Report for Divert Nova Scotia

Litter Behaviour Research Findings

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DAVIS PIER

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Executive Summary

Litter is a persistent challenge in Nova Scotia that has direct and indirect negative effects on the well-being of the province. Research has been conducted to gain a clearer understanding of litter behaviour, to identify successful litter reduction strategies, and to identify potential interventions to reduce litter in Nova Scotia. The project focused on applying behavioural insights (BI) to study littering in the province. BI refers to the application of behavioural science, which is the study of understanding, influencing, and predicting human behaviour. It combines parts of psychology, economics, sociology, and neuroscience

Literature Review
The literature review indicated that the tendency to litter can be explained by a set of individual and behavioural factors such as, demographic profile, social network, space perception, laziness, perceived anonymity, negative affect, ignorance, sense of community, and unconscious behaviour. Note however, that there is no consensus that littering rates can be predicted by either age or gender. Situational and environmental factors such as, contagion heuristic, bin infrastructure, and area cleanliness, also contribute to littering behaviour.

In terms of addressing littering, it has been reported that multi-channel media campaigns were successful in reducing littering behaviours. However, the long-term effect of media campaigns remains unclear. Littering has also been examined using experimental methods. Successful interventions in the jurisdictions reviewed, adopted designs that involved some level of modelling behaviour such as, community members taking ownership of littered spaces – particularly for cigarette butt litter.

There is mixed reporting on the long-term effectiveness of fines in reducing littering behaviour. One program that issues fines has reported its effectiveness in reducing roadside litter (i.e., Report a Tosser). However, other findings cast doubt on the long-term effectiveness of fines due to factors such as, difficulty of enforcement, high cost of implementation, low likelihood of getting caught, poor public perception of fine programs, and limitations with research methods.

Qualitative Research
Qualitative research was conducted with 20 people connected to litter in the province. This included a variety of stakeholders from provincial government departments, municipalities, community groups, business associations, and the restaurant industry. Primary research with litterers was dismissed as an option given the reality that information collected may be fraught with bias.

The research conducted identified a series of findings to understand the behaviour of litters in Nova Scotia and inform how BI may be used to influence the behaviour.

- The demographical profile of a litterer may be less relevant than the situational factors that contribute to littering behaviours.

- People litter mostly because of a combination of convenience (or the inconvenience not to), anonymity, apathy, and herd mentality.

- Some of the most highly littered areas identified are near fast-food restaurants and a relative perimeter around them, park & ride lots, highway on and off ramps, anywhere people congregate, and walking trails

- Smoking areas are prone to cigarette butt litter. Anti-smoking rules may prevent access to disposal bins.

- People litter at all times of the day and year and while there are inferred trends, the behaviour is driven more by situational factors than timing.

- Policy related efforts, primarily regulations/bylaws, fines, reporting, compliance, and surveillance are necessary, but have little impact on reducing littering behaviour.

Behavioural Analysis
A behavioural analysis was undertaken which diagnosed the behavioural biases which are hypothesised to contribute to littering behaviour. These biases were identified through the existing scientific literature, as well as consultation with Nova Scotian stakeholders. These behavioural factors are important to understand the behavioural phenomena which result in littering, and to design interventions which target the factors most likely to result in sustainable behavioural change. The behavioural biases identified broadly relate to four categories: social influence, individual factors, bin infrastructure and fines. We identify, define and outline how each of these behavioural factors are likely to contribute to littering behaviour.

Interventions
This report outlines a range of options for behaviourally informed interventions designed to mitigate littering behaviour. These interventions are divided into two key categories: litter receptacle infrastructure and behavioural messaging. Litter receptacle infrastructure interventions are designed to influence littering behaviour using changes to physical infrastructure of receptacles, such as visual features, locations and surrounding features. Behaviourally informed messaging refers to interventions which target the behavioural biases that are hypothesised to contribute to littering. The report outlines a range of options for testing these interventions using experimental methods, as well as related case studies from different jurisdictions.

1. Introduction

Litter is a problem in most jurisdictions around the world and Nova Scotia is no exception. The problem is societal, long-standing, ongoing, and difficult to combat. Litter is often recognized as an aesthetic issue and it is, but its impacts are more than visual – litter negatively affects the environment, people's health, and the economy, and has numerous ripple effects within each. For example:

- The environment is fragile and even small-scale litter, especially those with chemical contaminants, can affect localized water and soil quality.

- Negative impacts on the environment have negative impacts on the health of constituents, that are indirect, invisible, subtle, and contribute minorly to chronic issues rather than acute ones.

- Litter is expensive – it is costly to manage litter and has subtle and indirect influences over economic measures like tourism, community investment, and general well-being of residents and visitors.

Reducing litter of all types is a challenge. Divert NS recognized an opportunity to explore the behaviour of litterers to better understand them – who they are, why the litter, where, and when – and consider how to influence that behaviour. In the fall of 2021, Divert NS contracted Davis Pier Consulting to conduct a research project on the subject. The initiative was a follow-up to the 2021 Roadside Litter Audit and looked to apply behavioural science to better understand the challenge and explore how to combat it. Based on audit findings, Davis Pier was directed by Divert NS to focus the research on four specific waste categories: fast-food packaging, coffee cups, cigarette butts, and alcohol containers.

Behavioural insights is a term for the application of behavioural science, which is the study of understanding, influencing, and predicting human behaviour. Behavioural science is a relatively new field that combines parts of psychology, economics, sociology, and neuroscience. The term behavioural insights (BI) most often refers to the application of the behavioural science field within a public policy context. The general premise of BI is that humans do not always make logical decisions, but our illogical behaviour is predictable. Our decision-making and subsequent behaviour is much more influenced by instinct and automatic reaction than rational analysis. We are influenced by numerous, scientifically proven cognitive biases. The application of BI to address the problem of litter was identified as an opportunity to pursue.

The research project was conducted in four phases:

1. **Literature review**: What could be learned through secondary research of other jurisdictions around the world on their analysis of litter behaviour?

2. **Qualitative research**: What could be learned about the provincial contexts of litter by talking to stakeholders in a variety of roles connected to litter in Nova Scotia?

3. **Analyze Behaviours**: Use the literature and research conducted to assess the behaviour of litterers and identity behavioural biases that may contribute to littering and which could be influenced.

4. **Design Interventions**: Based on the research and analysis, several interventions to reduce littering behaviour are proposed and recommended to be rolled out as experiments for testing.

2. Literature Review

This literature review focused on synthesising academic, applied, and grey literature, which explored and investigated factors affecting littering of public spaces, successful litter reduction strategies, and interventions. To capture a representative profile of relevant publications from a variety of sources, we used an electronic library to conduct a literature search that spanned a variety of major publishers such as, Taylor & Francis, Sage Journals, EBSCO, Wiley Online, Oxford Journals, SciFinder, and SIAM Journal Online. We also broadened our search to other journal indexing platforms such as, Google Scholar and the Social Science Research Network (SSRN). Our search strategy used keywords associated with concepts such as, littering, litter campaigns, and littering interventions. Following the returned results, our selection criteria was based on relevance with the research objective, review of abstracts, and the total number of citations. We further adopted a snowball method by evaluating forward and backward citations for pioneering literature. This approach yielded a set of literature, which were then reviewed and analysed exhaustively with the aim of gaining a clear understanding of underlying constructs, the investigated relationships between phenomena, and the boundary conditions. Based on our synthesis, we extracted a set of themes that encapsulate a common understanding of the state of research as presented in the following sections. We further discuss our insights from the literature and identify gaps with the research methods and/or findings.

2.1 Behavioural factors

Individual factors

A number of reports have stated that littering tends to occur more with younger males aged 30 and below compared to other gender and age-based demographic profiles. Also, people younger than age 30 litter more when they are in groups while those who are much older tend to litter more when they are alone (Lewis et al., 2009). Littering rates are reported to be higher for those with a lesser sense of community than those with strong community ties (Lewis et al., 2009). With respect to consumables, littering is much higher for those who consume tobacco products as they tend to dispose of cigarette butts along roadsides (Lyndhurst, 2012; New South Wales Environment Protection Authority, 2019; Schultz et al., 2013; Seligmann, 2018). Schultz et al. (2013) points out that of all the disposal strategies used by smokers, "drop with intent" was the most frequently used (35%). This was followed by flicking (27%) and stomping cigarette butts (27%).

