



Determining Potential Business Impacts of an Extended Producer Responsibility Program for the Printed Paper and Packaging Waste Stream in Nova Scotia

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Executive Summary

The management of municipal recycling programs for the residential waste stream is increasingly costly and poses significant environmental risks when recyclable materials cannot be recovered. Mismanagement of recyclable materials contributes to an inefficient economy which demands the use of more raw resources and wastes valuable resources in the process. Historically, the onus for grappling with these materials has fallen onto taxpayers and governments, which requires significant capital financing and labour for solid waste resource management. A large amount of packaging and printed paper (PPP) materials flooding the marketplace and distributed to citizens has left municipalities struggling with large volumes of discarded materials to collect and process, and with the task of finding recycling end-markets in unstable global market conditions. As municipal recycling programs within Nova Scotia operate in a piecemeal function, a harmonized and cohesive program for PPP collection has not been achievable to date. Nova Scotia is currently shouldering a recycling program that is increasingly costly to administer amidst growing amounts of recyclable materials generated into the residential waste system.

One waste management approach known as the Extended Producer Responsibility (EPR) principle was developed in the 1990s in Europe as a method to address this stated issue of waste management, and to leverage the financial resources of producers to fund collection and marketing of products at the end of their useful life. The significance of EPR for PPP in the residential waste resource stream is in its main aim to create an impetus for companies to reduce their usage of packaging and paper materials in what they introduce to the market, as well as to select materials in the product design stage that are more easily recyclable. Several EPR for PPP programs are underway across Canada in British Columbia, Saskatchewan, Manitoba, Ontario, and Québec, wherein businesses have been required to finance recycling programs to relieve the burden on communities. Across all industries in Canada, thousands of domestic and international industry stewards are currently participating in EPR for PPP programs in the country. While Nova Scotians have been inadvertently paying for the costs of EPR through national product pricing implemented around the country, the province is receiving none of the benefits of EPR from stewards in delivering its recycling programs to residents. Efforts are underway by local governments and waste authorities in Nova Scotia to pursue an EPR program for PPP that would require industry operating in the province to finance and administer a recycling program to relieve local communities from the economic and logistical burden of creating an efficient and optimized system.

A proposed EPR for PPP program in Nova Scotia would require businesses to participate by paying their fair market share based on their annual revenue and the proportion of PPP materials that they introduce in the marketplace. A full model of EPR wherein industry would be required to both finance 100% of the costs and operate the program accordingly would be the first such program implemented in Atlantic Canada. Industry may be required to maintain current levels of service already offered to residents and integrate pre-existing recycling infrastructure into the new model.

This research has been undertaken to further examine what impact these propositions would place on the business community in Nova Scotia, in seeking a level playing field for all stewards. The key objective of this research has been to measure foreseeable financial and operational impacts that an EPR for PPP program may place on small, medium-sized and large businesses in the province of Nova Scotia. Findings from provincial business data from Nova Scotia indicate that the province is dominated by smaller sized enterprises, and, additionally, a small proportion of total businesses operating in the province would likely be implicated as stewards in the proposed program model. Lastly, best practices and crucial methods to reduce negative impacts on businesses in the province, optimize the provincial recycling system, and ensure maximal environmental benefits are investigated and proposed.

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Introduction

The management of residentially generated waste is a costly endeavour for citizens and governments to undertake, and waste mismanagement can place serious environmental and economic burdens on communities. The impetus for recycling recoverable waste materials is to regain valuable resources in production cycles, and to minimize further demand and consumption of raw resources in future manufacturing production (McDonough & Braungart, 2002). Millions of tax dollars are required for collection of recyclable materials, and these programs demand significant capital financing and labour. Nova Scotia's (NS) municipalities currently spend upwards of \$25M annually on recycling alone (Gorman, 2019).

Printed paper and packaging (PPP) materials comprise a significant proportion of residentially generated waste. Packaging materials like glass, metal, carton and plastic provide an essential contemporary function for the global distribution of food, beverages, and consumer goods (Hawkins, 2018). Printed paper products are similarly essential resources for businesses and organizations for advertising, public communication, and distributing consumer goods. While PPP materials are central within the modern marketplace and for organizational purposes, their complex array of physical and chemical properties pose challenges in ensuring efficient and effective collection, and in locating end-markets for their recycling. The cost and logistics required to uphold a municipal recycling program can be staggering for local authorities to undertake, due to increasingly fluctuant and instable global recycling markets for plastics, in particular (Canadian Council of Ministers of the Environment, 2009). The costs for collection and processing can account for between 77-95% of total costs within recycling programs, but could increasingly tend towards higher thresholds considering the greater difficulty in accessing end-markets for difficult-to-recycle materials (Giroux Environmental Consulting, 2014). Many materials, including post-consumer plastic categories, have variable resell values, and the costs of collecting and reprocessing those categories in municipally funded waste management programs can often outweigh their potential value in secondary markets, thereby disincentivizing investment in diversified recycling programs (Szaky & Zakes, 2015). Their mismanagement results in greater environmental and social costs.

The crisis of plastic waste mismanagement in particular poses many ecological, economic, and social dilemmas in the 21st century. Marine and terrestrial effects of accumulative plastic pollution on aquatic and terrestrial life, as well as that of humans, have been increasingly measured and documented (Eriksen et al., 2014; Rochman, 2018; Schwabl et al., 2019). Large volumes of plastic waste are generated from packaging materials, especially for the storage and distribution of food and cosmetic products which are often comprised of primary plastics (plastics produced from virgin materials) with a short use phase (Geyer et. Al, 2017). Research has found that food packaging waste alone comprises approximately one-third of all Canadian municipal solid waste (Xanthos & Walker, 2017). Recycling has been upheld as an important

step in recovering these resources and mitigating plastic pollution (Geyer et al., 2017; Ellen MacArthur Foundation, 2017).

A taxpayer-funded recycling model has been a conventional method in waste management around the world. Beginning in the late-20th century, authorities grappling with increasing volumes of wastes were faced with the dilemma of effectively increasing recycling and diverting residentially generated waste from landfill, and also minimizing the life cycle impacts of products at their disposal. Products of greatest concern like electronics, automobiles, household appliances, and hazardous household waste required new forms of coordination and life cycle analysis to develop improved end-of-life management strategies, to mitigate their entry into the natural environment through illegal dumping, abandonment, and landfill disposal (Lindhqvist, 2000).

Conversations about shifting the responsibility for managing materials at their end-of-life phase began in jurisdictions that were encountering these growing waste challenges. Thomas Lindhqvist, a Swedish academic in the field of industrial environmental economics, was among some of the first advocates for an alternative political approach to managing discarded material goods. In the 1990s, the Extended Producer Responsibility (EPR) principle was first articulated as a waste management approach by Lindhqvist and his colleagues in a report to the Swedish Ministry of the Environment (Lindhqvist, 2000). EPR is formally defined as “a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product” (Lindhqvist, 2000, p. v). The principle has the ultimate goal of developing “more environmentally adapted products and product systems” (Lindhqvist, 2000, p. i).

In the EPR model, businesses are responsible for paying the costs of end-of-life management for the materials they introduce into the marketplace, incentivizing recovery-based material streams and intending to stimulate improved environmental impacts through better product designs (Kunz et al., 2018; Lindhqvist, 2000). Since its development, the concept of EPR has been applied to many product industries like that of automobiles and electronic technology, and it has proven to be successful at creating networks of post-consumer material collection and recovery (Bocken et al, 2016). EPR for the PPP waste stream requires industries to finance, in part or in whole, the end-of-life management of materials that they provide into the market once they are discarded, alleviating tax-funding otherwise required to finance the system.

Throughout Canada, various provincial EPR programs have already been implemented for products ranging from car batteries, lightbulbs, and electronic waste (EPR Canada, 2016). Historically, across Canada EPR has been regarded as an effective strategy to manage and mitigate problematic waste categories and has been employed for many products due to its effectiveness in waste diversion (Duncan Bury Consulting, 2012). In NS, product stewardship programs employing an EPR model have been employed for many hazardous waste streams through both provincially regulated and voluntary producer programs. NS currently has a number of both provincially regulated and non-regulatory EPR and product stewardship

programs (Nova Scotia Environment, 2020). The beverage container recycling system is one example of a regulatory program operating in NS. In addition to collection of beverage containers, regulatory programs include collection of hazardous household waste including used oil, consumer paint products, and used tires; non-regulatory collection programs are undertaken independently by business or industry associations and include telephone directories and milk packaging (Nova Scotia Environment, 2020).

In Canada, the first EPR program for PPP materials in particular was introduced in 2002 in Ontario (Canadian Stewardship Services Alliance, 2020). Currently, five EPR programs for PPP are underway in British Columbia (BC), Manitoba (MB), Saskatchewan (SK), Ontario (ON) and Québec (QC). These programs are funded fully or partially by industries that supply PPP to the provincial market. Throughout four programs in BC, SK, MB and ON, there were 2,472 active industry stewards participating in EPR programs for PPP in 2020 (CSSA, 2020). New Brunswick (NB) approved an EPR policy for PPP in 2019, which would be Atlantic Canada's first such program. NS does not yet have an approved EPR program for PPP, despite many proposals from provincial entities and positive consensus among NS's municipalities to implement it.

Stewards across Canada provide hundreds of millions of dollars in annual funds to finance EPR programs in the country. For instance, industry stewards provided \$367M in EPR funds to Canadian provinces in 2016, of which NS received no funds (Halifax Regional Municipality, 2018). Many EPR programs for PPP are funded in Canada through national product pricing, wherein companies incorporate the costs of participating in these recycling programs into their products that are sold around the country, thereby offsetting the costs onto the consumers of their products (Halifax Regional Municipality, 2018). This means that Nova Scotians are paying the same price as consumers in other provinces who are receiving waste management support through this mechanism, without receiving any of the benefits and cost alleviation. Furthermore, Nova Scotian citizens are paying recycling prices twice in this regard. Any purchases made in NS that fall within these national product pricing models is coupled with property tax payments that citizens already make on an annual basis, which is the source of funds for municipal recycling programming (Halifax Regional Municipality, 2018; Gorman, 2019). As such, the province is investing in waste resource management programs in other provinces but faces an unfair disadvantage in that it has received no industry funds to support its increasingly costly recycling program.

