diverse characterizations of behaviours as a starting point to find relevant models for understanding that behaviour and effective interventions for changing that behaviour. The model assumes that one behaviour can be described with multiple theoretical models, and that thinking about different ways to understand and frame the behaviour can help determine interventions that match the behaviour (Chatterton & Wilson, 2014).

2.4 Effective Interventions for Increasing Recycling

From 1970 to 1982, the literature on recycling interventions tended to focus on the effects of external incentives such as monetary rewards, as well as socio-demographic characteristics. Due to the criticism that recycling would stop once monetary incentives were removed, and because it is not feasible to provide monetary incentives for every targeted behaviour, the focus of research shifted. From 1982 to the mid 1990's, most researchers focused on ways to increase long-term recycling behaviours with social-psychological interventions and other external incentives (Hornik et al., 1995).

The earliest known quantitative assessment of recycling interventions, and the second meta-analysis considering interventions within the PEB literature as a whole,

was actually a meta-analysis focused on determining influential factors of recycling, conducted by Hornik, Cherian, Madansky, and Narayana in 1995 (Osbaldiston & Schott, 2012). Despite the fact that most research on interventions does not explicitly draw upon or make connections to the underlying factors that have been found to influence recycling, this study includes underlying individual motivational factors, contextual factors, socio-demographic factors, and a few intervention strategies, uncharacteristically framing and treating the interventions the same as the individual motivational and contextual factors. Analyzing the findings of 67 studies testing various influential factors for recycling, Hornik et al. (1995) categorized variables according to extrinsic and intrinsic incentives, and external and internal facilitators. People making a commitment to recycle was considered to be an internal facilitator, monetary rewards, social influences, prompts, raffles and contests were considered to be extrinsic incentives, and convenience-related interventions including container proximity, collection frequency, and material distribution were considered to be external facilitators (Hornik et al., 1995).

The authors found that perceived social influence, commitment, monetary incentives, and frequency of collection were significantly related to recycling, although with low positive correlations (Hornik et al., 1995). Interestingly, the authors briefly discuss how recycling can be achieved through either altruistic or utilitarian strategies, with “nearly all the variables explored” being able to “be arrayed along this altruistic-utilitarian dimension,” suggesting that incentives can be deployed as strategies, and facilitators enhanced in order to increase recycling (Hornik et al., 1995, p. 110). While this early study provides some initial insight into concepts that would later be referred to as interventions and expanded upon in the intervention literature, it is important to note that the term *intervention* is never used, and that the primary focus of the study is not on assessing interventions. Furthermore, the authors do not include a list of the studies they used, which makes it challenging to compare and interpret these results (Osbaldiston & Schott, 2012).

In Osbaldiston and Schott's 2012 meta-analysis on interventions that increase general PEB, they also tested some interventions specific to recycling and conserving energy, and found enough variance to justify separating public recycling, central recycling, and curbside recycling into mutually exclusive groups, with effective interventions varying across the three types of recycling (Osbaldiston & Schott, 2012). Interventions that were found to be the most effective at increasing curbside recycling include making it easier to recycle, providing rewards or incentives to participants, making use of cognitive dissonance by encouraging participants to behave in ways that are consistent with their preexisting beliefs or attitudes, and using social modelling to encourage people to recycle by demonstrating or sharing that the communicator also participates in the behaviour (Osbaldiston & Schott, 2012). Furthermore, it was found that certain combinations of interventions are more effective than others, and focusing on the two most effective interventions for increasing curbside recycling, providing prompts and rewards were found to go well with making it easy, while getting participants to make commitments and engage in goal setting were found to go well with rewards-based interventions (Osbaldiston & Schott, 2012).

Since then, there have been several studies testing the relative effectiveness of interventions for recycling, with varying findings about which interventions are most effective for promoting recycling. For example, it has been found that increased convenience can be quite effective at increasing recycling (DiGiacomo et al., 2018; Osbaldiston & Schott, 2012). There has also been a lot of research done on incentives and information, with studies finding that while both can be effective at increasing recycling, incentives tend to have a drastic and immediate effect, while information tends to have longer-lasting effects, as recycling can stop once incentives are removed (Iyer & Kashyap, 2007; Varotto & Spagnolli, 2017). However, other authors argue that incentives and information interventions are much less effective than other interventions based on commitments, social norms, changing defaults (Byerly et al., 2018), cognitive dissonance (Osbaldiston & Schott, 2012), social modelling (Osbaldiston

& Schott, 2012; Varotto & Spagnoli, 2017), and environmental alterations (Varotto & Spagnoli, 2017).

In 2017, Varotto and Spagnoli conducted an updated meta-analysis, comparing the relative importance of the recycling interventions researched in recent studies. Based on Osbaldiston and Schott's results (2012), Varotto and Spagnoli (2017) categorized recycling interventions into six types, based on the underlying persuasive strategy. These include prompts and information, feedback, commitment, incentives, environmental alterations, and social modelling. Social modelling was found to be the most effective at increasing recycling, having almost double the effect on recycling than the next most effective intervention, which is making environmental alterations (Varotto & Spagnoli, 2017).

Prompts and information interventions entail providing facts, persuasive information or reminders to targeted individuals either in person or through written mediums in order to encourage recycling. This information can either promote recycling or explain how, when, or why to recycle, and can include things like signs on recycling bins, brochures mailed out to residents, demonstrations, etc (Varotto & Spagnoli, 2017). The second category is feedback, which refers to providing residents with "information regarding their recycling behavior along with a comparison with a predefined standard" in order to motivate them to fill the gap (Varotto & Spagnoli, 2017, p. 171). This feedback can be provided through websites, social networking sites, newsletters, leaflets, and computer programs that send feedback through mobile phones or displays (Varotto & Spagnoli, 2017).

Commitment refers to interventions where individuals are encouraged to "commit to produce a certain behavior or reach a certain goal," and is believed to be effective because people want to maintain consistency (Varotto & Spagnoli, 2017, p. 172). The fourth category is incentives, and revolves around providing some sort of benefit to participants, whether it be money, rewards, gifts, prizes, coupons, discounts, etc. Environmental alterations is defined as "making recycling more convenient and easy to perform by modifying the physical environment" and can include modifications such

as providing bins or home equipment for sorting waste to residents, changing the bins' design or appearance, or decreasing the distance people have to bring their bins (Varotto & Spagnolli, 2017, p. 172).

The final category is social modelling, and is defined as “any kind of passing of information via demonstration or discussion in which the initiators indicate that they personally engage in the behavior, also” (Varotto & Spagnolli, 2017, p. 272). An example of this would be to recruit active recyclers as block leaders who act as role models and provide information and support to other people in the neighbourhood (Varotto & Spagnolli, 2017). The six types of interventions are similar in that they are either characterized by a) communicating specific information, prompts, feedback, or resources through various forms of media or b) initiating changes or additions to programs through decision making processes.

While there are many interventions that have been shown to be effective at increasing recycling, critics argue that interventions tend to focus on changing simple actions with small impacts, and that there needs to be more than small changes to low-impact behaviours by individuals if the effects of climate change are to be minimized (Capstick et al., 2014). Furthermore, most interventions are based on changing individual motivational determinants rather than changing the social and economic circumstances that lead to the undesirable behaviours in the first place (Capstick et al., 2014). Therefore, interventions need to be more radical by challenging unsustainable lifestyles, systems of governance, and institutions (Capstick et al., 2014).

3.0 Methodology

For this study, I conducted a program evaluation of the Niagara Region's residential curbside blue and grey box recycling program, where I used content analysis to assess if, and to what extent, the Niagara Region has designed the program in a way that will increase recycling. The basis of evaluation was determined by the findings in my literature review on the factors that influence recycling and interventions that are

effective at increasing recycling (see Section 2). In the following section, I provide an overview of the methods used, first describing and defining program evaluation and content analysis in Section 3.1, outlining my data collection process in Section 3.2, and detailing how I conducted my data analysis in Section 3.3.

3.1 Program Evaluation and Content Analysis

Program evaluations emerged from practical roots rather than academic ones, beginning in the 1800's when the US government had public facilities such as prisons, schools, hospitals, and orphanages evaluated by inspectors. Applied social scientists began conducting evaluations of major social programs related to education, public health, and employment prior to World War I, with additional types of programs being evaluated in the 1950's. However, evaluations became especially prevalent in the 1960's, where they were used to evaluate elementary and secondary school programs (Mertens & Wilson, 2019). Despite this history, program evaluation is relatively new as an academic method, as it was not until the 1970's that the first journals with evaluation in the title emerged, professional organizations formed, and textbooks on the subject were published (Rossi et al., 2019).

Due to program evaluations being used in a variety of different disciplines, multiple approaches based on different theoretical frameworks have been developed over time (Mertens & Wilson, 2019). Furthermore, definitions for program evaluation differ depending on the perspective of the evaluator, and can emphasize varying concepts. These can include pursuing results that are useful to stakeholders, uncovering the viewpoints of marginalized groups and investigating power structures, designing robust quantitative methods, identifying values and perspectives through qualitative methods, and identifying and quantifying variables that would have an impact on program outcomes (Mertens & Wilson, 2019).

For the purposes of this study, program evaluation can be defined as “the application of systematic methods to address questions about program operations and results” (Newcomer et al., 2015, p. 8). A program can be defined as “a set of resources

and activities directed toward one or more common goals, typically under the direction of a single manager or management team” (Newcomer et al., 2015, p. 7), which in this case, refers to the curbside recycling program managed by the Niagara Region. While most programs, including the curbside recycling program in Niagara, aim to improve social problems, they may be unsuccessful and have unintended effects if they are not based on accurate or relevant theories, not aligned with the underlying causes of the problem, or not implemented well (Rossi et al., 2019). This makes program evaluations a necessary and useful tool for learning more about the underlying logic of program activities, as well as for providing feedback to help improve programs (Newcomer et al., 2015).

Evaluations can either be formative, summative, or in some cases, include objectives of both. While formative evaluations are undertaken during the planning, implementation, or delivery of the program, with the intention of providing feedback to improve the program, summative evaluations are undertaken during operations or at the end of a program, and focus on measuring program outcomes and impacts, what the program accomplished, if objectives were met, and if the implementation strategies were successful (Mertens & Wilson, 2019; Newcomer et al., 2015). Evaluations can also be characterized by whether or not they include continuous monitoring or a one-time assessment, the level of stakeholder participation in the evaluation process, the extent to which existing goals or standards are used to assess program quality, whether quantitative or qualitative data and approaches are used, and whether or not the evaluation is based on the assumption that a problem exists (Newcomer et al., 2015). Based on these characteristics, several different types of program evaluations exist, including needs assessments which aim to identify a program’s problems and resources, program theory and design evaluations which focus on how programs work and the causal mechanisms behind them, process evaluations which compare actual inputs, activities, and outputs with the program’s intended ones, and impact evaluations where the focus is on providing quantitative estimates of the causal effects of programs (Rossi et al., 2019).