Note, however, that Zero Waste Scotland (2013) and Lewis et al. (2009) are exceptions to reports that associate littering with a specific demographic profile. Rather, they state that younger males are more comfortable admitting that they litter (Zero Waste Scotland, 2013). As

mentioned above, group behaviour, which has otherwise been described as one's social network, is yet another factor attributed to higher littering rates (Lewis et al., 2009). Consequently, there have been interventions targeted at smokers, where cigarette receptacles have been placed proximally to smokers' locations, resulting in an 11% decrease in cigarette litter (Schultz et al., 2013).

Some reports have also indicated that littering rates are higher in urban compared to rural areas (e.g., Gershman, Brickner & Bratton Inc, 2005). Intentional littering tends to occur more often when people are among their peers and even more so, in areas that are already littered (Lewis et al., 2009). Based on an observational study, on occasions where members of the older population littered unintentionally, they admitted much less to littering compared to their younger counterparts, potentially due to a feeling embarrassment when discovered. Higher vehicle traffic in urban compared to rural areas may be a contributing factor to the level of littering in urban areas. As reported in Keep Britain Tidy (2009) cited in Lyndhurst (2012), littering from cars occurred more with commercial drivers compared to the general public.

Environmental factors

Two environmental factors that contribute to littering include bin infrastructure and area cleanliness. In the case of cigarette butts, they are likely to be littered in areas where concentrated smoking occurs and even more so when such areas lack cigarette receptacles.

There are a couple of points worth noting with respect to area cleanliness. The first point is, there is a tendency for people to litter when descriptive social norms have been established (Cialdini et al., 1990). Descriptive social norms refer to actual behaviours people observe in others as opposed to socially acceptable norms. In that light, a person who witnesses a group of colleagues stomp cigarette butts on the ground, is likely to imitate this behaviour as opposed to doing what may be considered socially accepted such as, making use of cigarette receptacles.[1]

The second point is that the tendency for people to litter at waste bins may be due to contagion heuristic (Nemeroff & Rozin, 1994). Particularly, negative contagion refers to the belief that when an uncontaminated object comes in contact with a contaminated object, properties of the contaminated object are permanently transferred to the uncontaminated object. Essentially, people are discouraged from disposing of waste in an appropriate manner due to a sense of contamination or even disgust associated with existing litter. In the classic Nemeroff & Rozin (1994) experiments, participants indicated refusal to drink water from a glass that had come in contact with a sterilised cockroach, based on the false belief that contamination had occurred. A different set of participants refused to wear a piece of cloth, which had previously

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[1] More details on interventions that compare the effect of descriptive versus injunctive social norms are in sub-section titled, "Interventions" below.

been worn by someone they did not like for the same false belief that it had been contaminated. Similarly, individuals trying to dispose of litter in a waste receptacle may do so from an unreasonable distance due to the contagion heuristic rather than getting close enough to bins. This may explain the poor state of area cleanliness around waste bins. Furthermore, littering due to contagion heuristic may be further worsened by the tendency for individuals to leave unintentional litter (Seligmann, 2018).

2.2 Campaigns

In terms of reducing littering, it has been reported that multi-channel media campaigns have been successful in reducing littering intentions and littering behaviour. Examples include campaigns such as, *'Are you a Tosser?'* and *'Don't be a Tosser',* which report campaign effectiveness using post-campaign surveys. Based on these post-campaign surveys, 68% of respondents indicated that the campaign influenced them to be less likely to litter while 80% indicated the campaign was effective in addressing litter prevention (New South Wales Environment Protection Authority, 2021). These campaigns demonstrate the power of leveraging social norms and social identity to influence littering behaviour.

Awareness programs in other jurisdictions have followed the same method by using post-campaign surveys to estimate campaign effectiveness (Gershman, Brickner & Bratton Inc, 2005; Lewis et al., 2009; Seligmann, 2018; McDonnell, 2021).[2] One exception is the *'Takeaway Trash'* campaign by Environmental Campaigns (ENCAMS), which claimed that there was a 35% reduction in littering rates in 2007 (Lewis et al., 2009). ENCAMS has also reported additional estimates such as a 23% and 33% littering reduction, following a campaign that used posters and portable ashtrays. However, as Lewis et al. (2009) noted, it is unclear how ENCAMS arrived at this estimate.

Based on post-campaign surveys, multi-channel campaigns seem to be effective at least in the short-term. There are, however, clear limitations to relying on post-campaign surveys to determine the effectiveness of campaigns. Otherwise stated, the literature under review does not clearly address the effectiveness of campaigns in the medium to long-term. For instance, for campaigns reported by New South Wales Environment Protection Authority (2021), it would have been more insightful if the results addressed whether behaviours returned to pre-campaign states, whether they remained stable over time, or whether littering rates continued to decrease in the long-term.

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[2] The Keep America Beautiful, 2020 National Litter Study (McDonnell, 2021) used a mix of approaches to reduce littering such as, awareness programs, remedial actions (i.e., clean ups), providing more bins and cigarette receptacles, and co-locating bins with cigarette receptacles. Similarly, the Adopt-a-Highway campaign combines awareness campaigns with remedial actions and reported a 9% to 15% decrease in littering at adopted sites (Gershman, Brickner & Bratton Inc, 2005).

2.3 Interventions

Other approaches have tested the effectiveness of interventions on littering rates using field experiments and quasi-experimental methods. Particularly prevalent in the literature are experiments that follow Cialdini et al.'s (1990) social norms framework. These authors argued that two types of social norms are at play in understanding littering behaviour: injunctive and descriptive. Injunctive norms refer to what people generally approve or disapprove while descriptive norms refer to what most people would actually do when they have litter. Importantly, in the minds of individuals, both norms are not always activated at a given time. Situational and environmental cues such as witnessing a person litter in an already littered parking garage could activate the descriptive norm to also litter as opposed to an injunctive norm to exercise more care for the environment. Conversely, witnessing a person who does not litter in a clean parking garage significantly reduces the tendency to litter. Cialdini et al. (1990) obtained empirical support for their theory on social norms across five experiments.

In a quasi-experimental setting, Sussman & Gifford (2013) extended the social norm framework to restaurant environments. Depending on the experimental condition, regular diners witnessed others properly dispose food waste and saw tabletop signs emphasising the benefits of proper waste disposal. The results showed that proper waste disposal was highest when diners also saw others properly disposing waste (57%) versus when they did not (43%). There was also a similar behavioural pattern when diners saw a tabletop sign and a model (34%) compared to when there was a tabletop sign but no model (19%). Although these results speak more to correct waste disposal than littering an environment, they are indicative of a seemingly consistent behaviour. That is, the human tendency to imitate behaviour extends to more conscious decisions, such as placing garbage in the correct waste receptacle.

On the other hand, it has been demonstrated that there are conditions where injunctive norms could also work (Hansmann & Scholz, 2003). The authors showed that when injunctive norms were combined with a polite appeal, cinema goers drew on higher and scarce cognitive resources by processing ambiguous information presented on cinema screens. This process led to a significantly higher rate of litter reduction. Note however, that this research may suffer from external validity limitations, given the interventions were conducted in highly controlled environments - cinemas. In other words, a sceptic could argue that similar results may not be obtained if messages constructed as injunctive norms combined with polite appeals, were presented as signposts on the streets, with higher littering rates. One reason is that in a cinema setting, an entire audience's attention is highly focused on the cinema screen in anticipation of deriving hedonic value from the movie. However, on the streets, passers-by may suffer from attention deficit due to cognitive overload from competing advertisements.

More recently, the New South Wales Environmental Protection Authority (2019) tested a set of manipulations aimed at reducing cigarette butt litter in Sydney, Australia. This set of manipulations were built into one treatment condition that emphasised injunctive norms. Specifically, smokers in New South Wales saw signs on butt bins and stencils pasted on the ground, showing directions on where to dispose cigarette butts. In addition, smokers were told

they were expected to use the bins to dispose of cigarette butts. The experimenters also emphasised to smokers that they could be fined for littering. The results showed that the binning rate for those who were exposed to these manipulations increased by approximately 53% compared to no increase in binning rate for control conditions, where smokers were not exposed to these manipulations. Note however, that this experimental approach could not isolate which one of the manipulations was more effective in increasing binning rate. Hence, it was impossible to derive clear insight on the extent to which messages framed as injunctive norms were effective in an outdoor setting.