The role of businesses operating in NS is therefore crucial in alleviating the inundating burden of financing the current recycling system in the province. The position of the business community in NS is varied in its response to the development of a provincial EPR program for PPP. The Canadian Federation of Independent Businesses (CFIB) and the Retail Council of Canada (RCC), among other stakeholders who advocate on behalf of businessowners across the country, have expressed the position that implementing EPR for PPP in NS may unfairly obligate a small quantity of businesses in the province who would be unfairly required to finance a system that pays for the collection of PPP materials of all businesses who meet the exemption threshold. This position will be expanded and analyzed in later sections.

The need for a provincial EPR program for PPP waste in NS has been identified by local governments and waste authorities in NS and is the subject of ongoing efforts by members of the Nova Scotia Federation of Municipalities (NSFM) (Halifax Regional Municipality, 2018). In response, the provincial recycling organization Divert Nova Scotia has identified the current need to understand how businesses operating in the province could be impacted by the potential implementation of an EPR program for PPP. Divert Nova Scotia has directed this research with key objectives being to identify the expected impacts on businesses, with sights on the environmental gains an EPR program for PPP would bring to the province.

Methodology

The research objectives of this project that have been determined by Divert Nova Scotia are fivefold:

1. Determine the impact of EPR for PPP on small, medium and large businesses in NS;
2. Determine the number of businesses that would likely be impacted at specified *de minimus* levels of \$1M and \$2M;
3. Determine the types of businesses that would be impacted in NS;
4. In other provinces where EPR for PPP exists, determine the number and types of businesses that are impacted; and
5. Investigate the ways to reduce impacts on NS business based on best practices in other jurisdictions.

These research objectives have required a mixed-methods approach, relying primarily on document review, on data available from the Canadian Stewardship Services Alliance, data from Canadian provincial stewardship organizations, as well as provincial financial data from Statistics Canada accessed through the Economics and Statistics Division of the Nova Scotia Department of Finance. Following is an overview of the methods that have been employed to fulfill the objectives of this research.

Literature Review

This research is comprised primarily of a literature review relying on peer-reviewed, governmental, and regional research that has been undertaken on the topic of implementing an EPR program for PPP materials. Available literature that has been produced for the implementation of an EPR program for PPP in NB has been employed in contextualizing the topic for Atlantic Canada.

An ongoing comprehensive literature review began in November 2018 and continued until March 2020. Peer-reviewed literature was retrieved from a number of sources, primarily through the digital Novanet library catalogue available to academic institutions across NS. Additional peer-reviewed literature was located from closely examining the citations included in bibliographies in each article, and relevant literature therein was located. The main search

terminology and thematic combinations of terms that were included in search queries are as follows:

- 'extended producer responsibility' & 'extended producer responsibility plastic' & 'extended producer responsibility packaging';
- 'EPR' & 'EPR plastic' & 'EPR packaging';
- 'packaging' & 'brand packaging' & 'food packaging' & 'printed paper packaging'
- 'packaging and paper' & 'packaging and paper waste' & 'plastic waste';
- 'product stewardship'; and
- 'recycle plastic' & 'recycling plastic' & 'recycle packaging'.

Extensive review of each of the five provincial PPP stewardship program regulations in Canada was also completed through an analysis of current program plans and policies that are available through each provincial stewardship organization's website. Stewardship programs were gathered from the organizational websites of Recycle BC; Multi-Material Stewardship Western; Multi-Material Stewardship Manitoba; Stewardship Ontario; and Éco Entreprises Québec. Since each program is renewed in different time periods, any updates or changes to programs that may not have been reflected in the currently available program plans were supplemented through the Canadian Stewardship Services Alliance's (CSSA) resources made available on their website.

Resources on the topic of EPR were employed from the Organization for Economic Co-operation and Development (OECD), the European Union, and various other governmental organizations that have produced rigorous coverage on EPR issues for all industries currently implicated in EPR stewardship around the world.

Lastly, media coverage of PPP recycling has risen steadily over the timeline that this research has been undertaken, especially in regard to the political and social eagerness for the adoption of an EPR program for PPP across the Atlantic region. Canadian and international media coverage in this respect has been another source of important literature in conducting this research.

Classification of National Stewards in Canadian Stewardship Services Alliance

The national stewards participating within each program operating in BC, SK, MB and ON are updated and made available at the beginning of each calendar year by the (CSSA). The CSSA, established in 2012, operates as the overarching body providing administrative services to four of the five provinces operating PPP stewardship programs in Canada (CSSA, 2020). Québec is currently not a member of the CSSA and operates its PPP program independently. At the time of writing, its own steward data were not available to apply to this research (CSSA, 2020).

Available steward data from four Canadian programs were analysed for several factors: their quantity of total active stewards, the quantity of both resident and voluntary stewards, and industry representation within the programs. All 2,472 stewards across four provinces were

individually categorized into their respective industry. This was undertaken to gain a general overview of the industries affected in other jurisdictions, and to determine if some industries showed a greater participatory predominance in current PPP stewardship programs.

Secondly, steward data from the CSSA were analyzed further beyond country-wide classification with focus on SK's program exclusively. Sizeably, SK's EPR for PPP program would be most comparable to NS than the other larger Canadian provinces, in terms of the composition of their small business community. Each steward in SK was classified into one of three categories: businesses headquartered in SK, businesses headquartered within a different Canadian province, and businesses headquartered outside of Canada. This information was analyzed to draw a comparison between two groups: stewards with a SK-based headquarters, and stewards from businesses that have headquarters located elsewhere. This analysis is useful for characterizing the local steward composition of SK, versus for stewards based outside of SK, and in doing so, it is possible to parallel the information to gauge the quantity of local NS-based businesses that may be implicated in the development of an EPR program for PPP in the province.

The North American Industry Classification Standard (NAICS) is employed as the standard categorical framework in this research to divide industry stewards into their applicable industries to facilitate defined comparison. The NAICS is employed by Statistics Canada and is composed of 20 industry types that are divided into two main categories of goods-producing and service industries.

Goods-producing industries include:

- Agriculture, forestry, fishing and hunting;
- Mining, quarrying, and oil and gas extraction;
- Utilities;
- Construction; and
- Manufacturing (including that of food; pharmaceuticals; beverages; textiles; paper and wood products; technology and hardware; petroleum and chemicals; consumer goods; as well as packaging materials themselves).

Service-providing industries include:

- Wholesale trade (includes enterprises that may distribute products from a manufacturer, or that may manufacture their own products to sell directly to retailers or other businesses);
- Retail trade (not including restaurant establishments);
- Transportation and warehousing;
- Information and cultural industries (including media; film, sound, and video industries; broadcasting; telecommunications; and libraries);
- Finance and insurance;
- Real estate, and rental and leasing;

- Professional, scientific and technical services (including legal, financial, architectural, engineering, design, and advertising labour);
- Management of companies and enterprises;
- Administration and support, waste management, and remediation services;
- Educational services;
- Health care and social assistance;
- Arts, entertainment, and recreation;
- Accommodation and food services (including restaurants);
- Other services (not public administration, but including repair and maintenance services; personal care services; religious, professional and social organizations; and private households); and
- Public administration.

Stewards were analyzed based on their main industrial sector. The purpose of this analysis has been to identify the most significant sources of PPP materials in Canada. Stewards were classified into only one industrial category and were categorized based on their main area of activity, though some businesses span multiple operations along their supply chain. This was done to simplify categorization and avoid duplication. For example, a manufacturer that is also involved in retail trade has been primarily categorized in the manufacturing category. If an agricultural food producer is also involved in the wholesale of agricultural produce, the business has been categorized in the goods-producing agricultural sector.

Nova Scotia's Business Impacts

The process of determining the quantity of small, medium-sized and large businesses in NS is based upon a methodology previously used within a 2019 report prepared by Recycle New Brunswick for the Union of Municipalities of New Brunswick, titled "Packaging and Printed Paper Dialogue Phase IV: Report on the Phase IV Packaging and Printed Paper Dialogue" (Léger, 2019). Its methodological approach therein is employed for the purposes of this report. Detailed provincial business revenue data collected by Statistics Canada were accessed through the Economics and Statistics Division of the Nova Scotia Department of Finance. To glean an accurate account of the industry composition in NS, revenue data were accessed from the reporting period of December 2019. In light of the substantial impacts of the global COVID-19 health pandemic on the business community within the country, particularly on small enterprises, data from this reporting period may be able to provide a more accurate account of the industry composition in the province from what could be considered a conventional economic landscape and conventional operational conditions.

Packaging and Printed Paper Material

Trading activities among human societies throughout history have always required packaging to fulfill essential functions to "contain, protect, identify, and distinguish" (Klimchuk & Krasovec, 2012, p. 3) goods. Traditionally, packaging materials were composed of metal, glass,

paper, and clay (Hine, 1995). Growing economic globalization coupled with technological innovations in the post-World War II era have required widening trade networks for food and other commodities to travel longer distances, which has necessitated greater volumes of packaging material to store and transport commodities to distant markets (Goldstein, 2012; Hawkins, 2018). Design principles for packaging materials are characterised by disposability, lightness of weight (known as material ‘light-weighting’ in product fabrication), and enhanced product hygiene (Miller, 2019). Alongside its physical characteristics, the visual features of packaging design are viewed as integral to a brand’s success in the marketplace, which therefore play a crucial role in the selection of a packaging material in the product design stage that will allow for businesses’ marketing objectives and strategies to be fulfilled (Birch, 2000). Marketplaces now rely on a flood of packaged goods to stock shelves, acting as “the skin of commerce” (Hawkins, 2018, p. 387).

Categories of Packaging

Due to the complexity of packaging categories and applications used in the marketplace today, it is important to define and clarify the existing terminology of the different functional classes of packaging available in retail outlets. This terminology will be further employed in following sections to describe designated materials collected in PPP stewardship programs.