For this study, I conducted a program theory and design evaluation of the Niagara Region's curbside recycling program with summative objectives. I attempted to assess the extent to which the program design is based on assumptions and expectations about increasing recycling that are aligned with the recycling literature, because effective implementation is insufficient to achieve desired diversion and participation rates if the program theory is faulty (Rossi et al., 2019). Common research questions for this type of evaluation include a) What are the intended outcomes and how do they relate to the problem we want to change? b) What is the theory of action that supports the intended outcomes? c) Is there an appropriate target population and are there procedures in place to effectively recruit and sustain their participation in the program? d) What services does the program provide and it is reasonable to expect that they will be effective? and e) What delivery systems will be used for the services and are they aligned with the target population (Rossi et al., 2019)?

My focus was on the question of effective procedures for recruiting and sustaining participation in the recycling program, where I was specifically interested in whether or not, and to what extent, factors that influence recycling and effective intervention strategies are being considered and used by the Niagara Region to increase recycling behaviours in the program. My evaluation was summative since the focus was on determining the effectiveness of the program throughout the time period associated with the current 2016-2021 Blue Box Program Plan. I did this by determining the interventions undertaken to increase recycling from 2016 to 2021, with the overall aim being to provide feedback on future directions for program interventions.

Since there are a wide range of purposes for program evaluations, there is no one approved data collection method or analytical approach that fits all cases (Rossi et al., 2019). Therefore, the most important thing is to choose an analysis method that fits the purpose and context of the evaluation (Goodrick & Rogers, 2015). For my program evaluation, I used the common method of content analysis, which can be defined as a "research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorff, 2004, p. 18). Content

analysis can be used to analyze a variety of materials including written text, images, maps, signs, symbols, sounds, etc., as texts are not defined based on physical characteristics such as medium, and in this study, text includes anything that a) “means something to someone” and b) “is produced by someone to have meanings for someone else” (Krippendorff, 2004, p. 19). For the sake of convenience, I will be referring to these items as materials throughout this study.

While many different definitions of content analysis have emerged, many emphasize either qualitative or quantitative analysis, and this is not necessarily a very useful distinction to make, since “all reading of texts is qualitative, even when certain characteristics of a text are later converted into numbers” (Krippendorff, 2004, p. 16). Regardless of whether the aim of using content analysis is to quantitatively describe text or qualitatively describe meanings within the text, a content analysis involves the following six steps: 1) unitizing, which involves making decisions about what will be observed and how the text will be broken down into independent and whole elements for sampling and coding, 2) sampling, which includes determining a sampling method that will result in a representative and manageable subset of texts to assess, 3) the integral step of coding which requires creating a coding schedule and manual, analyzing the texts, and making judgments about which codes to assign to particular text units, 4) reducing data which involves summarizing or simplifying the data, 5) abductively inferring contextual phenomena which involves inferring some meaning, making predictions based on existing data, and backing them up with evidence, and 6) narrating, which involves communicating the results of the study in a meaningful way for others by explaining the significance of the findings or making recommendations (Krippendorff, 2004).

Besides being flexible in the types of materials that content analysis can be applied to, content analysis is a highly transparent method, since the included coding schedule and manual make the sampling and analysis procedures clear and easy to replicate for other researchers (Bryman, 2012). Additionally, because the researcher has no interaction with the producers of the texts before or while they are being produced,

a reactive effect on participants is avoided (Bryman, 2012). It has also been found to be an effective method for increasing understanding of a phenomenon, and can be used to inform practical actions (Krippendorff, 2004).

3.2 Data Collection

In order to conduct the program evaluation with my evaluation framework, I first had to determine how I would search for and select my data. Since recycling interventions tend to involve either the communication of specific information, prompts, feedback, or resources through various forms of media, or the initiation of changes or additions to programs through decision making processes, I focused on searching for both decision-making materials and online media materials. For the purposes of this study, decision-making materials are defined as materials where the main purpose is to document or communicate decisions being made about the blue and grey box programs, and include committee meeting documents such as memorandums, presentations, plans, reports, and report appendices. Online media materials are defined as materials where the main purpose is to communicate information or promote recycling to the public, and include social media posts, YouTube videos, apps, and webpages.

In choosing my materials, I used relevance sampling, which is defined as sampling that “aims at selecting all textual units that contribute to answering given research questions” (Krippendorff, 2004, p. 119). Relevance sampling entails conducting a preliminary analysis of texts found through the search process in order to determine which ones are relevant to the purpose of the study, with the researcher ultimately selecting texts that contribute to the research objectives. By following this process, I ended up with the “population of relevant texts” rather than a “representative of a population of texts” (Krippendorff, 2004, p. 119).

In order to determine if a material contributed to the objective of understanding if, and to what extent, the Niagara Region is currently engaging in effective interventions for increasing recycling, I used four major selection criteria. The first criterion was that materials must be recent, which for the purpose of this study, means that all materials

must have been produced from 2016 onwards. Since my purpose was to evaluate the current intervention strategies being used in the curbside recycling program, it was essential that I search through recent materials that were produced during the timeline of the current 2016-2021 Blue Box Program Plan. The second criterion revolved around the reliability of the information, which I ensured in this study by only selecting materials that were produced by the Niagara Region. Since I was interested in understanding the current interventions being used in the Niagara Region's recycling program, the most relevant and reliable materials were ones published and produced by the Niagara Region since they are responsible for making the decisions on which interventions to use, and are also the main entity using media to implement communication-based interventions.

The third criterion was that the material had to be focused on one or more initiatives originating from the region, rather than just commenting on or planning for the implementation of a province enacted program such as the extended producer responsibility transition program. I ensured this by reading the title and first few paragraphs or pages, and then excluding items that described laws, programs, or plans that the Government of Ontario was working on, as well as items that focused on requirements of the provincial government that the region had to implement. This criterion was important since the purpose of my study was to understand what initiatives the region has decided to consider, plan for, and implement, rather than the initiatives that the province is promoting. The fourth criterion was that the materials must be focused on or describe one or more initiatives from 2016 to 2021 designed to promote or change the residential blue box and/or grey box program, rather than solely focus on other waste topics such as the green bin program, industrial, institutional, or commercial waste management, construction and demolition waste management, hazardous waste recycling, large item drop-off and recycling programs, landfills, recycling facility upgrades, or funding.

In order to find materials related to decision making, I manually went through the meeting agendas and minutes for the Waste Management Planning Steering

Committee (WMPSC) and the Waste Management Advisory Committee (WMAC), which were available on the Niagara Region's website. I also manually went through the agendas for the Public Works Committee (PWC) meetings since it oversees waste management and is one of the main standing committees, whereas the WMPSC and WMAC are both advisory committees. While the meeting minutes and agendas did not contain enough detail or context to include as materials themselves, they either included links, attachments or references to other decision-making materials of interest. While the agendas and minutes also included several councillor information requests, I decided to exclude these materials since they did not contain a lot of detail or context, and any relevant topics tended to be expanded upon in memorandums, presentations, plans, reports, and report appendices.

I checked the title and description of the referenced items, and made note of the ones that made some reference to recycling, waste management, or the blue/grey box program. For the agendas and minutes that provided links to the referenced items or included the items at the end of the document, I was able to access these documents directly, whereas for the referenced items that were not included in the agendas or minutes as links or attachments, I was able to find almost all of them within other meeting agendas or minutes. I screened these memorandums, reports, and presentations according to my four selection criteria to determine if the items were relevant to my study. From this process, I ended up with 38 materials, including 16 from WMPSC meetings, 14 from WMAC meetings, and 8 from PWC meetings.

Since not all interventions are based on making changes through decision-making processes, I also searched through online media since these are the types of materials that were most likely to represent current communication-based intervention strategies in practice, as well as communicate current interventions to the residents of the Niagara Region. I looked at materials produced by the Niagara Region from 2016 to 2021, including Facebook and Twitter posts, YouTube videos, and web pages from the Garbage, Recycling and Organics section of the Niagara Region's website, which include text, images, search tools, an interactive calendar, a game, and a link to a mobile app. I

utilized the advanced search function on Twitter to search for original tweets posted by the Niagara Region's account from January 1, 2016 to February 10, 2021 that either contained the exact phrase "blue box," or "grey box." I then applied the same two selection criteria as used with the decision-making materials in order to decide if the tweets would be included or excluded in my selection of materials. For example, Tweets that encouraged residents to put their used batteries beside their grey and blue boxes for pick-up and posts that notified residents of changes to collection and scheduling due to weather or delays were both excluded.

After applying the selection criteria, I ended up with 62 tweets. I then conducted the same search, but instead of requiring exact phrases, I searched for posts that contained at least one of the following words: Recycle, recycling, curbside, divert, or diversion, in order to find any additional posts. Applying the selection criteria led to an additional 14 tweets being added to my population of materials, resulting in 76 tweets overall. While I began a similar search within the Niagara Region's Facebook page, early on I discovered that the Facebook posts contained the same content as the Twitter posts, with the same content often being posted to both accounts on the same day. Therefore, I decided to put an end to my search and exclude Facebook posts from my study in order to avoid analyzing the same materials twice.

I also considered the videos posted by the Niagara Region's YouTube account from 2016 to February 2021. I decided to start watching a video if the title included one of the following terms: Recycle(s), recycling, recyclables, blue box, grey box, curbside, waste. I watched as long as needed to determine if each video met my other two selection criteria, and ended up with 10 videos for my study.

Finally, I decided to search for content within the Garbage, Recycling and Organics section of the Niagara Region's website, since it is one of the main places that the region promotes and describes the blue and grey box programs. To avoid wasting time by going through the whole website in detail during coding, I decided to select only those webpages that were relevant to my study. I went through each webpage within this section of the website, and applied the four selection criteria in order to decide if

the webpage would be included in my study as a material, which resulted in 19 webpages being selected. Throughout this process, I also came across the link to a waste management mobile application created by the Niagara Region, and after applying the same selection criteria, I included the app in my data set.