Reports have also focused on the effect of fines in reducing littering rates. For instance, the Keep Britain Tidy (2011) report found that fines are effective in deterring littering for those who have been fined and for those who know someone that has also been fined. However, other reports have argued that fines are ineffective in preventing litter for a number of reasons such as, difficulty of enforcement, high cost, and public perception that people are not likely to get caught (Zero Waste Scotland, 2013). It may be the case that fines are effective within the boundary conditions of the *'Report a Tosser'* program, which makes provisions for vehicle occupants to be fined based on observations by any member of the public. These conditions are clearly different from other regimes where significant resources must be expended in mobilising enforcement officers to issue fines to offenders.

3. Case Studies

The literature review above used over 45 sources and each is listed in Appendix A. Two campaigns from those sources are described in more detail below. These are both relevant because of their alignment with several of Divert NS' goals: they focus on litter prevention, have a behavioural insights aspect to them, extend beyond generic ad campaigns, and saw positive results. The first, *'Don't Mess with Texas'*, focuses on pride-in-community, which could resonate with Nova Scotians. The second, *'Report a Tosser'*, has a punitive element that is relevant as Nova Scotia explores the use and effectiveness of fines.

3.1 Don't Mess with Texas

'Don't Mess with Texas' is the call-to-action or slogan for a multi-channel advertising campaign (outdoor, radio, print, television, bumper stickers) commissioned by the Texas Department of Transportation, USA in 1985. Since its initial launch, the campaign has extended to online merchandising and virtual reality experiences during roadshows. More recently, it incorporated a *'Report a Litterer'*, component, which makes it possible for the public to report drivers and other road users who litter Texas roadways.

Behavioural Insights

The *Don't Mess with Texas* campaign is hypothesised to have been effective by successfully leveraging social identify and social norms (OECD, 2019). Specifically, the campaign leverages Texans' sense of social identity by aligning the desired behaviour with the regions' existing social norms of strong pride and individuality. In doing so, the campaign leveraged descriptive social norms to induce behavioural change by indicating that the relevant 'in-group', Texans, do not approve of littering. As such, it induces an innate social desire to conform with the social norm of not littering in the region (Cialdini, 2003).

In addition, the campaign potentially relies on affect heuristic to reduce littering in Texas. Affect heuristic is a mental shortcut associated with positive and negative emotions, which influences how people make decisions. Zajonc (1980) has argued that when people process information, they generate positive or negative emotions, which precede their deliberative judgments. There are also instances where people make judgments without much deliberation. Furthermore, positive or negative emotions towards an object (e.g., the colours of a state's

flag) tend to be more enduring once the individual has made a decision related to the object (e.g., deciding not to litter).[3]

Also, it has been established that positive emotions towards objects can be generated by how easy it is to process information (Reber et al., 1998; Bornstein & D'Agostino, 1994). Pleasure derived from objects that are easy to process, lead people to ascribe higher value to such objects (Zajonc, 1980). Such feelings are further reinforced when people repeatedly encounter objects that are prototypes of already familiar objects.
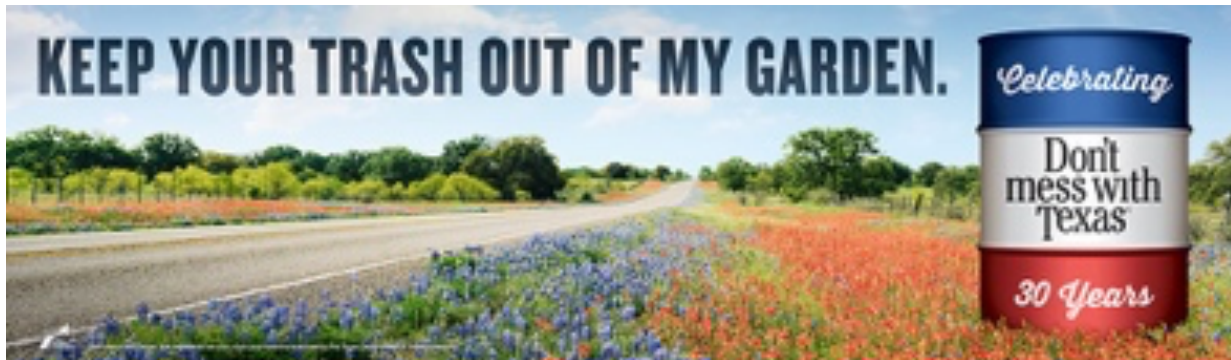
Don't Mess with Texas 2016 Billboard Advertisement

Theory on affect heuristic appears to be highly consistent with the 'Don't Mess with Texas' campaign efforts. Radio and television campaigns make use of celebrities, musicians, and artistes who incorporate the slogan in jingles, verse, and creative content (e.g., Stevie Ray Vaughan, Whitney K Lane, Lukas Nelson, Black Pumas, Austin Wayne Self). By creating virtual reality experiences during roadshows, the campaign creates additional opportunities for Texans to generate positive emotions from the campaign and potentially internalise the anti-litter message. Consistent with existing theory, *Don't Mess with Texas* campaigns have also made use of repeated exposure by consistently airing the campaigns for 37 years (Zajonc, 1968).

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[3] The reason proposed by Zajonc (1980) is that when people are in deliberative thinking mode, their judgments become subject to change if they encounter subsequent, superior information. On the other hand, if they generated a prior affective reaction (e.g., a positive emotion) towards the object, it becomes more difficult to cause a change in their attitude towards the object.

Don't Mess with Texas 2018-2020 Virtual Reality Experience

Measurable Success

Surveys conducted to examine campaign awareness, indicated that 52% of Texans correctly associated the campaign with 'don't litter' while only 22% failed to make this association (GDC Marketing & Ideation, 2017, 2020). Media sources have reported that the *'Don't Mess with Texas'* campaign reduced littering by 72% between 1986 and 1990 (Johnson, 2021; Virginias Port Aransas, 2021). There are also references to the campaign's success, based on industry awards and campaign popularity (Grinberg, 2011; Keltner, 2022). Outside of this, there is need for clear empirical evidence examining how effective the campaign has been in reducing litter.

3.2 Report a Tosser

This is a preventive campaign commissioned by the New South Wales Environment Protection Authority, Australia, to address (un)intentional roadside litter from vehicles. The campaign is backed by an Act and makes provisions for any member of the public to make a report when people litter from their vehicles.

To make a report, an individual has to provide details including vehicle registration, type of vehicle, type of litter, the location where littering occurred, and their personal details within 14 days after they witnessed the event. Vehicles that litter could be fined either $250 or $500 (Australian dollars), depending on whether it belongs to an individual or a corporation. On the other hand, the Act specifies that it is a criminal act to provide false or misleading information when making a report. Report forms are available online through the New South Wales Environment Protection Authority website. It may be important to note that

this campaign is part of a series of *'Tosser'* ad campaigns, aimed to raise awareness and sensitise the public about the environmental effects of littering.[4]

Behavioural Insights

One potential psychological explanation for the success of the *'Report a Tosser'* program is social presence. Academic researchers have demonstrated that people become more aware of their actions when they believe they are in the presence of others. To manage this sense of social presence, they are likely to exhibit behaviours that are more socially desirable (Baumeister, 1982). Also, they are more likely to engage in prosocial behaviours such as, cleaning up a mess when they believe they are being monitored by a security camera compared to conditions when they believed they were not being monitored (van Rompay et al., 2009). Applied to littering in New South Wales, Australia, it is plausible that the *'Report a Tosser'* program heightened feelings of social presence for drivers and other road users with respect to littering. As a result, people may feel a sense of increased social presence or a sense of being watched and monitored by the public. Conditions of social presence are at variance with a sense of anonymity, which is more convenient for exhibiting anti-social behaviour such as littering.

Measurable Success

Results from New South Wales Environment Protection Authority (2021) showed a downward trend on the number of fines issued for littering from vehicles. In addition, data from follow-up surveys revealed that the proportion of people who believed they would be caught and fined increased from 17% in 2014 to 32% in 2018. However, it dipped to 23% in 2019. In either case, there is some indication that in New South Wales, there was an increase in fear of being caught over a four-year period.

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[4] The *'Tosser'* campaigns include, '*Are you a Tosser?*' (The NSW Environment Protection Authority, 2021) and *'Don't be a Tosser'* ('Don't Be a Tosser!', 2021)

4. Qualitative Research

Qualitative research was conducted to understand the behaviour of litterers in Nova Scotia. The intention was to investigate who is littering, when do they litter, where do they litter, and what external factors influence behaviour.