Primary packaging acts as a main container of a product, having direct contact to the contents of the product. Secondary, or grouped packaging, provides less direct contact with the product, but acts as an additional material on top of the main protective layer, and is often used to contain several items for sale together (BIO, 2014). Tertiary packaging, also termed as transportation, bulk, or distribution packaging, combines or secures consumer goods in their movement from a manufacturing facility or main holding location to the marketplace (BIO, 2014). This category of packaging would secure goods within large shipments on pallets or crates. If removed within a retail location before a transaction, such packaging would not be considered part of the residential waste stream, but if brought home with the consumer to their household, it would be discarded into the residential waste stream and thus would be deemed a designated material in a PPP program (CSSA, 2020).

Service packaging is provided to consumers to be filled at a point of sale and includes such items as bags that are filled at bulk food counters, and takeout and home delivery food packaging (Recycle BC, 2019). Lastly, ancillary elements upon any of the listed packaging materials, or any features that hang onto or are attached to a package, and which are not intended to act as an integral part of the product’s long-term storage itself would constitute a PPP material (Recycle BC, 2019).

Packaging and Printed Paper Waste

As a waste class, PPP comprises many diverse types of materials. Printed paper materials act as vital resources for organizational and corporate communication and advertising, and as

materials deemed necessary for public use such as telephone books, brochures, and flyers. Packaging is also evidently a crucial material for the protection and transportation of goods in the marketplace and into consumer households.

PPP materials are functionally diverse and are similarly diverse in their physical and material properties, resulting in high levels of variability and complexity, which in turn pose a central challenge in recycling programs when materials are economically or technically infeasible to collect and recycle. The marketability of PPP materials is not homogenous, and the collection and management of these materials requires consistent public participation in sorting and collection, in addition to a large input of financial resources and coordination between many actors. Mismanagement of these materials results in increased litter and pollution rates, landfill disposal, and lost resources.

Not all packaging materials pose an equal challenge to recycle. For instance, throughout modern history, trade in scrap markets has been well developed for metals, glass, and other materials that have had value to humans for centuries (Strasser, 1999). Aluminum and other metal products have historically been considered of higher value for recycling, and more feasible to reuse where the required network and infrastructure has been available. Glass and metals have relatively stable end-markets for recycling and are considered more sustainable in product reuse systems. According to Novelis, the largest global manufacturer of flat-rolled aluminum, aluminum beverage cans are able to be recycled and distributed back to a retail outlet as new products within a total of sixty days, starting from their recycling until their redistribution (Hogan, 2019). Glass, a similarly robust packaging material, is optimal to maintain in product reuse systems through beverage deposit systems and other mechanisms; however, the material can also be challenging to recycle because of high rates of breakage and fluctuating market conditions (Giroux Environmental Consulting, 2014).

Through emergent trends in light-weighting and innovation in packaging design, however, plastic has become a popular choice for replacing weightier packaging materials like glass and metal. Plastics for packaging are variable and more complex in their physical and chemical composition than other material classes, and once discarded, they are oftentimes challenging to market for recycling due to their mixed material composition. PPP waste is also subject to higher rates of contamination which affects the quality of materials collected and makes recycling harder to undertake. Packaging materials in many cases are multi-plastic in composition, but during reprocessing and sorting, they are categorized based on their main material, resulting in poorly separated and lower quality materials collected overall (Brouwer et al., 2018). Mixed-material waste does not facilitate cost-effective recycling operations. By placing the financial responsibility for the management of PPP waste streams on producers, businesses would theoretically be incentivized to optimize their packaging designs and select materials that are less complex, and more financially worthwhile to recycle (Kunz et al, 2018; CSSA, 2020).

Many of the packaging materials that are employed today were designed for their low cost to manufacture and ease of disposal, with little oversight invested into the post-consumer costs

that they would place on consumers, households and communities in the future (Lindhqvist, 2000). In effect, increasing volumes of disposable packaging and paper materials have accumulated at a rapid rate and have left local authorities facing rising costs in the effort to recover resources and limit disposal. Large volumes of disposable material are met with an equally voluminous challenge – a reliance on foreign export recycling markets to accept materials that cannot be processed domestically due to lacking domestic recycling infrastructure.

Challenge of Locating End-Markets

China's ban on waste imports entering its country, enacted in 2018, left the global recycling market stranded. Through its National Sword policy, China shed its previous role as the world's largest importer of recyclable waste by banning 24 different types of materials from foreign shipments, thereby eradicating many nations' main export market for their recyclable materials (Franklin-Wallis, 2019; Liu, Adams, & Walker, 2018; Walker, 2018). Smaller recycling markets in south-east Asia attempted to fill the void left by China and began importing larger quantities of plastics and other recyclable materials to fulfill the overseas demand, and countries like Malaysia, Thailand, and Turkey were soon swallowed by materials (Giuffrida, 2020; OECD, 2018). Ratifications to the Basel Convention under the United Nations Environment Programme, which regulates the transboundary shipment of hazardous wastes, have attempted to limit the shipment of plastic waste overseas to countries lacking environmental protocols for effective recycling or safe operational conditions in recycling facilities (Secretariat of the Basel Convention, 2020). International efforts to limit mismanagement in the global recyclable material trade continue to attempt to effectively address the problem. Locating international markets for the recovery of recyclable materials is a central challenge for local authorities in NS, who are currently lacking domestic options. In this context, producers are better positioned to navigate these global market challenges and play a pivotal role in optimizing recycling systems.

Extended Producer Responsibility Principle for Packaging and Printed Paper

The CSSA describes EPR as “the concept that businesses assume responsibility for the impact of their product and/or packaging on the environment after it is discarded by consumers regardless of whether it is managed in the waste, organics or recycling stream” (CSSA, 2020, p. 8). An EPR program balances several goals at once: lowering waste material generated from packaging, increasing the quantity of waste packaging that is able to be collected and recycled in end-markets, and stimulating redesign for packaging materials that are difficult or costly to recycle, or that pose risks to human health (Azoulay et al., 2019). EPR programs for PPP require a balance between resident participation, operational efficiency along a reverse supply chain, and measurement of progress towards the overall goal of increasing resource efficiency and pollution prevention. In an EPR program for PPP, the economic, and in some cases operational and logistical, responsibility for the management of post-consumer PPP is put onto the

shoulders of industry. Following is a brief discussion of the key stakeholders and groups of actors in an EPR program.

Producer Responsibility Organization (PRO)

In Canada, EPR programs employ one or several stewardship organizations to represent stewards of a designated class of recyclable materials and act on their behalf (CSSA, 2020; Kunz et al., 2018). A Producer Responsibility Organization (PRO) is an entity that oversees the registration of obligated stewards and payments to reimburse municipalities for the costs of their recycling program. A stewardship organization is established in response to the approval of a provincial regulation for an EPR program. During the design phase of an EPR program, it would be the responsibility of a PRO to outreach to businesses to introduce them to applicable stewardship concepts, details about the proposed program, and to determine if they would be required to register as an obligated brand owner, first importer, or franchisor doing business in the province that supplies PPP material to residential consumers (Giroux Environmental Consulting, 2014). A PRO negotiates contracts for collection and recycling services and acts as a “collective service producer” to industry stewards (OECD, 2018).

Full Responsibility Model

In a full responsibility EPR model, producers are responsible for the entire financial cost and operational management of the program. In some full models, like that of Recycle BC’s, operational responsibility for collection, program promotion and education are still overseen by either a provincial recycling organization or by individual municipalities, if they choose to continue to operate their programs independently (Recycle BC, 2019). Generally, a full responsibility model requires the producers to finance and operate the process of collection, processing and locating end-markets for recyclable materials, unless an agreement outlines that a municipality or local stewardship agency will remain responsible for delivering a portion of the program.

The preference for a full responsibility model takes the onus off a local government to deliver recycling programming and allows a producer to have full control over program planning and administration. Producers are considered to be best positioned to carry out the most efficient and effective recycling systems, due to their ability to access and locate recycling end-markets on a global scale, as well as to respond to inefficiencies by making alterations to their product designs and selection of packaging materials.

A full responsibility model may allow a contract to be defined between producers and municipalities, that incorporates existing municipal infrastructure and other resources into the new program. In the transition from a municipally run recycling program to a full EPR model, any publicly owned recycling infrastructure may become a stranded asset unless producers agree to contract with a local government to employ pre-existing facilities or human resources in the new program (Halifax Regional Council, 2019). Therefore, stewards may contract with

local governments to use sorting facilities, vehicles, or other investments that have been made in the past. Additionally, a local government may remain the first point of contact with citizens in delivering educational materials for the program, or other services.

Shared Responsibility Model

In a shared responsibility model, stewards and local authorities are both financially and operationally responsible for a portion of the recycling program. A percentage of total annual program costs incurred by a municipality are reimbursed by obligated stewards. In Canada, the common percentage for municipal reimbursement currently ranges between 50% to 100%. A funding formula is employed in each program to determine all eligible costs that industry stewards are required to reimburse a municipality.

A shared EPR model allows for municipal or regional waste authorities to continue to have decision-making power over program design, operation and practices, which is an avenue that is ideal for municipalities that have made significant investments within publicly owned infrastructure for their recycling programs (Giroux Environmental Consulting, 2014).

There are criticisms and disadvantages to the shared model. Some disadvantages from an industry standpoint include their lack of control over program operations, since program administration, contract setting, and logistical decision-making power remain in the hands of municipalities. Industry finances the recycling program but does not have equal authority to control program delivery, or to implement program efficiencies to reduce overall costs. Additionally, there is found to be less impetus for industry to undertake packaging design changes in a shared model, resulting in reduced impact on design-for-environment objectives (OECD, 2018). A full EPR model allows for more direct feedback loops between the standpoints of waste collection and industry, wherein assuming the complete task of locating end-markets for recyclable materials would theoretically incentivise a producer to identify and undertake changes to their product designs and create more efficient material choices for optimal recyclability.

Actors in an EPR System

Thomas Lindhqvist, in his 2000 doctoral dissertation on EPR, defines four primary actors involved in an EPR program: producers, users, waste managers, and authorities.

Producers

Identifying the party along a supply chain responsible as a financially obligated producer may not be immediately straightforward (Lindhqvist, 2000). Early on in the development of European EPR programs, this issue was debated regarding which actor(s) should assume responsibility for managing such end-of-life materials. A supply chain can comprise many actors involved in the initial extraction of raw resources, in the design and development of materials,

in product distribution, and in retail (Lindhqvist, 2000). Therefore, a producer may be defined as any actor along the supply chain spanning raw material extraction, manufacturing and assembly, and distribution (which includes post-production actors like wholesalers, importers, dealers, and retailers) (Lindhqvist, 2000). In response to this complex matter of identifying a responsible party, EPR programs for PPP materials set three categories of obligated stewards to clarify and define responsibility. These include 'brand-owner', 'first importer', and 'franchisor'.