While I wanted to work with the complete population of materials relevant to my study, I initially ended up with 144 materials, and due to time constraints, it was necessary to reduce my data set to a more manageable size. Rather than take a sample from my population, after finding and selecting my initial materials, I conducted a secondary screening process in order to make sure I ended up with the most relevant and appropriate materials, effectively fine-tuning my population of data. I went through each type of material including Twitter posts, YouTube videos, the app, webpages, and meeting documents separately, and because the online media materials contained less text, they represented a manageable amount of material to get through in the time allotted for an MRP, and so I decided to include all of these materials in my final body of data.

However, since the meeting documents were longer, it was not feasible for me to analyze all 38 decision-making materials. Therefore, I conducted the screening which was based on avoiding duplication and redundancy, while also increasing consistency and relevancy. I excluded materials that had been duplicated or that presented information that was included in more detail within another material from that year. For example, four committee presentations were excluded because a separate memorandum or report described the same topic but in more detail, and several benchmarking reports were excluded because they focused more strongly on measures of diversion than initiatives to promote recycling, and the little bit of relevant information included lacked detail and was expanded upon in other materials.

Several memorandums were excluded because the same information was found in more detail in other appendices published in the same year, and often on the same day, and a few appendices were excluded because they focused on visual examples of promotional content described in other appendices, and so were seen as redundant.

Additionally, I excluded one material because on second review, it was not nearly as relevant as I initially thought. I also added one new data item after realizing I had initially missed it. Finally, three additional appendices were added to my study after separating them from other associated materials, in order to maintain consistency with the approach taken with the rest of my data materials. After completing the screening, I ended up with 22 decision-making materials, for a total data set of 128 materials. I imported and stored these materials in the software program QSR NVIVO, and filled out a coding schedule which included the data item number, title, published date, material type, source, and link for each material (See Appendix B).

3.3 Data Analysis

In order to achieve the first objective of developing a framework for evaluating the Niagara Region's residential curbside recycling program, I consulted my findings from the literature review on the factors that are associated with influencing recycling and the effective interventions that promote recycling behaviours. As discussed in Section 2, there are several challenges to incorporating factors that influence recycling in an evaluation framework. Due to the finding that socio-demographic factors are only weakly related to recycling (Miafodzyeva & Brandt, 2013), I did not consider these factors in my evaluation of the design and implementation of the Niagara Region's recycling program. While I could have evaluated the program by looking for evidence that the program's design utilizes the underlying individual motivational and contextual factors of recycling, as discussed in the literature review, there is significant uncertainty as to which factors are most important, and how most individual motivational factors can be used or changed to increase recycling. In order to properly use these individual motivational factors to evaluate the Niagara Region's recycling program, I would have first needed to review all of the additional sub-bodies of literature that focus on how to manipulate or change these factors in a desired direction, and what the desired orientations are in the first place, and that was beyond the reasonable scope of a MRP.

However, a second focus of the literature review was interventions that increase recycling, and interventions provided a practical and effective way to evaluate the Niagara Region's recycling program. Additionally, the contextual factors that have been found to increase recycling were able to be incorporated into this framework by including interventions that focused on making environmental alterations. Therefore, I drew upon the most recent research on recycling interventions, particularly the meta-analysis by Varotto and Spagnolli (2017), in order to come up with appropriate criteria for the evaluation framework, descriptions of these criteria, and considerations associated with each criterion (See Table 3.1). The six criteria came from the six intervention types found to have significant effects on recycling within this meta-analysis, and were the main elements used to evaluate the effectiveness of the Niagara Region's recycling program. Within the framework, Varotto and Spagnolli's study (2017) was also used to come up with considerations that describe the required evidence to signal that each criterion is occurring.

Using a deductive approach, I drew upon the evaluation framework in order to create a codebook that operationalized the criteria and considerations from the framework (See Appendix A). The considerations from the evaluation framework were adapted to create the description of each code, with examples being drawn from various studies on recycling interventions included in my literature review. In addition to the six intervention types from the evaluation framework being transformed into codes, four additional codes relating to the magnitude of interventions were developed and included within the codebook. This allowed me to be able to evaluate the Niagara Region's recycling program not only in terms of the inclusion of particular interventions, but also in terms of the magnitude of each intervention type. In this study, magnitude is defined as the stage of development, progress, and/or use associated with each individual intervention and intervention type.

Table 3.1. Evaluation framework developed to evaluate the Niagara Region’s residential curbside recycling program

Criterion	Description	Considerations
Social Modelling	Interventions that entail “any kind of passing of information via demonstration or discussion in which the initiators indicate that they personally engage in the behavior, also” (Varotto & Spagnolli, 2017, p. 272).	<ul style="list-style-type: none"> Description or embodiment of BOTH information transferal and an indication that the speaker/author/initiator also engages in recycling
Environmental Alterations	Interventions that revolve around “making recycling more convenient and easy to perform by modifying the physical environment” (Varotto & Spagnolli, 2017, p. 172).	<ul style="list-style-type: none"> Description or embodiment of changes to the physical environment being considered, planned or implemented, including the provision, number, design, or location of bins, or the sorting, drop-off or collection process of recyclables
Prompts and Information	Interventions that revolve around providing facts, persuasive information or	<ul style="list-style-type: none"> Description or embodiment of the provision of information or reminders that either promote recycling or explain how, when, or why to recycle WITHOUT any focus on acknowledging that the speaker/author/initiator

	reminders to targeted individuals either in person or through written mediums, in order to encourage recycling (Varotto & Spagnolli, 2017).	also engages in recycling OR without providing specific recycling feedback on constituents' recycling habits
Commitment	Interventions where individuals are encouraged to "commit to produce a certain behavior or reach a certain goal" (Varotto & Spagnolli, 2017, p. 172).	<ul style="list-style-type: none"> • Description or embodiment of encouraging people to make a verbal or written commitment towards a recycling-based behaviour or goal, either in a group or individual-based setting
Incentives	Interventions that revolve around providing some sort of benefit to people who participate in recycling programs (Varotto & Spagnolli, 2017)	<ul style="list-style-type: none"> • Description or embodiment of monetary rewards or other benefits being provided to people for participating in recycling behaviour
Feedback	Interventions that revolve around providing residents with "information regarding	<ul style="list-style-type: none"> • Description or embodiment of the communication of current or recent recycling behaviours at the individual, household, neighbourhood, or

	their recycling behavior along with a comparison with a predefined standard” in order to motivate them to fill the gap (Varotto & Spagnolli, 2017, p. 171).	community level, along with information communicating a predefined recycling standard
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Continuing to take a deductive approach, I conducted axial coding, which is a coding technique where the focus is on finding sections of the materials that fall under each created category, looking for one category at a time, rather than creating and condensing codes (Anandarajan et al., 2019). The process entailed going over each decision making material and online media material and searching through words, phrases, sentences, and paragraphs for evidence of my six intervention types, as described in the codebook. These coded sections are referred to as passages throughout the rest of this study. I utilized the coding capabilities in QSR NVIVO to manually code my materials and organize my passages. After the coding process was completed, I summarized my data by calculating the frequency of each intervention type, and the magnitude for both interventions overall, and for each intervention type, so that I could determine which interventions had been considered, planned for, and implemented by the region most and least often.

3.4 Limitations

While my study provides some valuable insight into important questions, there are also some limitations to consider. Although I stand by the usefulness of my evaluation framework, it is heavily based on a single meta-analysis since Varotto and Spagnolli (2017) have been the only ones to conduct a quantitative study that compares the relative effectiveness of recycling interventions, and this is a major limitation of my study. Furthermore, my study is limited by not including underlying factors within my evaluation framework, which was a conscious decision made in consideration of the time constraints and expected scope associated with a Masters-level major research project.

My study is also limited by focusing only on materials that met my four selection criteria. First of all, I only considered materials produced by the Niagara Region from 2016 to 2021. Furthermore, while my study focuses on interventions utilized by the Niagara Region during the current Blue Box Plan, which spans the years 2016 to 2021,

due to the timing of this study, I was not able to assess materials from after February 2021.

My study excludes interventions that originate from the provincial government, such as the transition to extended producer responsibility, even though the region is planning for these interventions in order to improve the recycling program. My study also focuses solely on residential recycling through the blue and grey box programs, and does not consider other important waste diversion behaviours and programs such as composting, industrial, institutional, or commercial waste management, construction and demolition waste management, hazardous waste recycling, and waste reduction and reuse. Finally, in screening my decision-making materials, certain materials were excluded in order to avoid duplication and redundancy, while also increasing consistency and relevancy, and so these materials that initially met the four selection criteria were ultimately excluded.

4.0 Results

This section presents the results obtained from the content analysis of decision-making materials and online media materials produced by the Niagara Region from 2016 to 2021 that met the selection criteria and passed the secondary screening process. These results include the frequency of passages coded to each intervention type and the magnitude of interventions. These analyses fulfill Objective b) as they represent the results of using the evaluation framework to see if, and to what extent, the Niagara Region has designed the residential curbside recycling program in a way that encourages recycling.

4.1 Intervention Frequencies

Since the six criteria in the evaluation framework are represented by the inclusion of each of the six intervention types presented and defined by Varotto and Spagnolli (2017), it was imperative that the frequency of the six intervention types be calculated,

in order to determine which intervention types were being used by the Niagara Region most and least often. Table 4.1 shows that in total, 692 passages were coded to eight intervention types within the 128 materials. Prompts and information interventions were most common, representing approximately 75% of the total passages, and occurring almost six times more often than the next most frequent intervention type. Furthermore, prompts and information interventions were coded to passages in 98% of materials, which is five times as many materials than the intervention type coded in the second most materials.

Table 4.1. Frequency of passages coded to each intervention type and frequency of materials where each intervention is present

Interventions	Number of Passages Coded to Each Intervention	Number of Materials Where Intervention Is Present
Prompts and Information	519	125
Environmental Alterations	89	24
Incentives	49	25
Feedback	13	11
Social Modelling	13	10
By-laws	6	3
Disincentives	3	2
Commitment	0	0
Total	692	128

Environmental alterations and incentives each occurred fairly often, representing approximately 13% and 7% of the passages respectfully. While environmental alterations were coded in more passages than incentives, incentives were found in slightly more materials than environmental alterations, which were each present in just under 20% of materials. Feedback and social modelling interventions occurred rarely,

each representing approximately 2% of the passages and occurring in less than 10% of materials. No instances of commitment interventions were found.