The research conducted took the form of interviewing 20 people involved in the eco-system of litter in the province. The scope of the work focused on the output of these interviews exclusively to collect, synthesize, and present findings in a way that centralizes what may be generally known already, but is disparate and not documented.

The interviews were conducted with representatives from:

- Atlantic Coastal Action Program Cape Breton
- Cape Breton Regional Municipality
- Clean Foundation
- Divert NS
- Halifax Regional Municipality
- Municipality of Colchester
- Municipality of East Hants
- Municipality of West Hants
- Nova Scotia Adopt-A-Highway Program
- Nova Scotia Department of Environment and Climate Change
- Nova Scotia Department of Transportation
- Restaurants Canada
- Restaurant owners/franchisees
- Spring Garden Road Business Association
- Town of Truro

Their roles and experience included policy, compliance and enforcement, solid waste, maintenance, advocates, elected officials, business owners, and volunteers.

Research was not done with the public - litterers or non-litterers. It was determined that litterers should not be approached even if they could be found efficiently, and if they were, the information they'd share would be of little accuracy or value. Talking to non-litterers about litterers was also deemed to have little value because individuals often are not reliable judges of the motivators of even their own behaviours due behavioural biases such as self-attribution bias and fundamental attribution error. Public surveys were also dismissed given that what people say or think, is not indicative of their behaviour, especially when the subject is something they should *not* be doing, particularly due to the influence of social desirability bias. Lastly, field observations were attempted to see what insights could be gleaned. These were done in a park, near a fast-food restaurant, and a parking lot but there were minimal insights gained from these methods so subsequent planned visits were cancelled.

4.1 Insights

The qualitative research conducted sought to identify external factors that contribute to littering in the province. It did that, but also provided views into the behaviour of litterers, most of which aligned with findings from the literature review.

The following insights provide perspective on a variety of topics related to littering, but they do not answer the question of who is littering. Most people who were consulted agreed that profiling or defining the people who litter is difficult, if not impossible, could be fraught with stereotypes, and may have little value. People do not litter because of *who* they are but a variety of traits (like their tolerance for inconvenience), behavioural biases (see Behavioural Biases section below), and situational factors (like where they are and how windy it is). For example, fast-food packaging is not littered by people in certain demographics – it is littered by someone who doesn't *want* to litter but doesn't want to carry a French fry container covered in ketchup on their 15-minute walk back to the office after lunch.

There is consensus among the group that there are no definitive types of people who litter. There are attitudes and mindsets that contribute to littering behaviour and situational factors that influence the behaviour.

Why do people litter?

According to the interviewees, people litter for a multitude of reasons – there is no fixed list, and it is often a combination of reasons coupled with a variety of circumstances. However, as stated below, convenience is thought to be the primary contributor to litter behaviour. Unfortunately, it is impossible to address the nuances and scenarios of convenience. More bins would naturally address *some* aspects of convenience but there is consensus (and supporting research) that it is impractical, if not impossible, for an increase in bin volumes to make a significant impact.

Convenience	Anonymity
Convenience, or lack of, is considered the most significant contributor to litter behaviour. Many people do not want to walk to the nearest bin, hang on to their garbage, tolerate a smell, have a mess in their car, get wet if it's raining, or chase down their garbage on a windy day.	Most people don't want to litter, but many are willing to do so when nobody is watching. They are more likely to litter on a desolate road, in an empty parking lot, waiting for a bus by themselves, or are out for a walk in the woods.

Apathy

Some people simply don't care about litter. They may not overtly *want* to litter but also don't consciously or subconsciously think not to – it is not part of their thought process.

Intentionality

There is consensus that a very small percentage of people intentionally litter. They do this to rebel, or to look "cool" or apathetic. They may have issues with defiance, the government, or with the location where they litter.

Understanding

There are people who don't understand the consequences of littering. They don't know the environmental impacts, they don't get who nor how it will get cleaned up, and they don't appreciate that other people *do* care.

Confusion

Sorting garbage is confusing for some people. They don't understand the rules or the signage, so they litter instead, out of frustration, protest, or, ironically, to avoid sorting incorrectly.

Herd Mentality

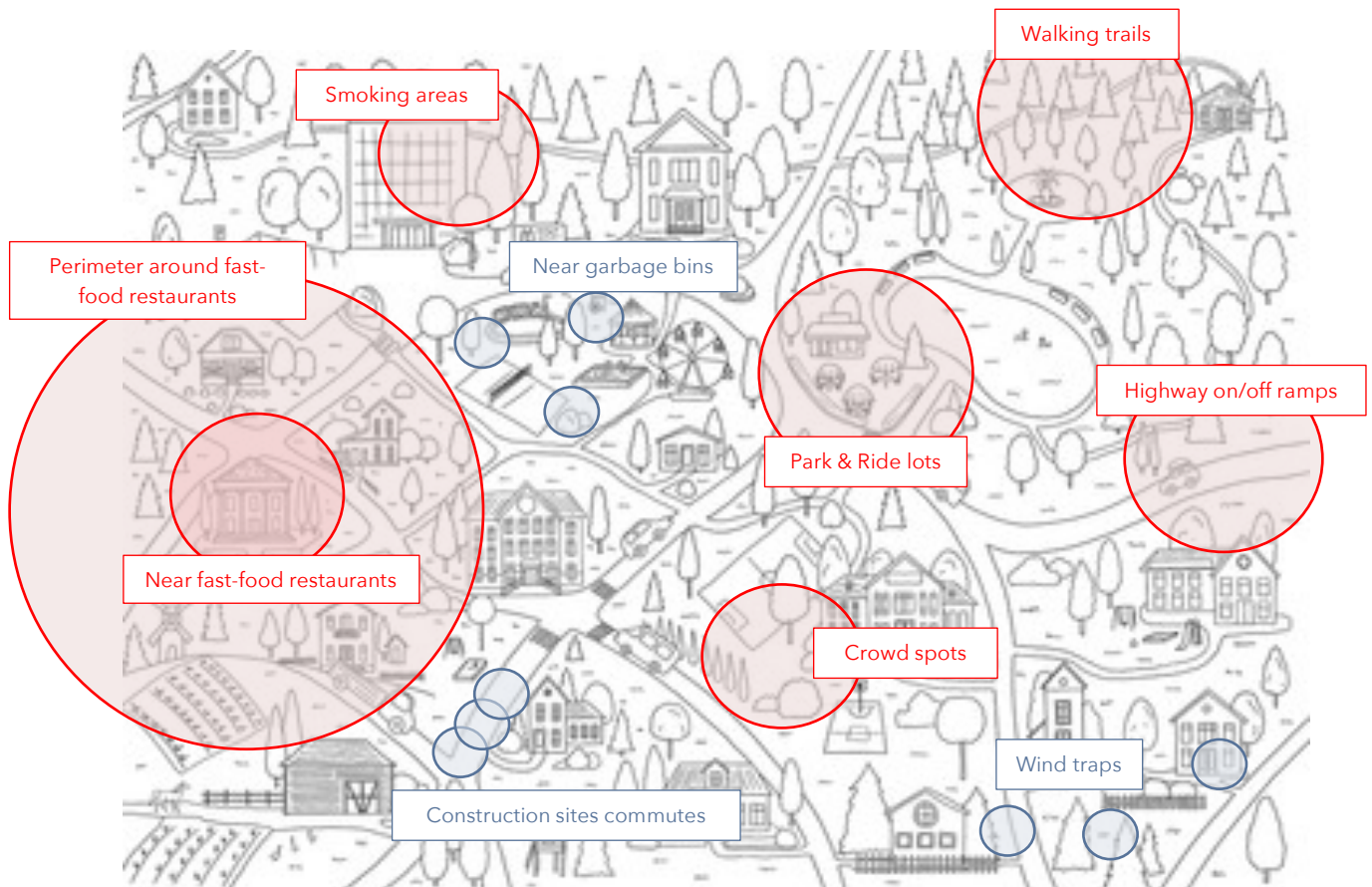It is easier to litter in a group than individually. People naturally conform to a group's behaviour, so littering may become socially acceptable. In groups, people may feel anonymous and there may be an assumption that someone else will clean up.