From a Canadian standpoint, the CSSA states that stewards may be deemed obligated if they provide any type of packaging or paper materials to residential consumers through sale, or through distribution of information or promotional materials (CSSA, 2020). Many stewards do not operate exclusively as businesses that produce or distribute PPP materials, but may be a non-commercial entity that distributes PPP material as part of an educational or community purpose. Churches, municipalities, and universities may qualify as obligated stewards in an EPR program for PPP, as they currently do in some EPR for PPP programs across Canada (CSSA, 2020).

Once a producer has been identified, there are two categories that define their participation in an EPR program, based on their operational conditions and their status as brand-owners, importers, or franchisors in the jurisdiction that they are operating in.

Obligated steward

Obligated stewards, also termed as resident stewards, are required to report and pay fees if they are a brand-owner, first importer, or owner of a franchising business operating within a jurisdiction supplying any designated PPP materials to residential consumers that will be generated in the residential waste stream.

An entity is deemed an obligated steward if they qualify to report and pay fees for the PPP materials they introduce into the marketplace, based on a set revenue-based or weight-based threshold. In Canada, there are various exemption factors in place to determine obligated and non-obligated producers in each provincial program. These exemptions are also termed as *de minimus* conditions. If a producer meets any of the *de minimus* criteria, they would be required to commit to an annual agreement that indicates that they fall within the applicable exemption threshold (Giroux Environmental Consulting, 2014). These exemption factors may be based on the following considerations and will be expanded upon in following sections describing how they are implemented in other provinces:

- Revenue-based threshold;
- Weight-based threshold;
- Single point of retail sale;
- Low volume steward fees;
- Flat fee categories; and

- Franchisor and franchisee obligations.

Simply put, any PPP-using organization that is not exempted from any of the provincially set thresholds for obligated stewards is required to report and pay their proportionate material fees annually.

Voluntary steward

Any non-resident stewards may be deemed responsible for designated PPP if they register to become voluntary stewards. Voluntary, non-resident stewards become obligated to report designated PPP materials and pay fees on behalf of another entity that supplies PPP material in a jurisdiction. Once a voluntary steward registers in one jurisdiction, they are responsible for reporting and paying fees for all of their brands that supply designated PPP materials to residential consumers within that specified jurisdiction (CSSA, 2020).

Users

A user is defined as any private or professional consumer or patron (Lindhqvist, 2000). By making purchasing decisions, the user fulfills a fundamental role in product systems as a consumer, and crucially, they are the first point of contact with waste managers when products become waste. Users fulfill an essential role as effective sorters of household waste and participants in recycling programs.

While the user is an essential stakeholder in product systems as a consumer and as citizen, they have comparatively little authority and power to innovate product designs and alter the supply chain for PPP materials that producers do (Lindhqvist, 2000). Users do have a role to play in bolstering product improvement and innovation through engagement and participation in consumer campaigns, and as informed and effective recyclers in the home and in public.

Additionally, the user plays an essential role as a taxpaying citizen which upholds the infrastructure and networks that are necessary for municipally run recycling programs to exist. Furthermore, from an EPR standpoint, the user continues to play an essential role as a consumer who indirectly pays some of the stewardship costs of an EPR program through national product pricing schemes or deposit refund systems, which are embedded into a products' total costs. While there is no one-size-fits-all model for the financing of an EPR program, the consumer plays an essential role in EPR for PPP programs in Canada.

Waste Resource Managers

These actors consist of the labour roles required along the entire recycling supply chain, beginning with waste collection, sorting, processing, treating and recycling (Lindhqvist, 2000). Depending on the particular model, waste managers may be public employees of municipal

programs, or private employees of a third-party waste company that has been contracted by a municipality, or an industry or business association.

Authorities

These actors are composed of all applicable levels of government comprising municipal and provincial levels who have legislative power in proposing, enforcing and regulating an EPR program (Lindhqvist, 2000). Whether a stewardship model is built on a full or shared responsibility funding model, the relationship between all actors, but especially that between authorities and producers, is critical in ensuring the financial and operational components of a program are well-defined and that all parties are fairly compensated and engaged. Monitoring and enforcement protocols to ensure industry stewards are fulfilling their duties are crucial, as are program targets to ensure that the program is achieving measurable progress in creating an efficient recycling system, and in reducing detrimental environmental impacts.

Design-for-environment

The central goal of the EPR principle is to achieve feedback loops between all implicated actors in the waste resource management chain. Improving the material characteristics of product systems for easier recyclability, safer disposal, or avoided disposal altogether by maximizing recyclability are each concepts that together form EPR's 'design-for-environment' (DfE) goal (Lindhqvist, 2000). There are a multitude of methods and actions that a producer could choose that encompass design improvements. This includes individual steps or a combination of the following concepts and activities (Kunz et al, 2018; Lindhqvist, 2000):

- reusability;
- repairability;
- refurbishment;
- leasing;
- cascading;
- capacity-sharing; and
- dematerialization.

Extended Producer Responsibility for Packaging and Printed Paper Programs in Canada

There are currently more than 80 provincial stewardship programs across Canada for various materials (CSSA, 2020). Currently, there are five EPR programs underway for the collection of PPP materials. In Canada, EPR for PPP programs cover residentially generated materials collected in residential waste streams. The programs do not involve waste materials generated through the institutional, commercial and industrial (ICI) sector. In Table 1, characteristics of each of the five programs include their regulatory frameworks, the overarching provincial

stewardship organization administering each program, their years of establishment, as well as the residential scope of their collection program.

Table 1: Overview of Provincial PPP Stewardship Programs in Canada in 2020.

Provincial PPP Programs	Provincial Stewardship Organization	Regulation	Year Active	Full or Shared	Producer Funding	Residential Stream Collection
British Columbia		Environmental Management Act, 2003 <i>Regulation 449/2004, Schedule 5</i> May 2011	2014	Full	100%	Multi- and single-family dwellings, depots, streetscapes, municipal parks and plazas
Saskatchewan		Environmental Management and Protection Act, 2002 <i>Household Packaging and Paper Stewardship Program Regulations</i> February 2013	2016	Shared	75%	Multi- and single-family dwellings, depots
Manitoba		Waste Reduction and Prevention Act, 1990 <i>Packaging and Printed Paper Stewardship Regulation</i> December 2008	2010	Shared	80%	Multi- and single-family dwellings, depots
Ontario		Waste-Free Ontario Act, 2016 (formerly Waste Diversion Act, 2002) <i>Blue Box Waste Regulation</i>	2004	Shared	50% (100% by 2023)	Multi- and single-family dwellings, depots
Québec		Loi sur la qualité de l'environnement (Environment Quality Act) <i>Regulation respecting compensation for municipal services provided to recover and reclaim residual materials</i>	2005	Shared	100%	Multi- and single-family dwellings, depots, streetscapes, municipal public spaces

Sources: CSSA, 2020; Éco Entreprise Québec, 2020; Multi-Material Stewardship Manitoba, 2017; Multi-Material Stewardship Western, 2015; Recycle BC, 2019; Stewardship Ontario, 2020

British Columbia

Recycle BC describes its provincial stewardship program as a reverse supply chain operation (Recycle BC, 2019). BC has had a full producer funding model since 2014, whereby 100% of their PPP program is funded by obligated stewards and operated in a shared model with Recycle BC. The program maintains a 75% recovery rate target (Recycle BC, 2019). As of 2020, BC had a total of 1,273 stewards: 1,050 resident and 223 voluntary stewards (CSSA, 2020). Recycle BC's program was the first of any jurisdiction's in North America to report on detailed material-specific PPP collection, and to set targets on sub-categories of both rigid and flexible plastics (Recycle BC, 2019). In Table 2, BC, alongside SK, is one of two provinces that implements a 'single point of retail' exemption as part of its exemption categories (CSSA, 2020).

Table 2: Recycle BC's Program Highlights.

	Types of Paper Product	Material Exclusions	Revenue-based Exemption	Tonnage-based Exemption	Single Point of Retail Sale Exemption
<p>Types of Packaging</p> <p><u>Materials collected:</u> paper, metal, glass & plastic</p> <p>Primary, secondary, tertiary, service & ancillary elements</p>	<ul style="list-style-type: none"> - Flyers; - Brochures; - Booklets; - Catalogues; - Telephone books; - Newspapers; - Magazines; - Paper fibre - Paper used for copying and writing 	<ul style="list-style-type: none"> - Unsafe or unsanitary paper items; - Bound textbooks, reference or literary books 	<ul style="list-style-type: none"> - ≤\$1M in annual revenue in BC; - Charitable organizations do not need to register; - No online sales; - Not part of chain or franchise 	<p>Businesses that supply ≤1,000 kg of PPP</p> <hr/> <p>'Low Volume Stewards' pay a flat fee with tonnage between:</p> <ul style="list-style-type: none"> - 1,000 kg – 2,499 kg & 2,500 kg – 4,999 kg <p>Increasing to:</p> <ul style="list-style-type: none"> - 5,000 kg – 9,999 kg & 10,000 kg – 15,000 kg 	<p>Businesses operating a single storefront</p>

Sources: CSSA, 2020; Recycle BC, 2019.

Saskatchewan

Multi-Material Stewardship Western is the provincial stewardship organization overseeing all producer obligations and facilitating the reporting and payment of annual fees from all obligated stewards. As of 2020, SK had 553 stewards: 298 resident stewards, and 255 voluntary stewards (CSSA, 2020). The program maintains a 75% target for PPP collection (MMSW, 2015). Under the provincial stewardship agreement, stewards can choose either to submit their own plan for collecting and recycling PPP materials, or become member to MMSW that develops a plan for stewards to meet the requirements of the regulation (MMSW, 2015).

In 2014, the province added a permanent exemption for businesses generating less than \$2M in annual revenue, for those supplying less than one tonne of residential packaging and paper, and for those operating a single retail store location. A two-year transition period was instated for implementing an exemption from reporting and paying fees for low-generating stewards. Visible in Table 3, SK is the second province that maintains a ‘single point of retail’ exemption.