Throughout the coding process, two additional themes were discovered, and these are creating and enforcing local by-laws to ensure recycling, as well as using disincentives to encourage residents to recycle. The passages coded as by-law interventions make reference to the Niagara Region's Waste Management By-law 63-2015, which "regulates all collection, recycling and disposal of items" (Niagara Region, n.d.-c), and "doesn't allow recyclable and organic material in the garbage" (Niagara Region, n.d.-a). Items under this code show that by-law officers "practice outreach activities, such as letters to owners, landlords and tenants requesting voluntary compliance" (Niagara Region, 2017, p.11) and "only use the powers available under the By-Law for enforcement, in those cases where residents or businesses refuse to comply" (Niagara Region, 2017, p.12). The passages coded as disincentive interventions all related to an implemented "partial user pay system (\$2 bag tags for residential waste over the set out limit)...for low-density residential properties up to and including 6 units" (Niagara Region, 2017, p.11). The by-law intervention was coded to six passages, representing approximately 1% of the passages, and disincentives interventions were coded to three passages, representing less than 1% of the passages.

4.2 Magnitude of Interventions

In addition to understanding which interventions the Niagara Region is using to encourage recycling, it is also important to determine the magnitude of these interventions, in terms of the stage of development that each intervention type is most commonly associated with. By knowing if the majority of interventions are in the stage of being considered, are being planned for or committed to, or have already been implemented, a more detailed representation of the region's current progress regarding each intervention type can be determined. It was found that more interventions were in later stages of development than earlier ones, with only 5% of the interventions being at

the stage of being considered, 19% having been committed to, and 77% having already been implemented, as seen in Figure 4.1

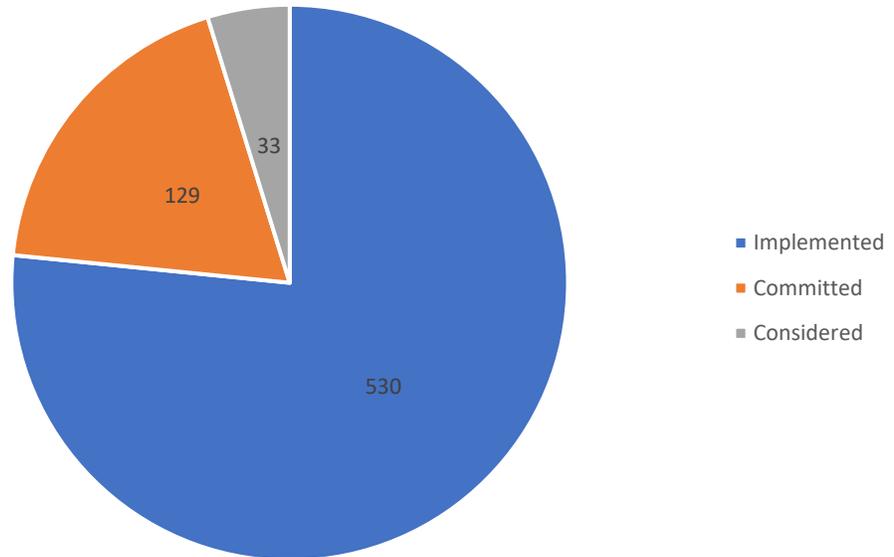


Figure 4.1. The frequency of the different magnitude level codes for the total amount of interventions

In addition to there being more implemented interventions overall, Table 4.2 shows that all but one of the intervention types had most of the associated interventions coded as implemented, with the exception of social modelling, where there was an equal amount of interventions that were being considered and committed to. Incentives, by-laws, and prompts and information interventions had the greatest proportions of implemented interventions, representing over 80% of their respective interventions.

Table 4.2. Frequencies of Magnitude Codes for Each Intervention Type

Interventions	Considered	Committed	Implemented
Prompts and Information	6	94	419
Environmental Alterations	21	21	47
Incentives	2	3	44
Feedback	1	5	7
Social Modelling	1	6	6
By-laws	1	0	5
Disincentives	1	0	2
Commitment	0	0	0

5.0 Discussion

Of the six intervention types found to have significant effects on increasing recycling from the most recent meta-analysis conducted by Varotto and Spagnolli (2017), from 2016 to February 2021, the Niagara Region utilized prompts and information, environmental alterations, incentives, feedback, and social modelling. The only intervention type not found in any of the analyzed materials was commitment. While the region’s program used all but one of the intervention types, there was a disproportionate reliance on certain interventions over others, with an especially high level of use of prompts and information interventions. While the reliance on certain interventions over others is good because not all of the six intervention types have the same size effect on recycling outcomes, it is important that the most effective interventions are the ones being more heavily utilized.

5.1 Frequency of Interventions

Prompts and information interventions were by far the most commonly used intervention type found in this study. Prompts and information interventions can be

useful because various forms of information including facts, persuasive information, and reminders can be used to reach a large amount of people with relatively low effort and costs (Varotto and Spagnolli, 2017). My evaluation of the region's program makes it evident that the region is taking advantage of these strengths, as a wide variety of initiatives using various forms of media were used to communicate important information to residents. Some of these initiatives include presenting recycling tips on social media, creating and posting educational videos about the recycling centre and ways to avoid common recycling mistakes, providing reminders on when to recycle through a waste app, offering a search bar on the region's website that allows residents to search and find out how to properly recycle specific materials, promoting the recycling program through media advertisements and staffed booths in the community, and educating children through school presentations and summer camp programs.

While these types of interventions can have significant effects on recycling outcomes (Iyer et al., 2007; Varotto and Spagnolli, 2017), prompts and information are usually not enough on their own to achieve large increases in recycling because people do not always understand the information, some people cannot be bothered to engage with the information, information is not very effective at increasing motivation, and information often needs to be targeted towards a specific audience in order to be effective (Varotto and Spagnolli, 2017). Furthermore, other intervention types have been found to be more effective at increasing recycling (Varotto and Spagnolli, 2017), and no significant relationship has been found between municipal spending on promotion and education, and recycling rates for municipalities in Ontario (Lakhan, 2014). However, prompts and information can be helpful when the main barrier to recycling is a lack of knowledge (Varotto and Spagnolli, 2017), and prompts and information have been found to complement other more effective intervention types (Osbaldiston and Schott, 2012).

Varotto and Spagnolli (2017) found that social modelling and environmental alterations are the two most effective interventions for increasing recycling. While the Niagara Region did use social modelling within the recycling program, out of the five

intervention types, it appeared in the least amount of passages, along with feedback. Furthermore, all thirteen passages coded to social modelling concerned a single initiative, which is the eco-ambassador program that was implemented in 2017. The program revolves around volunteers in multi-residential buildings “utiliz[ing] the principles of community-based social marketing to create and promote positive social norms around behaviours that lead to effective waste diversion practices within the building community” (Niagara Region, 2016, p. 2). While this is a great initiative, as a single program in a specific residential setting, it is limited in how many people it can reach. Even though social modelling is more than six times more effective than prompts and information interventions (Varotto and Spagnolli, 2017), social modelling appeared in almost forty times less passages than the latter intervention type.

While social modelling has been found to be almost two times more effective than environmental alterations in increasing recycling, environmental alterations still have a significant effect on recycling outcomes (Varotto and Spagnolli, 2017). They have been found to be more than three times more effective than prompts and information interventions, approximately three and a half times more effective than both incentives and commitment interventions, and more than five times more effective than feedback interventions (Varotto and Spagnolli, 2017). One of the major strengths of the Niagara Region’s recycling program is the commitment to making things more convenient for residents by implementing environmental alterations. These interventions include expanding recycling services to mixed-use residential properties and multi-residential buildings, reducing the frequency of garbage collection while maintaining weekly recycling collection, providing free blue and grey boxes to new residents within one year of moving, replacing broken blue and grey boxes for no charge, increasing the types of plastics accepted in the blue box program, allowing “clearly marked, rigid, reusable container[s] with handles or indentations on two sides” to be used as alternative blue box containers (Niagara Region. (n.d.-d), and making changes to collection vehicles, schedules, and routes. These types of interventions being the second most frequently used intervention type in the Niagara Region’s recycling

program shows that the program is well designed in that it is based upon the utilization of an effective set of interventions.

The third most common intervention used was incentives, but these all referred to a single “Recycle and Win” contest on the website where people could win prizes for completing an online game focused on the proper way to recycle various items. While incentives have been found to have immediate and drastic effects on recycling outcomes (Iyer and Kashyap, 2007), while also being slightly more effective at increasing recycling outcomes than interventions based on commitment and feedback (Varrotto and Spagnolli, 2017), recycling participation and rates tend to decrease again after the incentives have been removed (Iyer and Kashyap, 2007; Varrotto and Spagnolli, 2017). Based on the limited effectiveness of incentives, it is positive to see that the Niagara Region is limiting their usage of incentive-based interventions.

However, even though incentives represented only about 7% of intervention passages, which is much lower than more effective interventions such as environmental alterations, there were almost four times as many passages relating to the single incentives-based intervention than the single social modelling-based intervention. While the social modelling-based eco-ambassador program was discussed within decision-making materials and promoted through a single tweet, the incentives-based recycle and win contest was discussed in decision making materials but then also promoted much more heavily in twenty times more tweets. While it is good to see that the program is not relying heavily on incentives, there is room for improvement in regards to the level of promotion of these interventions.

Since feedback and commitment have been found to be the least effective of the six intervention types, it is positive that the program is using these interventions the least out of the six intervention types. However, both intervention types still do have an effect on recycling outcomes (Byerly et al., 2018; Osbaldiston & Schott, 2012; Varotto & Spagnolli, 2017), and so it is not ideal that commitment interventions were not even considered for the residential program. The region has implemented a “Rethink your Waste at your Workplace” pledge for businesses, but based on the results of my study,

the region has not considered, planned for, or implemented anything similar for the residential recycling program.

In terms of how my results relate to past literature on recycling interventions, the finding that prompts and information interventions were the most commonly used intervention is consistent with past research findings (eg. Osbaldiston and Schott, 2012; Varotto and Spagnolli, 2017). However, while the most recent meta-analysis found that prompts and information interventions were approximately two times more common than the second most common intervention type (Varotto and Spagnolli, 2017), my study found prompts and information interventions to be much more common, being approximately six times more common than the second most common intervention type. A major difference in my study is that environmental alterations were found to be the second most common intervention type, while previous studies have found it to be one of the least common intervention types (Osbaldiston and Schott, 2012; Varotto and Spagnolli, 2017). Additionally, while my study found that feedback interventions were one of the least commonly used interventions, Varotto and Spagnolli (2017) recently found it to be the second most common intervention type within the literature, and while commitments did not appear in any of the materials in my study, previous research has shown that commitments are relatively common in the literature (Osbaldiston and Schott, 2012; Varotto and Spagnolli). I see two likely reasons for the differences in these results. The first is that experimental studies are using interventions more or less frequently than they are actually being used within municipal recycling programs in practice, and the second explanation is that the Niagara Region is relying on different interventions than the majority of other recycling programs manipulated in past studies.