Mistake

Littering can be an honest and innocent mistake. There are times when people don't know they've littered, or litter in error but cannot reverse the action.

Where do people litter?

Litter can be found *everywhere*, but there are several places/areas that see high volumes of litter in the four categories being studied. These are highlighted in the visual below and described afterwards. The locations were identified by participants in the qualitative research – they were most frequently raised as problem areas.

Walking trails

Smoking areas

Perimeter around fast-food restaurants

Near garbage bins

Highway on/off ramps

Park & Ride lots

Near fast-food restaurants

Crowd spots

Wind traps

Construction sites commutes

Each location is unique and litter prevention efforts can/should be specific to the location. For example, a nature trail may benefit from signage related to protecting the environment, but that same sign may not be as effective near a downtown fast-food restaurant where more bins may be most effective.

NEAR FAST-FOOD RESTAURANTS

It is not surprising that fast-food packaging is littered near the point of purchase and a perimeter around the location that is equal to the consumption time and mode of transportation. For example, coffee cups are routinely found a 20-minute drive away and food wrappers a short walk away on common routes.

On their property, restaurants adhere to bylaws with bins and regular clean up. Off property, they cannot control the litter, but support communities as possible, mostly with clean up initiatives. They are challenged with misuse of their bins by people who clean their cars or dump household garbage. Restaurants have observed an increase in litter during the pandemic as more consumers are eating in the parking lot and littering the packaging.

PARK & RIDE LOTS

Parking lots are a common place for people to litter and park and ride lots are recognized as being especially troublesome. These lots are plagued by many of the reasons people litter – they are secluded, there are few bins, people are often there after consuming takeout, they are *waiting* for public transit, etc. The seclusion of these locations makes them problematic for household garbage to be dumped. Few lots have adequate receptacles, nor signage.

HIGHWAY ON/OFF RAMPS

Littering on highway on and off ramps is frequent and there are two situations that are primary contributors. First, is the anonymity provided to drivers as they transition to starting or ending a journey – ramps provide a first or last chance to pull over, or to simply toss their garbage. Second is truckers who use ramps as rest-stops and while parked, toss packaging or cigarettes.

CROWD SPOTS

Anywhere people congregate, litter will be present. This includes outdoor events, parks, fields, and popular places for groups. These locations are plagued by group mentality and often heightened inconvenience, real or not. Depending on the nature of the gathering, these locations are prime for well-intentioned people who plan to "get that later" but do not.

SMOKING AREAS

It is obvious that where people smoke is where there will be an abundance of cigarette butts. It is interesting and ironic however, that smoking bylaws in some municipalities have increased the volume of littered butts – banning smoking near buildings does not change people's desire/need to smoke but removes the receptacles they require to properly dispose of butts. This is especially prevalent outside of workplaces where there is often a default, accepted location used repeatedly by a common group.

WALKING TRAILS

Despite being perceived as pristine places in nature and used mostly by people who appreciate and respect the environment, walking trails are common places for litter, especially the four categories being studied. Litter here is hard to prevent because bins cannot be placed where they are needed – mid-trail when coffee, snacks, and cigarettes are consumed – and people do not want to carry garbage on their walk. Litter on trails and other places in nature is most unsightly and most noticed despite a relatively low volume, and as a result, is most frustrating for responsible users.

OTHER LOCATIONS

There are three additional locations where high volumes of litter are believed to be frequently found. They are:

- **Near garbage bins** - Even when people try to dispose of their garbage correctly in a bin, it can end up looking like litter. There are a few reasons, including: the bin is too full and not maintained, the wind has blown things out, people throw their garbage and miss, or they struggle with the bin (Examples: flap is stuck, opening is too small, or they don't understand sorting instructions).

- **Wind traps** –Litter is moved easily by the wind and accumulates repeatedly in common areas such as the side of hills, against buildings and fences, in ditches, and a host of other physical traps.

- **Construction site commutes** - Litter often inadvertently comes from construction trucks, especially pickup trucks. Drivers don't want to litter so put their waste in the truck bed, only to have it blow out during travel, which is then seen as roadside litter. This is observed frequently near construction sites, in business parks, and on highways where speed and wind are more prevalent.

When do people litter?

People litter at all times of the day and year, but the qualitative research highlighted there are patterns related to both time and season that influence what a person litters and why. For example, during the day there is likely an uptick of hot cups in the morning, fast-food packaging around breakfast/lunch/dinner hours, and alcohol beverage containers at night. From a seasonality perspective, during the summer there may be more plastic ice cream containers and alcoholic beverage containers but fewer hot cups.

People may litter more in warmer weather when they are more likely to be outdoors, but it may be a misconception that there is *more* litter in the spring – it only seems that way because melting snow exposes winter litter.

Weather plays a big role in when people litter – rain, snow, cold, wind, and other inclement conditions cause people to litter more because they don't want to take any extra time to outside to properly dispose of their garbage.

The COVID-19 pandemic has also affected when people litter. Restrictions on indoor dining and the fear of exposure has led to an increase in takeout and people dining outdoors, which increases littering behaviour.

Prevention

There are few concerted and consistent initiatives focused on litter prevention. On the contrary, there are many examples of initiatives focused on clean up. Participants in the study identified only a few, mostly dated Nova Scotia-focused campaigns to curb littering, for example '*Please Litter*' and '*The Best Thing You'll Never Do*' – but everyone knew of several clean-up efforts. This speaks to the challenge of prevention given the reasons people litter and the situational factors that increase the likelihood they will litter. Several participants identified educating young children as the most probable way of changing mindsets, but this is, of course, a long-term, generational change. Several participants felt that society has been generally moving in the right direction in their attitudes towards litter over the past few decades. Indeed, we heard anecdotal evidence from people who have been involved with on-the-ground litter management and clean-up that litter quantities have been diminishing over the past several decades.

Policy related efforts, primarily regulations/bylaws, fines, reporting, compliance, and surveillance are necessary, but have little impact on reducing littering behaviour. As the literature review found, fines are mostly ineffective as deterrents to littering. Participants pointed out the extreme challenges of catching someone, stopping them, prosecuting them, proving it, and collecting on the fines. The consensus is that anyone with authority to initiate the process would never act on it. Instead, they would ask the person to pick-up what they dropped and nothing more. There is also agreement that even if they did act on it, the courts would discourage it given the resources and process required to prosecute someone who tossed a coffee cup are the same as they are for serious crimes.

5. Behavioural Analysis

5.1 About Behavioural Insights

Behavioural insights (BI) is a term used to refer to the application of behavioural science, which is the study of understanding, influencing, and predicting human behaviour. Behavioural science is a relatively new field that combines parts of psychology, economics, sociology, and neuroscience among others. Over the past two decades, it has come to prominence as a result of its successful application of behavioural interventions across international governments and private organisations. BI is applied broadly to identify the behavioural factors which contribute to people's behaviour, and thus to identify the most effective methods for behavioural change.

Behavioural Biases

The general premise of BI is that humans do not always make logical decisions, but our illogical behaviour is often predictable. Traditional models of human behaviours (and particularly those used in standard economic theory) assumed that people make 'rational' decisions by weighing the relative costs and benefits of a decision and making choices which optimizes net benefits. Yet over the past several decades, behavioural scientists have demonstrated that there are many circumstances in which people do not optimize their decisions, in line with 'rational' decision-making. Indeed, they have found that there are literally hundreds of contexts in which humans are *predictably* irrational. These instances, supported by robust scientific studies and replications, are referred to as behavioural biases. By understanding when people are likely to be influenced by these factors, behavioural scientists can design interventions which target and mitigate the influence of such biases.

5.2 Biases Influencing Littering Behaviour

Through both the qualitative research and literature review, we have identified a range of behavioural biases which may be contributors to littering behaviour across Nova Scotia. These hypothesized biases have been summarized in the table below. It is important to note that without testing using scientific methods, these biases factors are only hypotheses. Indeed, even where these factors have been shown to influence littering behaviours in other contexts, it is important to test and confirm these hypotheses because human behaviour is highly subject to contextual influences. As such, the following hypotheses are designed to outline the theoretical basis for the proposed interventions outlined in the proceeding sections.