Table 3: Multi-Material Stewardship Western’s Program Highlights.

	Types of Paper Product	Material Exclusions	Revenue-based Exemption	Tonnage-based Exemption	Single Point of Retail Sale Exemption
<p>Types of Packaging</p> <p><u>Materials collected:</u> Glass, metal, paper, boxboard, cardboard, paper fiber, and plastics</p> <p>Primary, secondary, tertiary, service & ancillary elements</p>	<ul style="list-style-type: none"> - Flyers; - Brochures; - Booklets; - Catalogues; - Telephone books; - Newspapers; - Magazines; - Paper material used for copying and writing 	<ul style="list-style-type: none"> - Unsafe or unsanitary items; - Bound books; - Plastic pallet wrap; - Distribution, industrial or bulk packaging not meant for residents to bring to the household; - Cutlery; - Packaging sold as empty (e.g. waste bags); - Items an integral part of a product’s containment (e.g. toner cartridges and disposable cameras); - Durable packaging with a useful life of >5 years and remains with a product throughout its useful life; - Materials made of wood, ceramic, crystal and rubber 	<p>≤\$2M in annual revenues in SK</p>	<p>Businesses that supply ≤1,000 kg of PPP</p> <hr/> <p>‘Low Volume Stewards’ pay a flat fee with tonnage between 1,000 kg – 5,000 kg</p>	<p>Businesses operating a single storefront</p>

Sources: CSSA, 2020; Multi-Material Stewardship Western, 2015.

Comparing Saskatchewan and Nova Scotia’s Industry Composition

Due to comparable provincial populations and composition of small business communities in both provinces, sizeably, SK’s EPR for PPP program may be most applicable for comparison with NS than another larger Canadian province. NS’s proposed EPR program employs the same revenue-based exemption of \$2M for small businesses, the same weight-based condition of <1 tonne of PPP annually, as well as a single point of retail exemption. In Tables 4 and 5, small businesses constitute the largest proportion of businesses in NS and SK, though these data are representative only of businesses operating with employees in each province. Further information on total businesses operating in NS both with and without employees is available in following sections.

Table 4: Amount of Small, Medium, and Large Employer Businesses in Nova Scotia and Saskatchewan in December 2019.

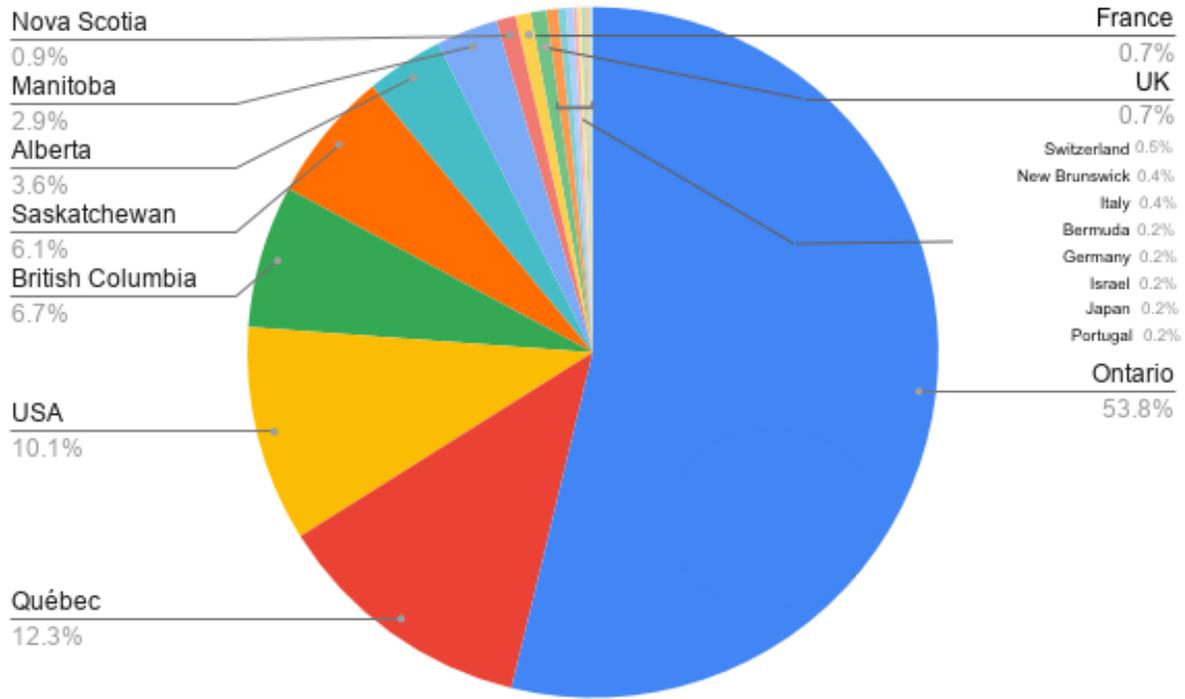
Province	Small businesses (1-99 employees)		Medium businesses (100-499 employees)		Large businesses (500+ employees)		Total businesses with employees
	Count	Percentage	Count	Percentage	Count	Percentage	
Nova Scotia	29,876	98.0%	542	1.8%	68	0.2%	30,486
Saskatchewan	41,008	98.3%	647	1.6%	77	0.2%	41,732

Sources: Statistics Canada, Table 33-10-0222-01 Canadian Business Counts, with employees, December 2019

In Table 4, NS was dominated by smaller business enterprises in the province in 2019. It is clear that the largest proportion of employer businesses is concentrated in the enterprises that are composed of under 100 employees. Findings in SK demonstrate an almost identical actuality in industry composition, indicating a larger presence of small employer businesses within the province.

Using national steward data available from the CSSA, a headquarter analysis of SK’s industry stewards has been undertaken to locate trends that might illuminate important insight for obligated stewards in an EPR program for PPP in NS. National steward data demonstrate that SK sees low amounts of locally headquartered businesses represented in its total stewardship, and a larger quantity of Canadian subsidiary brands and multinational corporations. SK’s resident stewards that are headquartered within SK total merely 33 local businesses, or approximately 6% of total industry stewards. A larger proportion of its stewards are located outside of the province. This demonstrates that only a small proportion of SK’s local business community is obligated in the province’s program, and larger corporations with multiple locations or subsidiary brands continue to play a predominant role in financing the program. These trends are visible in Figure 1.

Figure 1: *Composition of Industry Stewards in Multi-Material Stewardship Western Program in 2020.*



Source: CSSA National Steward List, 2020.

Manitoba

Multi-Material Stewardship Manitoba is the province's stewardship organization. As of 2020, the province had a total of 791 stewards: 545 resident, and 246 voluntary stewards (CSSA, 2020). The program maintains a 70% recovery rate for PPP materials (MMSM, 2017). MB is the only province that does not maintain a *de minimus* condition for exempted stewards to avoid registering with the provincial stewardship organization. Table 5 shows further details of the province's stewardship plan.

Table 5: Multi-Material Stewardship Manitoba's Program Highlights.

	Types of Paper Product	Material Exclusions	Revenue-based Exemption	Tonnage-based Exemption
<p>Types of Packaging</p> <p><u>Materials collected:</u> Glass, metal, paper, boxboard, cardboard, paper fibre & plastics</p> <p>- Primary, secondary, tertiary, service & ancillary elements</p>	<ul style="list-style-type: none"> - Newspapers; - Glossy magazines; - Directories; - Lottery tickets and information; - Product warranties and instructions; - Envelopes, statements and inserts from banks, credit companies, utilities and service providers; - Informational forms and promos from governments; - Free posters and calendars; - Unsolicited promotional coupons, handbills, and flyers; -Transportation and transit schedules 	<ul style="list-style-type: none"> - Bound reference books, literary books, or textbooks - Purchased calendars; - Envelopes; - Greeting cards; - Paper fibre; - Paper used for copying and writing 	<ul style="list-style-type: none"> - All stewards are required to register regardless of revenue - Exempt from reporting materials if gross annual revenue in MB is ≤\$750,000 	<p>N/A</p>

Sources: CSSA, 2020; Multi-Material Stewardship Manitoba, 2017.

Ontario

Stewardship Ontario is the provincial stewardship body administering Canada’s oldest PPP stewardship program, which was begun in 2005. As of 2020, Ontario had a total of 1,823 stewards: 1,794 resident, and 29 voluntary stewards (CSSA, 2020). The province currently maintains a 60% recycling target (Stewardship Ontario, 2018). Table 6 shows further information on the conditions set in the provincial stewardship plan.

Table 6: Stewardship Ontario Program Highlights.

 Stewardship Ontario	Types of Paper Product	Material Exclusions	Revenue-based Exemption	Tonnage-based Exemption
<p>Types of Packaging</p> <p><u>Materials collected:</u> Glass, metal, paper, plastics & textiles</p> <p>Primary, secondary, tertiary & ancillary elements</p>	<ul style="list-style-type: none"> - Newspapers; - Glossy magazines - Comic and puzzle books - Product catalogues; - Directories; - Lottery tickets and information; - Product warranties and instructions; - Envelopes, statements and information from banks, credit companies, utilities and service providers; - Information, forms, and promos from governments; - Business, investment and securities information; - Promotional calendars and posters; - Greeting cards; - Unsolicited coupons, handbills, and flyers; - Transportation and transit information 	<ul style="list-style-type: none"> - Bound reference books, literary books, or textbooks - Purchased calendars; - Envelopes; - Greeting cards; - Paper fibre; - Paper used for copying and writing 	<p>≤\$2M in annual revenue in Ontario</p>	<p>N/A</p>
			<p>Businesses with gross sales >\$2M but supplying less than <15,000 kg of materials must report but are not required to pay fees</p>	

Sources: CSSA, 2020; Stewardship Ontario, 2002.

Québec

A total of 55% of the ÉEQ's total program cost is funded by retailers, distributors, and first importers; the remaining proportion of costs is covered by manufacturers of consumer goods by 33%; providers of general services by 8%; and manufacturers of durable goods by a remaining 3% (ÉEQ, 2020). In Table 7, the material exclusions listed are comprehensive of more diversely characterized products than CSSA-administered programs.