Another interesting finding from my study is that the region utilizes other interventions than those included within my study's literature review. While both disincentives and by-laws appeared infrequently within passages, it is clear that they are still valued by the region as strategies for increasing recycling. Their inclusion as interventions in the program demonstrates that recycling programs are more

complicated, unique, and varied than past research may suggest, and that alternative interventions exist and can be used in recycling programs.

A search for these interventions within the literature shows that while there are some references to these interventions, their usage and assessment in field interventions for recycling and pro-environmental behaviours have been limited (Kazdin, 2009). Some authors conceptualize incentives and disincentives together as a single intervention type (eg. Dunlap, 2002; Kazdin, 2009), which is defined as "activators that announce the availability of a rewarding or penalizing consequence, respectively, in order to motivate behavior change" (Dunlap, 2002, p. 350). Dunlap (2002) reports that disincentives, including fines and laws, have historically been used by governments to increase pro-environmental behaviours, but that in order to be effective, disincentives require a significant amount of both promotion and enforcement. However, using disincentives has been discouraged since negative feelings or attitudes usually arise with these types of interventions, which lowers the chance of a behaviour becoming normalized compared to when incentives are used (Dunlap, 2002). Furthermore, it has been found that environmental alterations are more effective at increasing recycling than "initiating policies intended to penalize disposal" (Mueller, 2013, p. 515).

Very little recent research has been conducted on the usage of bylaws to promote recycling and other pro-environmental behaviours, which makes it difficult to know how effective this type of intervention can be (Kendler, 2011). However, recycling bylaws are used by many Ontario municipalities, and this intervention type is a tool used to "prescribe what are deemed to be pro-social behaviours that encourage environmental protection" (Greene et al., 2017, p. 4). Bylaws often outline which materials are acceptable and unacceptable in the garbage and recycling streams, and have the potential to have a substantial impact on increasing recycling (Kendler, 2011). Mandatory recycling programs have been found to be more effective at increasing recycling participation than voluntary programs, and mandatory programs with formal enforcement policies and activities have been found to lead to even higher rates of participation (Noehammer & Byer, 1997).

However, bylaws can be associated with high costs and administrative challenges, especially if significant enforcement is being used (Kendler, 2011), and bylaws tend to disproportionately affect vulnerable members of communities, which is why some authors argue that prevention-based interventions should be prioritized instead (Greene et al., 2017). Nevertheless, rather than eliminating bylaws, they can be improved by including clear guiding principles within them that discourage the over-use of ticketing and fines (Greene et al., 2017), and many municipalities still use bylaws while prioritizing education and warnings for waste infractions over implementing fines (Noehammer & Byer, 1997). As both disincentives and bylaws use penalties to discourage people from recycling improperly, it could be argued that they can be conceptualized as a single intervention type, and while no studies were found that test this intervention type, there were a few articles that implied the close connection between disincentives and bylaws (eg. Dunlap, 2002; Mueller, 2013).

5.2 Magnitude of Interventions

Besides determining which interventions were used most and least often, my study also resulted in findings regarding the magnitude of interventions. Figure 4.1 and Table 4.2 make it clear that the region is prioritizing implementing new interventions over planning for or considering interventions. It is positive to see that many interventions have already been implemented since it provides evidence that the Niagara Region is committed to taking action when it comes to increasing recycling.

However, in order to have effective and innovative interventions, it is also important that these interventions be well researched, planned, and based on evidence. Identifying and becoming familiar with relevant theories is an important early step for developing interventions, since theory offers knowledge gained by others on the topic, while also providing a framework that can be used to understand recycling and identify targets for change (Gainforth et al., 2016). It has also been argued that in order to develop effective interventions, a program should be designed to reduce the community-specific barriers and increase the benefits while incorporating effective

behavioural change tools (Schultz, 2014). Interventions should be implemented on a small scale first, modified as needed, and continuously evaluated after full implementation (Schultz, 2014).

In order to do this, there needs to be constant planning, research, and consideration of alternative interventions. The Niagara Region conducted a stakeholder consultation in 2018 in order to understand general attitudes towards recycling, participation rates in the recycling and organics programs, and how residents and businesses felt about various options for the new waste collection contract that came into effect on October 19, 2020 (Metroline Research Group Inc., 2019). However, there was no research conducted on the benefits and barriers that residents identified with recycling in the region, and this type of information would be very useful in designing effective interventions.

The results of my study show that interventions that had been committed to were four times less common than implemented interventions, and that interventions being considered were four times less common than interventions that were committed to and sixteen times less common than implemented interventions. The drastic differences between the three magnitude levels imply that many interventions are being implemented without being adequately researched or planned first, which is concerning. That being said, since this study only included materials from the current Blue Box Plan, it is possible that some, or even many, of the interventions that were implemented between 2016 and 2021 were discussed and considered during the last Blue Box Plan, which would lessen the previous concern. However, regardless of whether interventions from the current Blue Box Plan were considered prior to 2016, consideration of interventions is still happening less frequently than the literature recommends (eg. Gainforth et al., 2016; Schultz, 2014).

While there were twenty-two decision making materials, there were almost five times as many online media materials, and since the online media materials largely revolve around presenting prompts and information, as well as promoting other interventions, approximately 99% of the passages from online media materials were

coded as implemented. Another likely reason implemented interventions were so much more common than other stages of interventions is because while an intervention may have had a few different passages coded within a decision-making material, there were often multiple online media materials putting a single intervention into place, especially prompts and information being implemented across various media. When online media materials are excluded, while implemented interventions still remain the most common, representing 48% of passages, a more balanced picture forms as interventions that have been committed to increase to represent 41% of the passages rather than 19%, and interventions being considered also increases to represent 11% of interventions rather than 5%. This is likely a more realistic way to present the magnitude of interventions, and while it lessens the previous concerns about not enough interventions being committed to before being implemented, the amount of considered interventions remains quite low.

5.3 Overall Effectiveness of Program

Throughout the past five years, the Niagara Region has demonstrated significant effort in planning, committing to, and implementing several initiatives aiming to increase participation in the residential curbside recycling program, while also improving the waste diversion rate in the region. In terms of the effectiveness of the program's design, the biggest strengths include the program's inclusion of five out of the six effective intervention types used in the evaluation framework, the utilization of environmental alterations as one of the most commonly used interventions, the low reliance on feedback interventions, and the implementation of several interventions each year since 2016. However, there is still room for improvement, as the program did not include any consideration, commitment to, or implementation of commitment interventions, overutilized prompts and information, as well as incentives, while underutilizing social modelling interventions, and implemented significantly more interventions than were committed to or considered, demonstrating a lack of planning and evidence-based decision-making. Based on the achievement status of these standards, while the

program is more successful than not, the program is currently designed in a way that is likely to lead to limited effectiveness (See Table 5.2). The region should work to significantly improve certain aspects of the program for the upcoming Blue Box Plan in order to be more successful at encouraging participation and proper recycling.

It is difficult to compare these results with other studies or municipalities, due to a lack of available research. To my knowledge, this is the only study that evaluates a municipal recycling program based on the inclusion of effective recycling intervention types. So while findings exist from several studies on how to intervene to increase recycling, it appears that while individual recycling programs may be being monitored and modified by municipalities, the design of these municipal recycling programs are not being evaluated based on research evidence.

A 2007 report from Waste Diversion Ontario identified best practices for municipal blue box programs (See Table 5.1), which emphasized the inclusion of prompts and information interventions in the form of a Promotion and Education program, and using “established and enforced policies that induce waste diversion” within a recycling plan (KPMG International, 2007, p. 26). The report notes that these policies and incentives that are effective at reducing waste include solid waste bag limits, bi-weekly garbage collection, user pay programs for waste, and enforced mandatory recycling by-laws (KPMG International, 2007). While the Niagara Region’s recycling program exhibits these best practices, it does not necessarily mean that the program is any more effective than my results find.

Table 5.1. Best Practices for Ontario Blue Box Programs according to Waste Diversion Ontario (KPMG International, 2007, p. 26).

Best Practices
1. Development and implementation of an up-to-date plan for recycling, as part of an integrated Waste Management system
2. Multi-municipal planning approach to collection and processing of recyclables
3. Establishing defined performance measures, including diversion targets, monitoring and a continuous improvement program
4. Optimization of operations in collections and processing
5. Training of key program staff in core competencies
6. Following generally accepted principles for effective procurement and contract management
7. Appropriately planned, designed, and funded Promotion and Education program
8. Established and enforced policies that induce waste diversion

Although these best practices make reference to specific program initiatives, they do not include the usage of general effective intervention types as a measure of effectiveness, and only include specific interventions based on prompts and information, incentives, and environmental alterations. Therefore, while the Niagara Region’s recycling program may be seen as effective according to Waste Diversion Ontario based on certain characteristics associated with the recycling plan, contract, targets, use of technology for collection and processing, training of staff, and some specific interventions, my study evaluates the program’s design based on its utilization of intervention types found to be effective in peer-reviewed studies. In other words, my study has different results because it is evaluating the program with different criteria.

A 2013 study collecting data on 223 municipal recycling programs in Ontario from 2005 to 2010 found that certain specific practices led to higher recovery rates of recyclable materials, and these included collecting recycling weekly, having weekly solid

waste bag limits of three or less, and having a user pay program in place (Mueller, 2013). Looking at the study's results on how many recycling programs had implemented these practices, the Niagara Region's program can be seen as being similar to the majority of municipalities by collecting recycling weekly and having a user pay program, and as doing better than the majority of municipalities by having a weekly solid waste limit of one bag. However, it is important to keep in mind that more municipal programs may have also implemented these initiatives since 2013, which would mean that the Niagara Region is doing some good things with their program but is not necessarily performing better than other recycling programs in Ontario. Furthermore, this approach to evaluation only includes three specific initiatives, whereas my study's evaluation is based on a more expansive and detailed approach to interventions, which explains the differences in results.

While the Niagara Region's program may be comparable to other recycling programs in Ontario, a recent report from the Environmental Commissioner of Ontario (2017) demonstrates that many of these residential recycling programs have not been as effective as previous reports and studies may have found. The 2017 report discusses the Waste-Free Ontario Act, 2016 and the reasons that a new statute was needed. Reflecting on the progress made towards waste diversion, the report clearly describes the Blue Box program as having had modest results. The Environmental Commissioner expresses that "Ontario has not made significant gains over the past two decades in increasing the percentage of waste recycled and composted" and that "Ontario's total waste diversion rate still hovers around 25%, far short of the province's 60% target" (Environmental Commissioner of Ontario, 2017, p. 30).