Hypothesized Biases	Definition	Influence on Littering Behaviour
Related to Social Influences		
Social Norms	Social norms are the informal rules which govern behaviour in a group or society. There are two key kinds of social norms: descriptive and injunctive. Injunctive norms refer to those which people believe are approved or disapproved of by a group, while descriptive refer to the perception of behaviours which are typically performed by others.	In the context of littering, both descriptive and injunctive social norms are likely to influence people's decision to litter. If people believe that most people disapprove of littering, they are likely to want to conform with this descriptive social norm. Similarly, if people believe that most other people do not litter themselves, they will also be influenced to litter less due to the presence of this injunctive social norm.
Broken Window Effect	The state of an urban environment demonstrates a social norm in the area. As such, visible signs of anti-social behaviour, such as vandalism and littering, further encourages these behaviours (Joao & Torgler, 2012).	Anecdotal evidence suggests that in the Nova Scotian context, areas with high levels of littering and low levels of clean up experienced higher instances of littering than areas that are consistently cleaned.
Audience Effect	Individuals modify their behaviour in response to the belief that they're being watched, and particularly, they demonstrate more prosocial behaviours under these conditions (Cañigueral & Hamilton, 2019).	The qualitative research suggested that littering is particularly problematic in times and locations in which the behaviour was not easily observed, such as in remote location. As such, it is likely possible that people are influenced by the audience effect where they believe they are being observed by other people, resulting in lower littering.
Identifiable Victim Effect	Identifiable Victim Effect describes the increased empathy and propensity to offer assistance where a 'victim' of an action or event is more specific and	In the research of littering behaviour in Nova Scotia, it was identified that the public are likely unaware of the potential impacts and victims of

Hypothesized Biases	Definition	Influence on Littering Behaviour
	directly identifiable, as opposed to being a more unknown group (Perrault, Silk, Sheff, Hoffman, & Totzkay, 2015).	littering behaviour. This ambiguity and lack of an identifiable 'victim' of littering could be a contributor to higher instances of this behaviour.
Related to Individual Factors		
Intention-Action Gap and Habitual Behaviour	The Intention-Action Gap refers to the difference between people's intended actions, and what they actually do. This gap is often the result of habitual behaviour, which is developed through repetition over time. This results in habitual behaviour no longer aligning with new intentions (Kennedy, Beckley, McFarlane, & Nadeau, 2009).	The Intention-Action Gap could be a contributor to instances of littering in Nova Scotia, in that people may have developed habitual littering behaviours, such as littering cigarette butts out of cars. While their intentions may have changed and they intend to no longer litter, their embedded habits may be creating an 'intention-action' gap.
Present Bias and Hyperbolic Discounting	Present Bias refers to our preference to choose immediate rewards as opposed to those in the future. Furthermore, Hyperbolic Discounting refers to the fact that we value rewards less the further they are in the future (Green, Fry, & Myerson, 1994).	Present Bias is likely an influence on littering behaviour because people may place value on the convenience and time-savings they obtain by littering in the present and undervalue the long-term benefits of a litter-free environment.
Self-Serving Attribution Error	Self-serving attribution bias refers to the tendency to attribute one's own negative behaviour to external causes, but the same behaviour in others to negative personal attributes (Hansmann & Steimer, 2017).	In the context of littering, people are likely to view their own littering as justified and unavoidable, but others' behaviour to be the result of negative character traits, like ignorance and laziness.

Hypothesized Biases	Definition	Influence on Littering Behaviour
Related to Bin Infrastructure		
Friction Costs	Friction costs are the barriers to making a particular decisions or actions (Shahab & Lades, 2021).	Friction costs in the context of littering include the perceived time and effort required to dispose of litter. For example, the effort required to search for an appropriate bin.
Salience Bias	Salience Bias refers to the tendency to focus on information or items which draw our attention (Tiefenbeck, et al., 2016).	Where a sorting bin is clearly labeled and draws attention, it is more salient and therefore more likely to be used.
Related to Incentives and Fines		
Incentivization	Incentivization refers to the provision of a reward for a given behaviour or threatening a penalty for failing to do that behavior (Gneezy, Meier, & Rey-Biel, 2011).	Incentives may refer to a financial incentive for disposing of litter, such as the recycling reward program. Similarly, this can also include disincentives, like fines for littering. Where these disincentives for littering are not large enough, or they are not being enforced, people will make the 'rational' decision to litter, because the perceived benefits outweigh costs.
Over-justification Effect	This occurs when an external incentive, such as a financial reward, actually decreases motivation to perform an activity. This occurs because the financial reward actually 'crowds out' the intrinsic reward for performing that behaviour (Rosenfield & Adelman, 1980) (Frey & Goette, 1999).	The over-justification effect may be responsible for increased littering behaviour as people's altruistic motivation for not littering may be 'crowded out' by fines and financial incentives. To reduce littering, a financial incentive/ disincentive would need to be larger than the effect of the altruistic motivation to compensate for the loss of intrinsic motivation.

6. Proposed Interventions

The following section intends to outline a range of options for Divert NS to introduce and test behaviourally informed interventions which utilise the behavioural insights outlined in this report. Utilising the insights from the literature review, qualitative research, and behavioural analysis, we have outlined several intervention options, which are intended to target and mitigate the hypothesised behavioural biases which contribute to littering behaviour.

These interventions are intended to alter the 'choice architecture' of littering behaviour. Choice architecture refers to the different ways in which choices can be presented to people. A vast range of behavioural science literature has demonstrated that minor and seemingly insignificant changes to the ways in which choices are presented, such as when, where and how they are presented, can have a major impact on the decisions that people make. As such, the interventions outlined in this report intend to alter the choice architecture of littering behaviour, by changing things like the location, aesthetic, or messaging of waste receptacles. These alterations are intended to mitigate the behavioural biases which contribute to littering behaviour at the moments in which they are most influential on that behaviour, such as through messaging on the litter itself or in the areas which have been identified as problematic for littering behaviour.

Importantly, this section outlines not only the proposed interventions, but also a description of the methods which can be used to test, measure and evaluate their efficacy. This step is crucial to provide evidence on whether or not the intervention has had the desired effect on littering behaviour, and furthermore, which intervention has the largest effect. This provides valuable data to inform future decisions on which intervention will provide the greatest return on investment when rolled out on a larger scale, such as provincial litter messaging campaigns.

For ease and brevity, the proposed interventions have been grouped into two categories: Bin Infrastructure and Behaviourally Informed Messaging. Bin infrastructure refers to interventions which change the choice architecture of littering through changes to physical infrastructure, such as waste receptacle locations, aesthetic, or features. Behaviourally informed messaging refers to interventions which change the choice architecture using messaging, which is designed to combat the hypothesised behavioural biases, and thus reduce instances of littering behaviour.

6.1 Receptacle Infrastructure Interventions

Nudging littering by altering the choice architecture of waste receptacles.

We propose four options which change the infrastructure of, or around, waste receptacles. This is intended to adjust the 'choice architecture' of littering by making appropriate waste disposal options more salient, attractive, habitual, pro-social, lower effort or associated with an incentive.

Intervention #1:
## Creating a Nudge to Litter Receptacles

Create a 'path' for people to follow through to litter receptacles using paint or stickers, thereby making them more salient and reducing the friction costs associated with locating a waste receptacle. These paths draw attention to litter receptacles, making them more salient. These can be particularly valuable to target roadside litter by using 'green footpaths' in locations in which people stop their vehicles, such as gas stations, car washes and parking lots. As such, the intervention can nudge people to dispose of waste before they are tempted to litter items which accumulate in vehicles, such as coffee cups and fast-food packaging.

Case Study Examples

A number of jurisdictions have introduced footprints or maps to nudge people into using litter receptacles, including a successful initiative in Copenhagen, Denmark which has resulted in more than 1500 litter receptacles with footprint paths being introduced across the city.