Table 7: Éco Entreprises Québec's Program Highlights.

	Types of Paper Product	Material Exclusions	Revenue-based Exemption	Tonnage-based Exemption
<p>Types of Packaging</p> <p><u>Materials collected:</u> Paper, carton, plastics, glass & metal</p> <p>- Materials that contain, protect, wrap or notably present products at any stage in the movement of the product from the producer to the consumer and is intended for a single or short-term use and designed to contain, protect or wrap products</p>	<ul style="list-style-type: none"> - Newsprint inserts and circulars; - Catalogues and publications; - Magazines; - Telephone books; - Paper for general use; - Other printed matter 	<ul style="list-style-type: none"> - Agricultural containers - Containers and packaging sold as products meant to contain or package materials (e.g. waste bags) - Long life containers or packaging designed to accompany, protect or store a product for >5 years - Books - Newspapers (covered separately by Recycle Médias) - Personal and official identification documents like birth certificates, passports and medical records 	<ul style="list-style-type: none"> - ≤\$1M in annual revenue in Québec 	<ul style="list-style-type: none"> - ≤1,000kg of PPP annually

Sources: Éco Entreprises Québec, 2019.

Classification of CSSA National Stewards

In 2020, there were a total of 2,472 stewards participating in BC, SK, MB and ON's programs. The total membership of Québec's provincial stewards was not available at the time of writing, and it was therefore not possible to reach an entirely inclusive total of stewards active across all five programs in Canada. Stewards responsible for financing each EPR program emerge from various industries and range from multinational brand owners and franchises, to non-

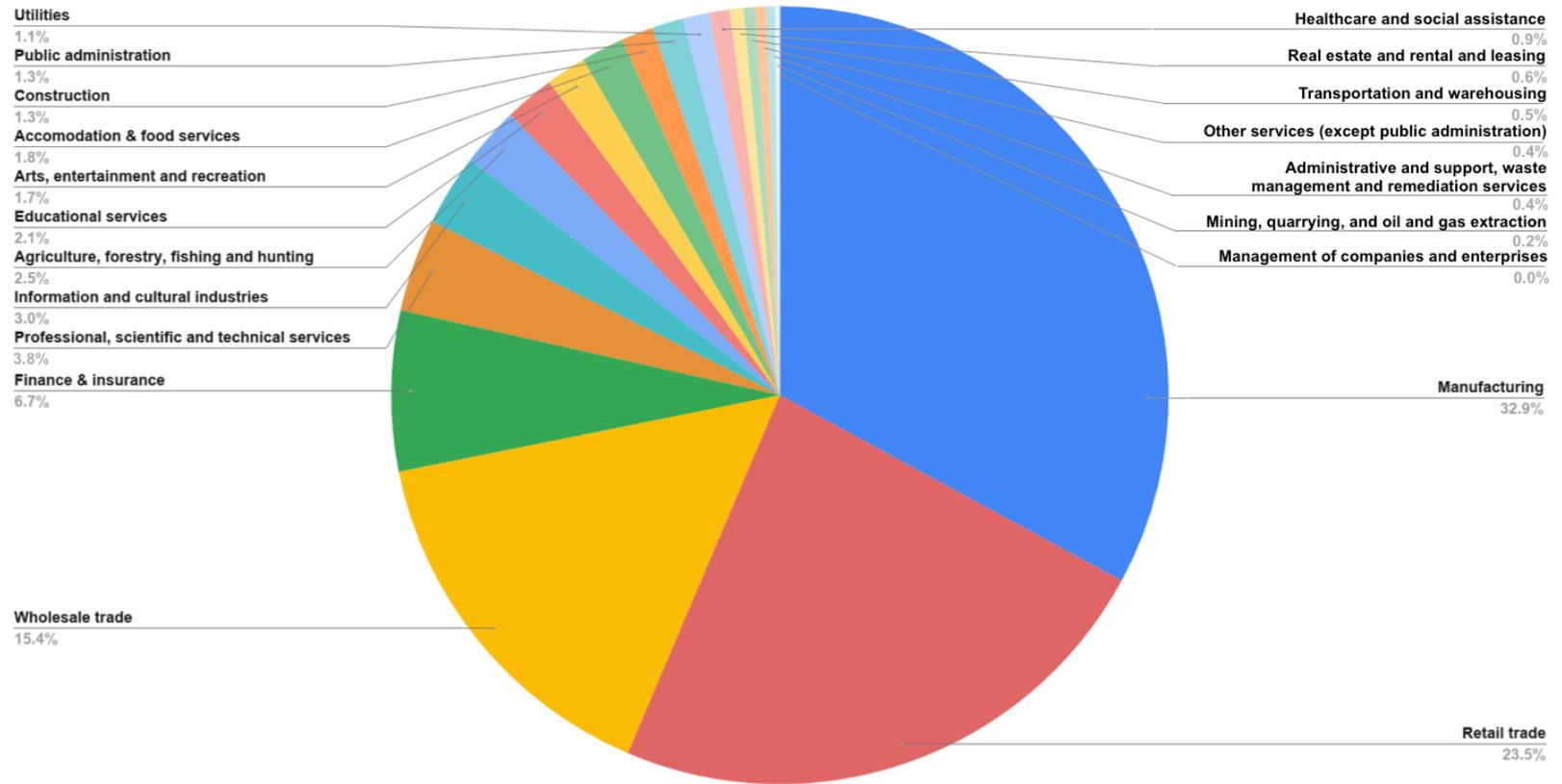
commercial institutions and organizations. Such non-commercial entities are large enough generators of packaging or printed paper that they become obligated to fulfill stewardship responsibilities.

A total of 558 (about 23%) of stewards are implicated in all four programs. Based on the available data from BC, SK, MB and ON, the total 2,472 stewards listed on the CSSA's national steward registry were individually classified into 20 industries. This was completed to identify any existing patterns and trends that are currently observable in Canadian stewardship programs for PPP among the organizations and businesses that are implicated in PPP stewardship programs today. While this particular classification cannot be observed as an all-encompassing resource for Canadian EPR for PPP as a whole, since it is lacking stewardship classification data from the ÉEQ, it may still be useful as a representative guide in illuminating which industries currently contribute most to the PPP waste stream, as well as which industries participate most in EPR for PPP.

One significant trend that can be easily ascertained in Figure 2 (below), is that program stewardship is currently dominated by the manufacturing industry, by approximately one-third. Following that, the retail trade and wholesale trade industries together comprise an approximate 40% of stewardship participation. The wholesale industry comprises a range of supply chain actors that are involved in the provision of products to market; while they may have manufacturing operations, their main business activity consists of wholesaling merchandise through distribution and supplying directly to the retail sector and other businesses (Statistics Canada, 2017).

Close to 75% of the CSSA's national stewards are represented by just three industries: the manufacturing sector, the retail trade sector, and the wholesale trade sector. The remaining share, about 28% of stewards, is composed of 17 other industry categories each occupying a much smaller share in EPR for PPP programming. Non-commercial entities such as educational services and public administration contribute a significant amount to the PPP waste stream as well, considering their relatively small share as stewards compared to the predominating manufacturing industry. Further research would be required to clarify the composition and nature of PPP materials and usage among these industries – specifically, by identifying the quantities of PPP materials introduced to the marketplace for commercial purposes, and the quantities of PPP materials for distributional, educational, or other non-commercial means.

Figure 2: Industrial Classification of Stewards in BC, SK, MB and ON EPR Programs for PPP in 2020.



Data Source: CSSA National Steward List, 2020.

Extended Producer Responsibility for Printed Paper and Packaging in Nova Scotia

In November 2018, a unanimous resolution was passed by the NSFM to support the province's development of legislation and a regulation for a full EPR model for PPP (Halifax Regional Council, 2019). The Municipal-Provincial Priorities Group of the Nova Scotia Solid Waste-Resource Management Regional Committee has been leading the charge in pursuing an EPR program for PPP in the province. The Priorities Group has proposed a full EPR model to be funded 100% by producers, and it includes conditions that are intended to create a fair landscape for all stewards. Various exemption conditions for small businesses are based on the following thresholds (Halifax Regional Council, 2019):

- Revenue less than \$2M;
- <1 tonne of PPP to NS residents annually;
- Operating as a single storefront;
- Not supplied or operated as a franchise; and
- Newspapers and registered charities.

The proposal also includes the following stipulations for the dynamic between industry stewards and municipalities in NS:

- Maintain residential curbside access for all citizens in the recycling program;
- Maintain bi-weekly collection schedule at a minimum;
- Maintain a comprehensive sort list inclusive of currently designated recyclable materials;
- Provide ICI sector access to the program;
- Allow municipalities a right of first refusal to provide collection and program education services to residents; and
- Use existing municipal infrastructure and resources in the program.

Identifying Small, Medium and Large Businesses in Nova Scotia

The total quantity of registered businesses in the province of NS in December 2019 are listed in Table 9. The Unclassified industry category has been omitted from this analysis. In December 2019, Unclassified businesses totalled 7,445 in the province. Unclassified businesses have not been specifically included in previous regional analysis of EPR for PPP. Further investigation may be required to identify the particular activity of this class of businesses and to clarify potential impacts that this group could face in the province.

Table 8: Total Enterprises with and without Employees in Nova Scotia, December 2019.

Industry (NAICS categories)	Quantity
Agriculture, forestry, fishing and hunting	7,720
Mining, quarrying, and oil and gas extraction	190
Utilities	95
Construction	7,425
Manufacturing	1,740
Wholesale trade	2,105
Retail trade	6,175
Transportation and warehousing	2,810
Information and cultural industries	1,050
Finance and insurance	5,660
Real estate and rental and leasing	10,450
Professional, scientific and technical services	6,935
Management of companies and enterprises	845
Administration and support, waste management, and remediation services	2,320
Educational services	770
Health care and social assistance	6,565
Arts, entertainment, and recreation	1,390
Accommodation and food services	2,945
Other services (not public administration)	5,985
Public administration	300
Total	73,475

Source: Statistics Canada – Enterprise Counts by Revenue Range, December 2019

The industrial community in NS is characterized by many small and locally owned enterprises that operate in both the production and service sectors. A small business in Canada is classified as operating with less than 100 employees (Statistics Canada, 2018). This is the manner in which some entities in the province define small, medium and large businesses by size-based comparisons of workforces.