My findings on the overall effectiveness of the Niagara Region's recycling program are consistent with this latest report, as they both find that recycling programs in Ontario have had limited effectiveness. While part of the failure can be explained by Ontario not focusing enough on reducing and reusing waste, diverting organics through composting programs, enforcing standards for what counts as recycling, and diverting industrial, institutional, and commercial waste (Environmental Commissioner of Ontario,

2017), my study suggests that the poor design of the actual recycling programs may also be a contributing factor. While the new Waste Act is right to focus on previously overshadowed areas within waste diversion, there is still a place for recycling in diverting waste, and so it is still important that these recycling programs are designed in a way that will optimize participation and diversion in the future. The results of my study show the areas of improvement for the Niagara Region's recycling program, but there are many other municipal recycling programs that would benefit from the same type of analysis.

6.0 Conclusion and Recommendations

This study began as a desire to improve the problem of waste production, which is having major negative environmental impacts both globally (Kaza et al., 2018; UN Environment, 2019), and in our own communities here in Ontario (Environmental Commissioner of Ontario, 2017). As a recent report from the Environmental Commissioner of Ontario declared, "Ontario has a waste problem. For decades, the Ontario government has pledged to tame this problem. But despite ambitious targets and seemingly widespread recycling, diversion rates have stagnated and the mountain of waste continues to grow" (Environmental Commissioner of Ontario, 2017, p. 4). While there are many aspects to diverting waste, there is evidence that recycling is one of the easiest behaviours to change (Nisa et al., 2019), and that it can lead to positive environmental impacts (Larson et al., 2015; Tabi, 2013; Thøgersen, 1999). Since most waste management services are planned and administered locally (Kaza et al., 2018), it made sense to focus on recycling in the local context, and I chose to focus on the Niagara Region because of the potential for improvement in waste diversion, as well as because the region has demonstrated a commitment to improvement by making changes to their waste diversion programs (Niagara Region, n.d.-a; Niagara Region, 2019).

After determining that I could best contribute to alleviating the problem of waste production by focusing on recycling in the Niagara Region, the purpose of this study became to examine recycling as a pro-environmental behaviour, in order to better understand how recycling rates could be increased in the Niagara Region. The first objective was to use my findings from the literature review on factors that are associated with influencing recycling and the effective interventions that promote recycling behaviours to develop a framework for evaluating the Niagara Region's residential curbside recycling program. The second objective was to use the framework to evaluate the Niagara Region's residential curbside recycling program to see if, and to what extent, they have designed the program in a way that will increase recycling.

In order to achieve my purpose and objectives, I conducted an extensive literature review in order to identify factors associated with influencing recycling and effective interventions for promoting recycling. My literature review demonstrated that while recycling may be one of the easiest pro-environmental behaviours to change (Nisa et al., 2019), there are still several factors that have been found to influence recycling, and interventions that have been found to be effective at promoting recycling behaviours, and navigating these factors and interventions to successfully increase recycling rates is still a complicated task. Furthermore, while there has been a significant amount of research on both influential factors and effective interventions, these bodies of research have largely remained separate from each other (Varotto and Spagnolli, 2017). Most studies on underlying determinants, factors, and correlates have not indicated effective interventions to change the behaviours, and most studies on interventions have not referenced theory or underlying factors (Varotto & Spagnoli, 2017).

After conducting the literature review, I used the findings to develop an evaluation framework, which was used as a basis for evaluating the Niagara Region's recycling program. I conducted a program theory and design evaluation by coding several decision-making and online media materials produced by the Niagara Region from 2016 to 2021, in order to determine whether or not, and to what extent, effective

intervention strategies were being considered and used by the Niagara Region to increase recycling. In following these methods, I found several strengths and weaknesses in the design of the program, which are summarized in Table 6.1.

Table 6.1. Evaluation of the Niagara Region’s residential curbside recycling program based on my evaluation framework

THEME	STANDARD	ACHIEVEMENT STATUS 0=NO, 1=YES	TOTAL SCORE
Inclusion of Effective Interventions	The program includes the following six intervention types:		5/6
	• Prompts and Information	1	
	• Environmental Alterations	1	
	• Incentives	1	
	• Feedback	1	
	• Social Modelling	1	
Relative Use of Effective Interventions	The program utilizes interventions in the following ways:		2/5
	• Social Modelling is one of the most commonly used interventions	0	
	• Environmental Alterations is one of the most commonly used interventions	1	

	<ul style="list-style-type: none"> Prompts and Information is one of the least commonly used interventions 	0	
	<ul style="list-style-type: none"> Incentives is one of the least commonly used interventions 	0	
	<ul style="list-style-type: none"> Feedback is one of the least commonly used interventions 	1	
Magnitude of Interventions	The development stages of interventions are represented in the following ways:		1/3
	<ul style="list-style-type: none"> Several interventions have been implemented 	1	
	<ul style="list-style-type: none"> At least as many interventions have been committed to as have been implemented 	0	
	<ul style="list-style-type: none"> At least as many interventions have been considered as have been implemented 	0	
OVERALL SCORE			8/14

The program is strengthened by its use of five out of the six effective interventions used in the evaluation framework, but is weakened by the complete absence of commitment interventions. While the inclusion of the six intervention types is important for increasing the effectiveness of the recycling program, the relative use of the intervention types is also important. While the program succeeds in its utilization of environmental alterations as one of the most commonly used interventions and the low reliance on feedback interventions, the program limits its effectiveness by overutilizing prompts and information and incentives, while underutilizing social modelling

interventions. In terms of the magnitude of interventions, the program has done a good job of implementing several interventions, but is weakened by committing to and considering way fewer interventions than have been implemented. Therefore, the overall finding is that the program is currently designed in a way that is likely to lead to limited effectiveness.

6.1 Recommendations

On the basis of my results, I have come up with six recommendations for the Niagara Region to follow in planning their next Blue Box Plan, which can be seen in Table 6.2. My hope is that by identifying these areas of improvement, the Niagara Region will be able to build upon the strengths in the recycling program to become even more effective at diverting waste.

Table 6.2. Recommendations for the Niagara Region to increase the effectiveness of their residential curbside recycling program

Recommendations
<p>1. Social modelling interventions have been found to be the most effective intervention for increasing recycling (Varotto and Spagnolli, 2017), and yet are one of the least commonly used interventions in the region’s recycling program. Therefore, the Niagara Region should consider increasing the use of social modelling interventions, such as using block leaders to “model recycling behavior and to inform and convince the non-recycling members to participate in their turn (Varotto and Spagnolli, 2017, p. 172) or using any other interventions based on the “passing of information via demonstration or discussion in which the initiators indicate that they personally engage in the behavior, also” (Osbaldiston and Schott, p. 272).</p>
<p>2. Prompts and information have been found to be much less effective than social modelling and environmental alterations (Varotto and Spagnolli, 2017), and yet prompts and information interventions are used six times more often than environmental alterations and almost forty times more often than social modelling interventions in the region’s recycling program. Therefore, the Niagara Region should consider decreasing their reliance on prompts and information as interventions for encouraging recycling.</p>
<p>3. While commitments have been found to be less effective than other intervention types, they still have a significant effect on recycling behaviours, and are more effective than the feedback interventions currently used by the region (Varotto and Spagnolli, 2017). Therefore, the Niagara Region should at least research and consider utilizing some sort of commitment-based intervention(s) within the residential curbside recycling program.</p>
<p>4. Incentives have been found to be much less effective than environmental alterations (Varotto and Spagnolli, 2017), and so it is positive to see that they are utilized much less often than environmental alterations, and represent a single “Recycle and Win” intervention. However, social modelling is also represented by a single intervention (the Eco-Ambassador Program), and yet appeared almost four times less in materials produced by the Niagara Region. This suggests that the region is currently discussing and promoting incentives much more often than social</p>

modelling, and therefore, the Niagara Region should aim to dedicate at least as much time and effort promoting social modelling interventions as incentives.

5. In order to design effective interventions, it is important to conduct prior research and choose intervention types that have been shown to be effective in past research. This study found that the region has implemented many more interventions than have been committed to or considered, and this suggests that many interventions are not being adequately researched and planned for before being implemented. Therefore, the Niagara Region should work to conduct more research and planning before implementing interventions, in order to ensure that the chosen interventions are based on evidence.

6. While it is important to turn to theory and peer-reviewed studies when planning interventions, it is also important to design interventions based on the benefits and barriers unique to the community implementing the interventions. Therefore, the Niagara Region should conduct a study or survey on the benefits and barriers that residents identify with recycling in the Niagara Region, and use this information when designing future interventions.

Besides the practical usefulness of my results for the Niagara Region, my study also uncovered some important insights regarding the previous body of recycling studies conducted and the future of recycling research. Based on the results of my literature review and program evaluation, I present four recommendations for future research on recycling. As discussed previously, research on the underlying factors that influence recycling has largely been carried out separately from research describing and testing interventions for increasing recycling (Varotto and Spagnolli, 2017). While valuable findings have come out of both bodies of research, studies looking at influential factors could be improved by discussing how to utilize the factors in interventions, while studies testing interventions could be improved by incorporating underlying motivational, contextual, and socio-demographic factors that have been shown to influence recycling. Therefore, I recommend that future research aim to combine the findings from both approaches to recycling in order to better understand how to promote recycling behaviours.

My second recommendation is to conduct more program evaluations and assessments of municipal recycling programs, especially within Ontario. While trying to compare my results to other studies, it became apparent that program evaluations of municipal recycling programs are severely lacking. In order to determine if recycling programs are being designed effectively, future studies should aim to assess the strengths and weaknesses associated with other municipal recycling programs' utilization of interventions. By determining whether or not the majority of recycling programs in Ontario are using effective interventions, it would be easier to determine whether or not the poor design of recycling programs has been a contributing factor to the poor waste diversion rates in Ontario over the past few decades. This research would also be helpful in determining whether or not the Niagara Region is utilizing interventions in a unique or more common way.

My third recommendation is that future research should focus on identifying and assessing the relative effectiveness of interventions being used by municipal recycling programs that are focused on less often in intervention studies. For example, additional

research should be conducted on disincentives and bylaws, since very few recent studies have tested them in the recycling context. Research should aim to identify and assess the relative effectiveness of additional alternative interventions to the six intervention types focused on in this study that other recycling programs may be using.

My fourth recommendation is that future research should assess the interventions utilized by the Niagara Region throughout the previous Blue Box Plan. This study should aim to determine if interventions that were implemented between 2016 and 2021 were discussed and considered during the previous Blue Box Plan. This evaluation would be able to address the concern from this study that very few interventions were planned for and considered in depth before being implemented during the current Blue Box Plan.