Copenhagen, Denmark – Green Footprints

Green footprint paths were painted on the ground in urban areas, leading to litter receptacles of the same colour. The intervention was found to reduce litter by 46 percent within a month, and 26 per cent after three months. This was more effective than anti-littering advertising campaigns.
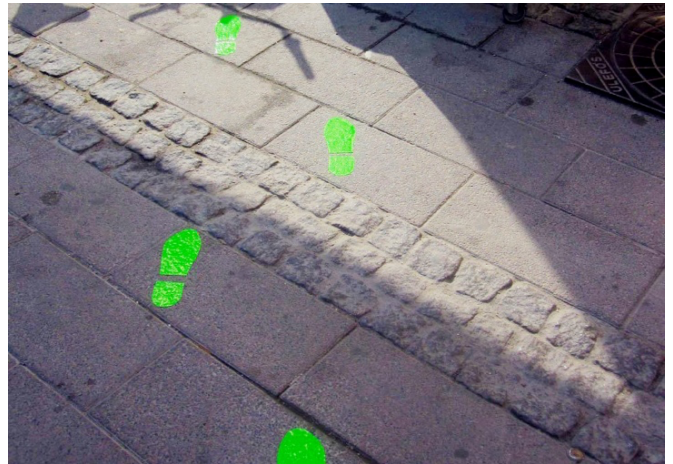
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United Kingdom – Green Footprints

Based on the success of the Copenhagen trial, similar experiments were run across several regions of the United Kingdom. Replicating the findings, these trials found that footprints reduced litter by up to 46.1% (3 weeks after implementation) in parks and recreation sites, as well as retail and

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Potential Experimental Design

A small-scale experiment can be conducted by testing the impact of green footprints in different gas station locations. Gas stations provide an opportunity to mitigate roadside littering by encouraging people to dispose of litter in a convenient location.

1. Partner with a chain of gas stations.

2. Identify two or more gas station locations which are as similar as possible in terms of design, consumers, prices, etc.

3. Assign each gas station to either a 'treatment' or 'control' condition.

4. Conduct a daily clean-up and measure weekly litter volumes collected in waste receptacles at each location for several days to create a baseline.

5. Install 'green footprints' in the treatment locations. Change nothing in the control area.

6. Conduct a daily clean-up and measure weekly litter volumes for a few weeks at each of the locations.

7. Run analysis to compare the impact of the interactive green footprints on waste collection compared with the rates in the control group.

Biases Targeted	Litter Targeted	Considerations
• Salience • Habitual Behaviours • Friction Costs • Social Norms	• Roadside litter, including fast-food packaging, and takeout cups.	• Requires partnership with a gas station chain. • Requires design and purchase of 'footprints. • Requires resources for litter measurement

Intervention #2:
Interactive Cigarette Butt Receptacles

Create litter receptacles which encourage interaction from the public, by making the receptacles more appealing and more salient. These litter receptacles can include interactive elements, such as voting systems, musical features, or verbal responses to encourage the desired behaviour. In doing so, they create interest and incentives for appropriately disposing of litter. These present a valuable opportunity for targeting cigarette butt littering as they can be placed at locations where smokers congregate, such as near the entrance of bars, restaurants, and buildings with a large number of workers, such as hospitals.

Case Study Examples

A number of organisations have introduced a range of different designs for interactive litter receptacle features, including:

United Kingdom - Cigarette Butt Ballot
Butt Ballot, a UK based firm, has developed a cigarette butt ballot, which asks smokers to use their cigarette butts to vote on questions. These are designed to encourage a fun and interactive way to appropriately dispose of cigarette butts.

Denmark - Musical Cigarette Butt
The Dutch/Turkish firm 'ioglo' created a musical cigarette disposal called 'Fumo'. Every time a cigarette butt is thrown into this waste disposal, it plays music and illuminates to create interest and novelty for appropriate disposal.

Potential Experimental Design

A small-scale experiment can be conducted to evaluate the efficacy of interactive cigarette butt receptacles.

1. Identify two small areas prone to cigarette butt litter, which are as similar as possible. These might include areas outside of two similar restaurants.
2. Conduct a daily clean-up and measure weekly litter volumes for a few weeks to create a baseline.
3. Assign areas to either a 'treatment' or 'control' condition.
4. Install interactive cigarette receptacles in only the 'treatment' area. Change nothing in the control area.
5. Conduct a daily clean-up and measure weekly litter volumes for a few weeks.
6. Run analysis to compare the impact of the interactive cigarette receptacles on littering rates compared with the rates in the control group (which has regular litter receptacles).

Biases Targeted	Litter Targeted	Considerations
• Salience • Social Norms • Habitual Behaviours • Incentives	• Cigarettes	• Requires partnership with a municipality • Requires purchase of specialized receptacles • Requires resources for litter measurement.

Intervention #3:
Anthropomorphised Waste Receptacles

Create litter receptacles which are designed to take animal or human characteristics. The goal is to draw attention to the receptacles, thus making them more salient in locations which are prone to littering behaviour, including near fast-food restaurants, crowd-gathering locations and walking trails.

Case Study Examples

Our research found examples of anthropomorphised litter receptacles which have been introduced in other jurisdictions. These provide some valuable examples of how such an intervention could be implemented in practice. Unfortunately, none of these examples were subject to evaluation using scientific methods, and as such, there is not yet robust evidence of the efficacy of these types of intervention on reducing littering behaviour.

Germany – Service Industry Trash Cans

Jonathan Schäper designed garbage cans to look like workers from the service industry. The intent was to grab the attention of potential litterers and highlight the value and important service that litter receptacles provide to society.

Oita, Japan – Monster Trash Cans

Oita City partnered with Coca-Cola to introduce 'monster' trash cans which eat plastic bottles in order to reduce instances of litter in the city. The trash cans are shaped like monsters which featured in the popular television series 'Attack on Titans'.

Potential Experimental Design

A small-scale experiment can be conducted to evaluate the efficacy of anthropomorphised litter receptacles on litter rate.

1. Identify two small areas in an urban area prone to litter, which are as similar as possible in nature. These might be a couple of streets, blocks, or confined areas that are highly trafficked by pedestrians. It could also be the main street in two smaller municipalities, i.e., New Glasgow and Truro.
2. Conduct a daily clean-up and measure weekly litter volumes for a few weeks to create a baseline.
3. Assign areas to either a 'treatment' or 'control' condition.
4. Install anthropomorphised waste receptacles in only the 'treatment' groups. Change nothing in the control area.
5. Conduct a daily clean-up and measure weekly litter volumes for a few weeks.
6. Run analysis to compare the impact of the anthropomorphised litter receptacles on littering rates compared with the rates in the control group (which has regular litter receptacles).

Biases Targeted	Litter Targeted	Considerations
• Salience • Friction Costs • Intention-Action Gap	• Small-size litter, including fast-food packaging, and takeout cups.	• Requires partnership with a municipality • Requires design or purchase of anthropomorphized receptacles

6.2 Behavioural Messaging Interventions

Nudging littering decisions using behavioural messaging.

The second range of intervention options fit under the category 'behaviourally informed messaging'. This refers to the use of message-based nudges rather than physical changes to waste infrastructure. We propose several behaviourally informed messaging options which are grounded in behavioural science. Each type of messaging proposed has been demonstrated to target specific behavioural biases to induce behavioural change, either directly in a littering context, or for similar behavioural change interventions.

Rather than proposing an intervention for each behavioural messaging type, we outline several messaging types, along with several options for mediums through which these messages can be implemented. Each medium is designed to nudge people's behaviour at key litter decision points, such as when their vehicles are located near waste receptacles, fast-food outlets, etc. We provide two examples of interventions which could utilise these kinds of behavioural messaging, noting that similar intervention options could be developed for each intervention medium. Where possible, it would be encouraged to test multiple message types to enable comparison of which message is most effective in each context.

Behavioural Messaging Options

The following table summarises four behaviourally informed messages which are designed to target some of the hypothesised behavioural biases identified through this research, each with an example of the type of message.

Messaging Type	Description	Litter Messaging Examples
Behavioural Message 1. Social Norms Messaging	People's behaviour is strongly influenced by what they believe other people do – essentially, what is the social norm. Therefore, including a simple message which highlights that the majority of people in Nova Scotia do not litter, we highlight that not littering is the social norm (Cialdini, Reno, & Kallgren, 1990)	*"98%* of Nova Scotians dispose of their litter in the right place."*
Behavioural Message 2. Audience Effect Messaging	The feeling of being watched by others influences people to behave in a more prosocial way, such as reduced littering behaviour. Evidence has shown that simply including an image of a pair of 'watching eyes' on potential litter can reduce littering behaviour (Dear & Dutton, 2019; Bateson, et al., 2015).	Inclusion of a pair of 'watching eyes' with a standard anti-littering message, included on potential litter and/ or in high-risk littering locations.
Behavioural Message 3. Identifiable Victim Messaging	Highlighting a local and direct impact of littering behaviour to create an identifiable victim of littering is likely to be effective in reducing littering. For example, a local animal which is directly impacted as a result of littering behaviour. Research has found that animals elicit greater empathy than human victims in messaging (Perrault, Silk, Sheff, Hoffman, & Totzkay, 2015).	*"Littering costs Nova Scotian lives"* with image/ cartoon of whales, seals, birds etc."
Behavioural Message 4. Self-Serving Messaging	In the case of littering, it has been found that individuals' own littering behaviour is more frequently attributed to factors like poor infrastructure, where others' behaviour is attributed to negative traits like ignorance (Hansmann & Steimer, 2017). Therefore, highlighting this bias to people encourages self-awareness and personal responsibility for littering.	*"Nobody thinks of themselves as a litterbug. Keeping Nova Scotia beautiful is all of our responsibility, all of the time."*

*Percentage an example only. Accurate littering behaviour data would need to be sourced.