The Priorities Group has proposed a small contributor policy of setting a *de minimus* condition at \$2M (Gorman, 2019). Businesses that exceed the \$2M threshold for the small business exemption policy would be affected as obligated stewards if they qualify as either brand owners or first importers of PPP that generates waste in the residential stream. Tonnage-based information on PPP usage and other conditions would evidently need to be taken into account in tandem with these findings.

For a closer view at the concentration of small, medium, and large businesses that operate in the province, provincial revenue data from Statistics Canada provide quantities distinguished by

industrial sector. In Table 9, a total of 20 categories quantify NS-based businesses into ranges of \$1M and \$2M, as well as businesses that gross higher than \$2M in revenue. All industry categories included in Table 9 could expectantly employ PPP materials and contribute to PPP waste in the residential waste stream. While this table is comprehensive of the industries that are active stewards in EPR for PPP programs across Canada, any absent industries that will not be captured in this analysis may require additional research.

As a point of clarification, two different numerical counting methods are used within provincial revenue data presented here, due to data having been made available in two different formats. Sector totals below \$1M and \$2M revenue employ an exact numerical counting method. In contrast, business total above \$2M revenue employ a numerical counting method wherein figures appear rounded to the nearest fifth. This disparity is due to Statistics Canada's own variable reporting formats. While sector information will evidently vary in its specificity due to this disparity in counting methods, conclusions that are reached are sensitive to this.

Table 9: Enterprises with and without Employees in Nova Scotia by Revenue Ranges of \$1 and \$2M in December 2019.

Industries in Nova Scotia	< \$1M in Annual Revenue	< \$2M in Annual Revenue	> \$2M in Annual Revenue
11 – Agriculture, forestry, fishing and hunting	7,291	7,525	195
21 – Mining, quarrying, and oil and gas extraction	155	165	30
22 – Utilities	49	57	35
23 – Construction	6,388	6,570	555
31-33 – Manufacturing	1,237	1,356	380
41 – Wholesale trade	1,204	1,398	710
44-45 – Retail trade	3,746	4,571	1630
48-49 – Transportation and warehousing	2,477	2,587	220
51 – Information and cultural industries	814	894	145
52 – Finance and insurance	5,008	5,231	435
53 – Real estate and rental and leasing	9,975	10,168	280
54 – Professional, scientific and technical services	6,438	6,662	280
55 – Management of companies and enterprises	743	780	70
56 – Administrative and support, waste management and remediation services	2,000	2,119	205
61 – Educational services	68	709	60
62 – Health care and social assistance	5,901	6,219	340
71 – Arts, entertainment and recreation	1,275	1,343	40
72 – Accommodation and food services	2,226	2,680	280
81 – Other services (except public administration)	5,605	5,818	165
91 – Public administration	238	258	45

Data Source: Statistics Canada – Enterprise Counts by Revenue Range, December 2019.

Based on the above data, a total of **62,838** businesses operated under the threshold of \$1M in 2019. A total of **67,110** businesses operated under the threshold of \$2M in 2019 (an increase of approximately 4,272 businesses from \$1M). There is a total of **6,100** businesses listed that generate above \$2M in annual revenue, and that would fall above a revenue-based exemption threshold as proposed by the Priorities Group – a considerably smaller amount than the quantity of businesses who would be exempted. These data and their associated implications for program development will be discussed in the following section.

Expected Impacts on Businesses in Nova Scotia: Observations & Analysis

Developments in the modern marketplace have resulted in a significant reliance on packaging materials to transport and contain commodities, as well as a growth in the use of printed materials for media, advertising, promotional information, and within educational industries. The flood of discarded PPP materials into the residential waste stream has placed an overwhelming burden on modern waste management systems, with repercussions that are increasingly costly and operationally complex for local governments to address in efforts to keep up with waste generation rates, and reduce landfill waste and environmental pollution in the process. The complexity of modern packaging materials, in addition to the instability of global recycling markets, creates a complex landscape for local governments to navigate, who have very little influence on product supply chains and very little capacity to improve product designs from their vantage point. The technological limitations of modern recycling infrastructure decrease what can be recycled and diverted from landfill. Requiring industry to finance recycling programs, instead of taxpayer funding, would foreseeably ensure proper PPP management, reduce waste of valuable materials, and avoid environmental impacts of pollution and further resource consumption. EPR programs for PPP also create opportunity for feedback loops between waste management systems and producers, who are better poised to increase efficiencies and undertake product changes to optimize recyclability of PPP materials moving forward. For this reason, EPR for PPP is being proposed in the province.

An EPR program for PPP would require the most significant generators of PPP materials in the marketplace to be responsible for their fair market share. The proposed framework of a full EPR program for PPP in the province would require industry to finance 100% of the costs of recycling collection, processing, and exporting materials to end-markets. Determining the impacts on producers who would be responsible for upholding an EPR for PPP program in the province requires further investigation.

As previously discussed, there exist various exemption thresholds and conditions within the EPR principle, which are used in tandem in determining obligated industry stewards. The Priorities Group has set a number of exemption conditions for stewards and to accommodate small businesses that include a \$2M *de minimus*, as well as a weight-based exemption condition set at one tonne of PPP annually. Additionally, the Priorities Group has set conditions based on single storefronts and franchisee restrictions. Combining provincial revenue findings alongside

additional weight-based data relating to PPP usage of businesses in the province would be the next step in determining obligated stewards in the province.

Analysis of SK's industry stewards shows that only a small proportion (approximately 6%) of their total stewardship is comprised of local businesses headquartered in that province. If SK's low proportion of local stewards provides any indication of the quantity of local stewards who may become obligated in NS, only a small percentage of the province's local businesses would be impacted. While SK's program plan resembles the same revenue and weight-based conditions in NS's current proposal, the program is not identical and therefore any comparisons should be nuanced in this regard.

The business community in NS is composed of a large proportion of small businesses operating below \$2M revenue. A total of 6,100 businesses have been identified as grossing higher than \$2M, sitting above the revenue-based exemption condition. This portion represents just 8.3% of all businesses in the province. Most impacts to high-grossing businesses in the retail trade sector and the wholesale trade sector have been indicated.

The quantity of affected businesses above the \$2M threshold as a proportion of all businesses operating in that sector in NS is presented below:

- Agriculture, forestry, fishing and hunting: 2.5%
- Mining, quarrying, and oil and gas extraction: 15.8%
- Utilities: 36.8%
- Construction: 7.5%
- Manufacturing: 21.8%
- Wholesale trade: 33.7%
- Retail trade: 26.4%
- Transportation and warehousing: 7.8%
- Information and cultural industries: 13.8%
- Finance and insurance: 7.7%
- Real estate, and rental and leasing: 2.7%
- Professional, scientific and technical services: 4.0%
- Management of companies and enterprises: 8.3%
- Administration and support, waste management, and remediation services: 8.8%
- Educational services: 7.8%
- Health care and social assistance: 5.2%
- Arts, entertainment, and recreation: 2.9%
- Accommodation and food services: 9.5%
- Other services: 2.8%
- Public administration: 15%

Considering these proportions are strictly based on the consideration of revenue and are thus not inclusive of all exemption conditions in the development of an EPR program for PPP,

the individual proportions that have been calculated above are representative of the maximum quantity of stewards in each sector that could be impacted by a revenue-based threshold. Many businesses in all sectors would likely be exempted on the basis of low rates of PPP material output, or due to a relatively low reliance on PPP materials in relation to other classes of businesses.

These findings demonstrate somewhat of a correlation with findings from national steward data. While the CSSA's national steward data do not include details that explain why particular sectors dominate across the country, the greater presence of businesses from manufacturing, retail, and wholesale industries suggests a heavier volume of PPP material usage among them. Since retail, wholesale, and manufacturing businesses in other programs qualify as stewards at a greater rate across the country, the expectation for NS is that participating stewards would not deviate from that actuality. According to the CSSA, many of the largest producers in NS are multinational corporations who themselves have made commitments to improve their packaging designs and increase recycled content in their product materials (Halifax Regional Council, 2019). It could therefore be considered within the best interests of industry to participate in a full model of EPR for PPP to become better positioned to achieve these commitments.

As it has been made visible through analysis of SK's industry stewards, some NS businesses are stewards in other EPR for PPP programs. Further research would be useful to quantify how many NS-based businesses are already industry stewards across Canada and, if applicable, internationally.

Reducing Impacts on Nova Scotia Businesses

Authorities in NS have worked on strategies that have engaged industry stakeholders and municipalities in the province to identify their concerns and interests. A number of mitigative solutions are discussed that have been proposed by provincial actors and the CSSA that would ensure fair impacts to businesses operating in the province, and also ensure that industry is paying their fair market share into an EPR program for PPP.

Determining Exemption Conditions

Firstly, exemption categories are implemented within provincial programs to ensure the contributions of stewards are proportionate to the PPP materials they introduce to the residential consumer, and thus to ensure that small organizations and businesses are not unjustly or disproportionately impacted by a PPP program. As discussed, there are a number of factors that can be implemented in program planning to accommodate all ranges of industry and ensure a level playing field in the process.

Past development of PPP stewardship programs in other provinces left the process of determining exemption conditions to the PROs, which led to significant confusion expressed by

stewards relating to large financial impacts anticipated by small businesses (Giroux Environmental Consulting, 2014). This lack of engagement and integrated dialogue with producers in provinces has created a “strained public relations” between the PRO and members of the business community, as well as with regulators and businesses who had expressed sentiments of abandonment within an overall important dialogue (Giroux Environmental Consulting, 2014, p. 25). To avoid previous shortfalls made in this regard, it is recommended to undertake long term and consistent consultation with the business community to identify and understand the collective needs and operational conditions of stewards across all affected industries.

The proportion of stewards who sit above the \$2M revenue threshold is smaller in comparison to the quantity of stewards that operate below that threshold. This matter arises the matter of free ridership that concerns some industry stakeholders including the RCC and the CFIB. Entities like the RCC and CFIB posit that a \$2M *de minimus* condition provides a disproportionate advantage to small businesses, who comprise the larger proportion of industry in the province, which would unfairly require a much smaller group of medium and large stewards in the province to finance the collection and recovery of all PPP materials in the residential waste stream, suggesting a scenario that would result in a minimal number of businesses accounting for the entire PPP waste volume generated by all businesses in the province.