While improving recycling programs will not be enough on its own to decrease waste diversion to a sustainable level, recycling should still be included in the arsenal of solutions used to manage waste. So while it is positive to see that Ontario is shifting the focus of waste diversion to waste reduction and reuse, prioritizing the management of IC&I waste and organic waste, and shifting responsibility of waste management to producers, recycling programs still need to be designed to maximize participation and effectiveness, and municipalities will continue to have a role in planning, implementing, and promoting these programs. Therefore, I hope that this study will be useful in informing both the Niagara Region's recycling program and the future of recycling research, and that Ontario is able to make improvements to waste diversion going forward.

7.0 References

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10.0 Appendices

10.1 Appendix A: Coding Manual

Table 10.1. Coding manual used during the content analysis of materials

Category	Code	Description	Examples
Intervention	Social Modelling	<ul style="list-style-type: none"> • Description or embodiment of BOTH the following criteria: <ul style="list-style-type: none"> ○ Information promoting recycling or explaining how, when, or why to recycle being communicated to others through a discussion or demonstration ○ An indication being made by the speaker/author/initiator that he or she also engages in the recycling behaviour being communicated 	<ul style="list-style-type: none"> • Recruitment of active recyclers as block/neighbourhood/ • community leaders who act as role models and provide information and support to other people in the neighbourhood (Varotto & Spagnolli, 2017) • Public or virtual demonstrations, discussions, or sharing of personal experiences
	Environmental Alterations	<ul style="list-style-type: none"> • Description or embodiment of changes to the physical environment being considered, planned or implemented, including the provision, number, design, or location of bins, or the sorting, drop-off or collection process of recyclables 	<ul style="list-style-type: none"> • Providing bins or home equipment for sorting waste to residents • Changing the bins' design or appearance • Decreasing the distance people have to bring their bins

		<ul style="list-style-type: none"> As long as the first criteria is met, the inclusion of different forms of the following terms and phrases: Change, modify, adjust, increase, decrease, rather than....this will happen 	<ul style="list-style-type: none"> Modifying the schedule, frequency, or process for curbside recycling pick-up
	Prompts and Information	<ul style="list-style-type: none"> Description or embodiment of the provision of information or reminders that either promote recycling or explain how, when, or why to recycle WITHOUT any focus on acknowledging that the speaker/author/initiator also engages in recycling OR without providing specific recycling feedback on constituents' recycling habits As long as the first criteria is met, the inclusion of different forms of the following terms and phrases in the information being communicated or in the title, heading, description, or introduction to the information being communicated: Details, information, tips, see, find, find out, understand, learn, do/did you know, you can do this/should do this, to do this...do this, this should be/must be/is required to be done, where to, how to, don't forget 	<ul style="list-style-type: none"> Information communicated through the following media: Signs, posters, brochures, videos, figures, diagrams, presentations, interactive games, demonstrations, web pages

	Commitment	<ul style="list-style-type: none"> • Description or embodiment of encouraging people to make a verbal or written commitment or goal in regards to participating in the curbside recycling program or increasing recycling efforts, either in a group or individual-based setting • As long as the first criteria is met, the inclusion of different forms of the following terms and phrases: Goal, pledge, commit, set, agree, vow, aim, intend, I will... 	<ul style="list-style-type: none"> • Encouraging people to complete a pledge • Encouraging people to set goals
	Incentives	<ul style="list-style-type: none"> • Description or embodiment of monetary rewards or other benefits being provided to people for participating in recycling behaviour • As long as the first criteria is met, the inclusion of different forms of the following terms: Earn, win, save, receive, qualify for, obtain, attain, collect, reward, gift, prize, contest, lottery, coupon, ticket, refund, discount, dollars 	<ul style="list-style-type: none"> • Provision of monetary rewards, gifts, prizes, lottery tickets, or discount coupons • Refund and unit pricing programs
	Feedback	<ul style="list-style-type: none"> • Description or embodiment of BOTH the following criteria: <ul style="list-style-type: none"> ○ Information and/or data representing current or recent recycling rates and/or progress at the individual, household, neighbourhood or 	<ul style="list-style-type: none"> • Feedback (current or recent recycling rates and/or progress along with a predefined standard) provided through websites, social networking sites, newsletters,

		<p>community level being communicated to constituents</p> <ul style="list-style-type: none"> ○ Information and/or data on a predefined recycling standard being communicated to constituents as a comparison with their own recycling rates and/or progress 	<p>leaflets, computer programs, mobile phones, or other displays</p>
Magnitude of Intervention	Considered	<ul style="list-style-type: none"> ● Description or embodiment of interventions being introduced, mentioned, researched, and/or considered but not planned for or committed to ● As long as the first criteria is met, the following three criteria may be used: <ul style="list-style-type: none"> ○ The inclusion of different forms of the following words and phrases: Considering, looking at, researching, possible, option, other municipalities have done _____, ○ The exclusion of words and phrases that imply an intention to commit to or implement an intervention including the following: Plan, intend, commit, we will be/are going to be..., implemented, changed, updated, revised, in place, since this date...., began 	<ul style="list-style-type: none"> ● Within decision-making materials, an intervention being discussed or mentioned as a possible solution or option to improve recycling rates ● Within decision-making materials, an intervention that other municipalities have used or that a report has included being introduced or discussed ● Discussions, meetings, reports or surveys where council members, stakeholders, and/or members of the public are being asked to provide feedback on an intervention as an option

		<ul style="list-style-type: none"> ○ The exclusion of future dates, future plans, past dates, or implementation details when describing interventions 	
	Committed	<ul style="list-style-type: none"> ● Description or embodiment of interventions being decided upon, planned for, or committed to, but not yet implemented ● As long as the first criteria is met, the following three criteria may be used: <ul style="list-style-type: none"> ○ The inclusion of different forms of the following words and phrases: Plan, intend, commit, we will be/are going to be... ○ Inclusion of dates or future plans for interventions ○ Exclusion of words and phrases that imply the intervention has already been implemented (eg. Past tense words and phrases such as implemented, changed, updated, revised, in place, since this date...., began, etc.) 	<ul style="list-style-type: none"> ● Within online media materials, a notice of the commitment decision ● Within decision-making materials or online media materials, details and/or plans for the intervention planning process and implementation
	Implemented	<ul style="list-style-type: none"> ● Description or embodiment of interventions having already been implemented or put into place, even on a trial-basis ● As long as the first criteria is met, the following two criteria may be used: 	<ul style="list-style-type: none"> ● Within online media materials, an intervention being utilized in practice (eg. Prompts and information being communicated, a pledge being shared, rewards being given out etc.)

		<ul style="list-style-type: none"> ○ The inclusion of different forms of the following past-tense words and phrases: Implemented, changed, updated, revised, in place, since this date...., began ○ The inclusion of past dates and/or details regarding when and/or how interventions were implemented 	<ul style="list-style-type: none"> ● Within decision-making materials and online media materials, details or information about an intervention that is in place including what the intervention entails, how to participate in/utilize the intervention, or why the intervention is important
	Undetermined	<ul style="list-style-type: none"> ● Description or embodiment of BOTH the following criteria: ● Description or embodiment of interventions where it is unclear whether the intervention is being considered, committed to, or implemented ● The description or embodiment of the intervention does not meet the primary criteria for any of the other three magnitude of intervention codes 	<ul style="list-style-type: none"> ● Within decision-making materials and online media materials, describing or referring to an intervention without providing context or intentions ● Briefly describing or mentioning an intervention (eg. that another municipality has utilized) without discussing pros and cons or connecting it back to the Niagara Region

10.2 Appendix B: Coding Schedule

Table 10.2. Coding Schedule used to record important administrative information about materials

Data Item Number	Title	Date Published	Decision Making or Online Media Material	Specific Type of Material	Source	Link
1	Twitter Post 1	October 19, 2016	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/788751308119482368
2	Twitter Post 2	October 19, 2016	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/788812209409265664
3	Twitter Post 3	April 18, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/854430052485910528
4	Twitter Post 4	April 21, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/855475884786155520
5	Twitter Post 5	May 2, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/859418703921692675
6	Twitter Post 6	May 4, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/860148765956734978
7	Twitter Post 7	May 11, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/862821877021949952
8	Twitter Post 8	May 23, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/867069474352050176

9	Twitter Post 9	May 25, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/867806304320016384
10	Twitter Post 10	June 2, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/870719188012220416
11	Twitter Post 11	June 6, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/872099590627106816
12	Twitter Post 12	June 13, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/874621880707170304
13	Twitter Post 13	June 15, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/875497150502907905
14	Twitter Post 14	June 22, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/877893189226569729
15	Twitter Post 15	June 27, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/879712188298133504
16	Twitter Post 16	July 21, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/888469142403031040
17	Twitter Post 17	April 10, 2018	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/983768743296864263
18	Twitter Post 18	June 8, 2018	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1005140902354927617
19	Twitter Post 19	November 21, 2018	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1065314994563284992

20	Twitter Post 20	May 29, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1133761163315912705
21	Twitter Post 21	August 23, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1164952944485289985
22	Twitter Post 22	August 27, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1166338531477852163
23	Twitter Post 23	September 25, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1176907716792672256
24	Twitter Post 24	October 1, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1179055871545856002
25	Twitter Post 25	October 3, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1179810846156808192
26	Twitter Post 26	October 15, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1184190454880845824
27	Twitter Post 27	November 15, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1195436015466504192
28	Twitter Post 28	November 18, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1196527244941963265
29	Twitter Post 29	November 21, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1197552753754529792
30	Twitter Post 30	December 3, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1201908958920732672

31	Twitter Post 31	December 5, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1202603534492921863
32	Twitter Post 32	October 18, 2016	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/788403204954480640
33	Twitter Post 33	April 18, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/854349123662774272
34	Twitter Post 34	April 20, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/855120109026902017
35	Twitter Post 35	May 9, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/861946865344020481
36	Twitter Post 36	May 16, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/864544075789324288
37	Twitter Post 37	May 18, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/865224806832230402
38	Twitter Post 38	May 30, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/869710517463650305
39	Twitter Post 39	June 8, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/872833598436651008
40	Twitter Post 40	June 20, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/877219246274629633
41	Twitter Post 41	June 29, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/880508166055833601