Behavioural Messaging Delivery Options

The proposed behavioural messages are designed to target the hypothesised biases. These messages are likely to be most effective when provided at key points at where people are making their decision on how to dispose of their waste. As such, we propose a range of different options for mediums through which to make these messages salient at these key moments. In particular, a range of communication mediums options are proposed to present the behavioural messages to each of the four categories of litter identified as the focus of this this research. These are outlined in the following table, along with a description of the kind of partnership which may be required to set up a trial intervention:

Litter Type	Message Mediums	Partnership Required
Coffee Cups	Messaging included on coffee cups.	Partnership with coffee chain or fast-food companies that sell coffee.
	Messaging included at the drive-thru.	
	Messaging included on the waste receptacles in-store.	
Fast-food Packaging	Messaging included on packaging (i.e. on a bag).	Partnership with fast-food company or individual restaurants.
	Messaging included at the drive-thru waste receptacle signage.	
	Messaging included at the waste receptacles in-store.	
	Messaging included on waste receptacles in problem litter locations (i.e. nearschools , parking lots, etc.).	Partnership with local/municipal government authorities.
Cigarette Butts	Messaging included at common smoking 'hot spots', (i.e. doors of workplaces, front of bars, etc.).	Partnership with local/municipal government authorities.
Alcoholic Beverage Containers	Messaging included on alcoholic beverage bags.	Partnership with the provincial liquor corporation.
	Messages included in problem litter locations (i.e. parks, parking lots).	Partnership with local/municipal government authorities.

Intervention #4:
Behavioural Messaging at Fast-Food Drive-Thrus

Test the effect of behaviourally-informed litter messaging at fast-food venue drive-thrus, located in close proximity to waste receptacles. This intervention is designed to minimise the littering of fast-food packaging and/ or coffee cups by encouraging appropriate disposal at a convenient time. This preventative approach intends to leverage behavioral responses such as social norms, the audience effect, and the identifiable victim effect to minimise roadside litter.

Potential Experimental Design
A small-scale experiment can be conducted by testing the impact of behavioural messaging at different fast-food restaurants or coffee shops

1. Partner with a chain of fast-food restaurants or coffee shops.

2. Identify several drive-thru restaurant chain locations which are as similar as possible in terms of design, consumers, prices, etc.

3. Assign each restaurant drive-thru venue to either a 'treatment' or 'control' condition.

4. Conduct a daily clean-up and measure weekly litter volumes collected in waste receptacles to create a baseline. This can be measurement could also be the volume of litter found in the surrounding area, rather than volume collected in the waste receptacle.

5. Install a different behaviourally informed message next to the waste receptacle at each of the 'treatment' drive-thrus. Change nothing in the 'control' drive-thrus. An example of this allocation of treatment and control groups is provided in the table below.

	Drive-Thru Location #1	**Drive-Thru Location #2**	**Drive-Thru Location #3**	**Drive-Thru Location #4**
Group Allocation	Control	Treatment 1	Treatment 2	Treatment 3
Intervention Implementation	Business-as-Usual messaging	Social Norms messaging	Audience Effect messaging	Self-Serving Attribution messaging

6. Conduct a daily clean-up and measure weekly litter volumes for a few weeks at each of the drive-thru locations.

7. Run analysis to compare the impact of each of the different types of behavioural messaging on waste collection volume compared with the rates in the control group.

Biases Targeted	Litter Targeted	Considerations
• Salience • Habitual Behaviours • Friction Costs • Social Norms	• Roadside litter, including fast-food packaging, and takeout cups.	• Requires partnership with a fast-food chain. • Requires resources for litter measurement.

Intervention #5:
Messaging to Target Identified Littering 'Hot Spots'

Test the effect of including different behaviourally informed messaging types at places where people congregate, like bus stops. This intervention is designed to minimiselittering by targeting behaviour in locations which see intentional littering behaviour, such as at bus stops.

Potential Experimental Design

A small-scale experiment can be conducted by testing behavioural messaging at bus stops.

1. Partner with a local municipality willing to run a litter trial around bus stops.

2. Identify several bus stop locations which are as similar as possible in terms of distance to waste receptacles, passenger profile, length of stay, proximity to fast-food venues, etc.

3. Assign each bus stop to either a 'treatment' or 'control' condition.

4. Conduct a daily clean-up and measure weekly litter volumes collected around each location to create a baseline.

5. Install a different behaviourally informed message at each of the 'treatment' bus stops. Include no messaging in the 'control' bus stops.

6. Conduct a daily clean-up and measure weekly litter volumes for a few weeks at each of the bus stop areas.

7. Run analysis to compare the impact of each of the different types of behavioural messaging on litter volumed compared with the rates in the control group.

Biases Targeted	Litter Targeted	Considerations
• Salience • Social Norms • Audience Effect • Self-Serving Attribution Bias	• All litter types	• Requires partnership with a local municipality. • Requires resources for litter measurement.

7. Next Steps

The intended outcome of this report is to improve our understanding of littering behaviours and influencers in Nova Scotia, and to provide a range of potential interventions that can be considered by Divert NS and their stakeholders as they take action to prevent litter.

This information can be used by Divert NS to:

- Inform upcoming marketing campaigns that aim to prevent litter, to ensure they are designed with consideration for the information contained herein.

- Prompt conversations with stakeholders to aid the determination of approaches, priorities, and resource allocations to combat litter.

- Explore partnership opportunities with groups and organizations interested in supporting litter prevention initiatives (Example: fast-food sector) so that ideas can be developed collaboratively with government, community, and industry stakeholders.

- Implement proposed behavioral messaging or bin infrastructure interventions to prevent litter.

The proposed interventions should be prioritized and used to conduct small-scale experiments to test their efficacy. These proposed interventions present an opportunity for Nova Scotia to leverage behavioural science to focus litter-related efforts on prevention.

Appendix A: Literature Review Sources

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Appendix B: Behavioural Analysis and Interventions Sources

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Appendix C: Behavioural Messaging Literature and Example Interventions

Messaging Type	Literature and Existing Interventions
Behavioural Message 1. Social Norms Messaging	Cislaghi, B., Heise, L. Theory and practice of social norms interventions: Eight common pitfalls. *Global Health* 14, 83 (2018). https://doi.org/10.1186/s12992-018-0398-x Lede, E., Meleady, R., Seger, C.R. Optimizing the influence of social norms interventions: Applying social identity insights to motivate residential water conservation. *Journal of Environmental Psychology* 62 (2019). https://doi.org/10.1016/j.jenvp.2019.02.011
Behavioural Message 2. Audience Effect Messaging	Dear, K., Dutton, K., Fox, E. Do 'Watching eyes' influence antisocial behaviour? A systematic review & meta-analysis. *Evolution and Human Behaviour* 40, 3 (2019). https://doi.org/10.1016/j.evolhumbehav.2019.01.006 Bateson M, Robinson R, Abayomi-Cole T, Greenlees J, O'Connor A, Nettle D. Watching eyes on potential litter can reduce littering: evidence from two field experiments. *PeerJ.* (2015) 10.7717/peerj.1443
Behavioural Message 3. Identifiable Victim Messaging	Perrault, E. K., Silk, K. J., Sheff, S., Hoffman, A., & Totzkay, D. (2015). Testing the identifiable victim effect with both animal and human victims in anti-littering messages. *Communication Research Reports*, 294-303.
Behavioural Message 4. Self-Serving Messaging	Hansmann, R., & Steimer, N. (2017). Subjective reasons for littering: A self-serving attribution bias as justification process in an environmental behaviour model. *Environmental Research, Engineering and Asset Management,* 71(1).