42	Twitter Post 42	January 15, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1085233189071798272
43	Twitter Post 43	May 22, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1131224449263513601
44	Twitter Post 44	June 5, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1136291587229569024
45	Twitter Post 45	June 21, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1142120454301388800
46	Twitter Post 46	June 25, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1143518961000210432
47	Twitter Post 47	July 16, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1151203344142049285
48	Twitter Post 48	July 23, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1153661242768351233
49	Twitter Post 49	July 30, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1156251860296065024
50	Twitter Post 50	August 6, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1158812483148288007
51	Twitter Post 51	August 13, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1161272441991073793
52	Twitter Post 52	August 23, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1164969553467781124

53	Twitter Post 53	September 13, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1172510772804685824
54	Twitter Post 54	September 17, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1174016163581317120
55	Twitter Post 55	September 19, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1174688594574884864
56	Twitter Post 56	October 9, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1181945159774175232
57	Twitter Post 57	November 19, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1196858176328654848
58	Twitter Post 58	November 26, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1199357143662518272
59	Twitter Post 59	November 28, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1200081923210665985
60	Twitter Post 60	December 10, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1204426797569363968
61	Twitter Post 61	January 17, 2020	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1218171514048196610
62	Twitter Post 62	May 22, 2020	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1263884832318337025
63	Twitter Post 63	April 15, 2016	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/721037424843993089

64	Twitter Post 64	March 17, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/842732256280174592
65	Twitter Post 65	July 21, 2017	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/888469073432113152
66	Twitter Post 66	April 9, 2018	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/983346544689627136
67	Twitter Post 67	October 5, 2018	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1048237144169492485
68	Twitter Post 68	April 16, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1118136964308447233
69	Twitter Post 69	May 1, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1123599995402321920
70	Twitter Post 70	May 8, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1126147244741287936
71	Twitter Post 71	May 15, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1128710382527188993
72	Twitter Post 72	July 10, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1148970248198131714
73	Twitter Post 73	September 3, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1168909766363504640
74	Twitter Post 74	September 4, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1169331797311836161

75	Twitter Post 75	October 10, 2019	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1182362409207513088
76	Twitter Post 76	June 19, 2020	Online Media	Twitter Post	Twitter	https://twitter.com/NiagaraRegion/status/1273999479268495361
77	Recycling Matters! Episode 1 - Aerosol Cans	May 1, 2019	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=_yF_LmclU50
78	Recycling Matters! Episode 2 - Stretch Test	May 8, 2019	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=fqw-E3_AzHA
79	Recycling Matters! Episode 3 - Stuff Tie and Toss	May 15, 2019	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=5B1bz2fqQYk
80	Recycling Matters! Episode 4 - Pop and Water Cases	May 22, 2019	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=egi7MY-F_uc

81	Recycling Matters! Episode 5 - Propane Cylinders	May 29, 2019	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=xOL-yNNIAto
82	Recycling Matters! Episode 6 - Newspapers in Sleeves	June 5, 2019	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=iNE1pUAJ1uo
83	Recycling Matters! Episode 7 - Liquids in containers	August 27, 2019	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=Pc2ZVTzGlk8
84	Niagara Recycling - Where does it go?	November 23, 2020	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=vSjXgiumKkg
85	Niagara Recycling - What shouldn't go in	November 23, 2020	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=ZRBIBKhNC2k

	your Blue and Grey Boxes					
86	Niagara Region is making changes to waste collection	October 2, 2020	Online Media	YouTube Video	YouTube	https://www.youtube.com/watch?v=-JUnJ5Es3HQ
87	Niagara Region Waste App	2020	Online Media	App	Garbage, Recycling and Organics section of website	https://apps.apple.com/app/id1523757894
88	GRO webpage 1	NA	Online Media	Webpage	Garbage, Recycling and Organics Section of website	https://www.niagararegion.ca/waste/default.aspx
89	GRO webpage 2	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/collection/schedule/default.aspx
90	GRO webpage 3	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/containers/container-locations.aspx

91	GRO webpage 4	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/containers/acceptable-containers.aspx
92	GRO webpage 5	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/containers/buy-recycling-organics-containers.aspx
93	GRO webpage 6	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/COVID-changes.aspx
94	GRO webpage 7	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/collection/items/default.aspx?sublanding=1
95	GRO webpage 8	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/collection/items/blue-box.aspx
96	GRO webpage 9	NA	Online Media	Webpage	Garbage, Recycling and	https://www.niagararegion.ca/waste/sorting-your-recycling-matters.aspx

					Organics section of website	
97	GRO webpage 10	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/disposal/items/odd-couple-plastic-bags-grey-box.aspx
98	GRO webpage 11	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/containers/damaged-boxes.aspx
99	GRO webpage 12	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/colletion/items/grey-box.aspx
100	GRO webpage 13	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/containers/apartments.aspx
101	GRO webpage 14	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/containers/default.aspx

102	GRO webpage 15	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/presentations/default.aspx
103	GRO webpage 16	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/presentations/request-form.aspx
104	GRO webpage 17	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/collection/services.aspx
105	GRO webpage 18	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/presentations/recycle-and-win/default.aspx
106	GRO webpage 19	NA	Online Media	Webpage	Garbage, Recycling and Organics section of website	https://www.niagararegion.ca/waste/collection/apartments.aspx
107	WMPSC-C 3- 2016 Memorandum	February 1, 2016	Decision- Making	Memorandum	WMPSC-C 3- 2016	https://www.niagararegion.ca/government/committees/wmac/pdf/2016/wmpsc-c-3-2016%20-%20memorandum.pdf

	on 2016 Social Marketing and Education Plan and Overview of 2015 Initiatives					
108	2014 Waste Management Benchmarking and Performance Monitoring Report	July 11, 2016	Decision-Making	Report	WMPSC-C 32-2016	https://www.niagararegion.ca/council/subcommittee/SubCommittee%20Documents/2016/WMPSC-agenda-july-11-2016.pdf
109	WMPSC-C 48-2016 Memorandum on Multi-Residential Eco-Ambassador Volunteer Program	September 12, 2016	Decision-Making	Memorandum	WMPSC-C 48-2016	https://www.niagararegion.ca/council/subcommittee/SubCommittee%20Documents/2017/WMPSC-agenda-jan-23-2017.pdf

110	2016 – 2021 Blue Box Program Plan	January 23, 2017	Decision- Making	Plan	WMPSC-C 1- 2017	https://www.niagararegion.ca/council/subcommittee/SubCommittee%20Documents/2017/WMPSC-agenda-jan-23-2017.pdf
111	WMPSC-C 8- 2017 Appendix C: Details of Social Marketing and Education Planned for 2017	January 23, 2017	Decision- Making	Report	WMPSC-C 8- 2017	https://www.niagararegion.ca/council/subcommittee/SubCommittee%20Documents/2017/WMPSC-agenda-jan-23-2017.pdf
112	Appendix A: Details of 2016 Promotion and Education Outreach	January 23, 2017	Decision- Making	Report	WMPSC-C 8- 2016	https://www.niagararegion.ca/government/committees/wmac/pdf/2017/wmpsc-c-8-2017-appendix-a.pdf
113	Memorandum on Waste Management Advisory Committee Members	April 26, 2017	Decision- Making	Memorandum	WMAC 2-2017	https://www.niagararegion.ca/government/committees/wmac/pdf/2017/Memo-WMAC-Suggestions-Summary-and-Results.pdf

	Suggestions and Updates					
114	Appendix A: Details of 2017 Promotion and Education Outreach	January 22, 2018	Decision-Making	Report	WMPSC-C 6-2018	https://www.niagararegion.ca/government/committees/wmac/pdf/2018/WMPSC-C-6-2018-Appendix-A.pdf
115	Appendix C: Details of Social Marketing and Education Planned for 2018	January 22, 2018	Decision-Making	Report	WMPSC-C 6-2018	https://www.niagararegion.ca/government/committees/wmac/pdf/2018/WMPSC-C-6-2018-Appendix-C.pdf
116	Stakeholder Consultation and Engagement on Proposed Collection Service Changes for Next	March 19, 2018	Decision-Making	Report	WMPSC-C 9-2018	https://www.niagararegion.ca/council/Council%20Documents/2018/WMPSC-agenda-march-19-2018.pdf

	Collection Contract					
117	WMPSC-C 18-2018 Memorandum on Recycling of Black Plastics in Niagara Region	April 30, 2018	Decision-Making	Memorandum	WMPSC-C 18-2018	https://www.niagararegion.ca/government/committees/wmac/pdf/2018/WMPSC-C-18-2018.pdf
118	WMPSC C 2-2019 Appendix A: Details of 2018 Promotion and Education Outreach	Feb. 25, 2019	Decision-Making	Appendix	WMPSC 2-2019 Agenda	https://pub-niagararegion.escribemeetings.com/filestream.ashx?DocumentId=2054
119	Appendix C: Details of Social Marketing and Education Planned for 2019	February 25, 2019	Decision-Making	Report	WMPSC C 2-2019	https://www.niagararegion.ca/government/committees/wmac/pdf/2019/WMPSC-C-2-2019-Appendix-C.pdf

120	WMPSC-C 16-2019: Proposed Curbside Waste Diversion Container Distribution Program	April 29, 2019	Decision-Making	Report	WMPSC-C 16-2019	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=3269
121	WMPSC-C 24-2019 Memorandum on "Recycling Matters" Awareness Campaign	June 24, 2019	Decision-Making	Memorandum	WMPSC-C 24-2019	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=4201
122	WMPSC-C 31-2019 Memorandum on Multi- Residential Eco- Ambassador	August 26, 2019	Decision-Making	Memorandum	WMPSC-C 31-2019	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=5140

	Program Update					
123	Curbside Waste Diversion Container Distribution Options for Every-Other-Week (EOW) Garbage Collection	November 5, 2019	Decision-Making	Presentation	PWC 11-2019 Agenda	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=6275
124	PWC-C 14-2020: Memorandum on Overview of the Communications Strategy and Public Education Campaign for the Collection	June 16, 2020	Decision-Making	Memorandum	PWC 5-2020 Agenda	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=9370

	Service Level Changes					
125	Web and Mobile Waste Application	September 8, 2020	Decision-Making	Presentation	PWC 8-2020 Final Agenda	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=11133
126	PWC-C 29-2020: Memorandum on Update on Public Education Campaign and Contract Implementation	September 8, 2020	Decision-Making	Memorandum	PWC 8-2020 Final Agenda	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=11127
127	PWC-C 38-2020: Update on Public Education Campaign and Contract Implementation	October 13, 2020	Decision-Making	Memorandum	PWC 9-2020 Final Agenda	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=11778

128	BOX IT. BIN IT. SORT IT. - Campaign Overview	January 12, 2021	Decision- Making	Presentation	PWC 1-2021 Agenda	https://pub-niagararegion.escribemeetings.com/files/tream.ashx?DocumentId=13694
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