What is not usually noted in this argument is that once obligated, a steward is exposed to a number of options to offset the incurred stewardship costs of EPR for PPP. There are a number of different avenues available to a steward to finance their costs in an EPR program. As previously stated, internalizing the costs of participating in an EPR program within products sold to consumers is commonplace, thus offsetting the stewardship costs of becoming an obligated steward. Once obligated to pay, an industry steward has mechanisms available to them to respond to the costs incurred and respond accordingly – these include advanced disposal fees and deposit fees that could be embedded into the cost of a product and applied at the point of sale (OECD, 2006). As discussed, many stewards in Canada already rely on national product pricing to embed the costs of stewardship into the commodities that are sold to consumers around the country.

Single Point of Retail Exemption

For further discussion on the effectiveness and fairness of various exemption categories, the CSSA upholds that single storefront exemptions, also definable as single point of retail exemptions, are not needed to promote greater fairness, since revenue-based and weight-based conditions will achieve enough in leveling the playing field for small businesses (Halifax Regional Council, 2019). Such a condition may be an ineffective indicator for measuring the size and relative impact of an enterprise. Exemptions measuring tonnage and revenue alone have been found to achieve necessary benefits proportionate to the needs of small businesses.

Harmonization

Current recycling conditions in Canada consist of many fragmented and disjointed elements, wherein many disparate programs can operate within the same province and might mandate their own set of recyclable material lists. This disjointed landscape of recycling in Canada underlines harmonization as one of the foremost key issues that EPR for PPP attempts to address.

Establishing a streamlined provincial or Atlantic Canadian approach for the central elements of an EPR for PPP program would benefit producers. Harmonized definitions in program plans must define the legally obligated parties, designated PPP materials, and performance targets and metrics (Halifax Regional Council, 2019). Standardized factors concern the percentage of steward contribution for program funding (full or shared); designated PPP material lists; levels of service for urban and rural households, and depots; and standardized material fees (Giroux Environmental Consulting, 2014). Consistency among all program elements in this regard would better allow and simplify negotiations with the business community in program design, who would likely be obligated across multiple jurisdictions in the implementation of a regional program (Giroux Environmental Consulting, 2014). Further strategies could include harmonized criteria for minimum physical requirements on product innovations redesigns to achieve meaningful design-for-environment principles (Leal Filho et al., 2019).

As the CSSA states, it is difficult to achieve true harmonization across all economic and operational factors in one jurisdiction without a mandated national standard for harmonization countrywide (Halifax Regional Council, 2019). As it stands currently, EPR for PPP programs continue to operate with their own particular intricacies, and respond to the unique needs of local stakeholders in each province.

Harmonization is also important for consistency in what a sector pays for cost per kilogram of the same material across provinces. For example, as of 2014, the newspaper sector paid 0.5¢/kg in Ontario but 20¢/kg in B.C. (Giroux Environmental Consulting, 2014). This underlines the need to determine harmonized material fees as well as stable market prices not subject to regional inconsistencies; if the material properties of a product category are not altered by geographic region, their price should not be subject to change.

Fee Differentiation Among Recyclable Materials

Some assessments of EPR for packaging waste have pointed out the lack of differentiation of producer fees between those who achieve better circular design, and those producers who have been motivated to alter the problematic features of their packaging designs and pursue reusability (Leal Filho et al., 2019). Around the world, PROs often employ weight-based fee payment systems that get averaged across producers, thus not identifying who among producers is making strides in improved packaging redesigns and circularization (Leal Filho et al., 2019). Motivation for producers to undertake innovation could be integrated into

stewardship programs through a differentiation or hierarchy of EPR fees that seek to incentivize producers towards choices like redesign or mandating banned substances, and reward successes by the reduction of fees (Leal Filho et al., 2019; Kunz et al., 2018).

Materials that have been consistently difficult or impossible to market based on recycling market conditions were identified with research undertaken with local authorities and waste managers in Atlantic Canada in 2014, and are detailed in Table 11. According to Giroux Environmental Consulting (2014), material processors noted the PPP materials collected in each Atlantic province that were most challenging to recycle, in the following table:

Table 10: *Collected Materials Difficult to Recycle in Atlantic Canada in 2014.*

New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland and Labrador
Wax-coated packaging	Plastic film	Boxboard limitation to 20% in bales	Plastic bags
Plastic bags	Coloured glass		Clamshells
EPS	EPS		Glass
Plastic film	Coffee cups		Styrofoam
Glass	Aerosols		Plastics #6 and #7
Newsprint	Milk cartons		Plastics without a number
Plastics #3 & #6	Gable tops		
Clamshells	Select boxboard and paper that is compostable		
	Frozen juice containers		

Source: Giroux Environmental Consulting, 2014.

There are many materials that are deemed too difficult to market for recycling and are thus excluded from recycling programs altogether. The EPR Environment and Sustainability Standing Committee of the Halifax Regional Council has measured that industry currently employs upwards of 84 packaging materials, some of which are currently landfilled in the province since domestic recycling technology is unequipped to process them, and end-markets for their recycling are not available (Halifax Regional Council, 2019). The proposed EPR program for PPP would require industry to maintain the existing designated materials list currently employed in recycling programs in the province, and ideally increase the quantity of collected materials by locating new end-markets for their recovery. For any remaining material categories that are not able to be efficiently recycled, industry stewards would have the capacity to take steps to altogether phase out the use of problematic materials in packaging design within their own supply chains.

Investment in Regional Recycling End-Markets

An EPR program for PPP is still subject to the same fluctuating end-markets conditions for recycling regardless of program financing. Stewards financing PPP collection, processing, and marketing could develop mechanisms to incentivize local investment in recycling infrastructure as opposed to end-markets overseas. Analysis by Duncan Bury Consulting (2012) found that any employment losses in the landfill waste collection and disposal sector would likely be offset by additional jobs made available through the collection of a greater number of recyclable materials. The employment and economic impacts of EPR made possible in the switch from a non-producer funded model has been shown to increase employment through additional diversion activities as well as potential market development (Duncan Bury Consulting, 2012).

Stranded assets represent a central concern in the transition from a municipally run program to EPR for PPP in NS. Publicly owned recycling infrastructure and human resources within the current program are considered essential elements to integrate into a producer run operation. A key stipulation in the currently proposed program asks that municipalities are allowed the right of first refusal to contract with industry to deliver collection and educational services in a producer-funded model.

Individual Producer Responsibility

The emergent term of 'individual producer responsibility' (IPR), coined by Lifset and Lindhqvist (2008), attempts to reposition the original vision of EPR in individualizing the capacity of each producer in their own supply chains to alter their product systems and assume greater responsibility in developing different end-of-life services for the products they put onto the marketplace. Membership in a PRO allows for a collective system of responsibility in product stewardship programs. In the Canadian context and around the world, there has been a preference for such collective EPR systems that focus on meeting collection and recycling targets on behalf of groups of producers or entire industry associations (Lifset & Lindhqvist, 2008). While these collectives may make it administratively, logistically, and financially less burdensome on obligated stewards to report materials and pay fees, the framework set out by the PRO may disincentivize businesses from assuming greater accountability in broader product innovation in integrating modularity, reuse, or other environmental considerations into product design (Kunz et al, 2018; Lifset & Lindhqvist, 2008).

Since the majority of EPR systems have been formed using the model of collective responsibility, design-for-environment achievements and industry-wide progresses in packaging choices have not been as wide-ranging by comparison with the original conceptualizations of the EPR principle for packaging system transformation (OECD, 2016). By tending toward light-weighting, and shifting packaging choices between different classes of disposable materials, which merely minimizes the volume-based costs incurred as a steward, conventional business responses to stewardship obligations in PPP programs have avoided some deep-set product improvement in the overall packaging supply chain. The feedback loops between all actors in

the EPR framework that are necessary for a wider transformation towards design-for-environment require concerted supply chain coordination and a communicated understanding of the real economic, technological and environmental challenges and hurdles each actor faces in handling PPP materials and managing them in modern waste infrastructure. These feedback loops can mobilize actors in their otherwise discrete realms of manufacturing, retail, and waste processing to make long-lasting improvements to product design, manufacturing, and development of waste sorting technologies (Lindhqvist, 2000). EPR is as much a principle of communication and knowledge-sharing, as much as it is a legislative and economic instrument.

Stories of PPP stewardship succeeding in supply chain innovation have taken place within Canada. In Ontario, rigid plastic clamshells commonly distributed to grocery stores to contain fruits, vegetables, and baked goods were posing an ongoing challenge to recyclers (Stewardship Ontario, n.d.). Clamshells are fabricated from different types of similar looking thermoformed packaging – polyethylene terephthalate (PET) is of higher value and is easier to recycle in end markets, compared to clamshells made from polystyrene (Stewardship Ontario, n.d.). Due to municipal facilities lacking the sorting technology to sort out the higher value plastic from lower grades, contamination between those different materials was becoming a major challenge resulting in unmarketable PPP materials (Stewardship Ontario, n.d.). In 2011, the provincial stewardship organization achieved a commitment from the retailers Loblaw, Sobeys, Metro, Walmart, and Safeway to coordinate with their suppliers to source strictly PET clamshell packaging for their shelves. This success story in establishing a municipal, retail, and manufacturing feedback loop is an encouraging record of the potential inherent in EPR for PPP programs to accomplish wide-ranging design-for-environment changes in Canadian product systems.

Conclusion

The main objective of this report has been to investigate the foreseeable impacts that small, medium-sized, and large businesses operating in Nova Scotia could expect amidst the implementation of an Extended Producer Responsibility program for the residential packaging and printed paper waste stream. Currently, there are five such stewardship programs underway in Canada, but no such programs yet exist in the Atlantic provinces. New Brunswick was the first of the Atlantic provinces to announce an EPR program for packaging and printed paper, but it is not yet regulated. Meanwhile, there has been long-lasting municipal support for such a program to be implemented in Nova Scotia. Divert Nova Scotia has identified the existing knowledge gap in determining the potential business impacts that such a program may have in the province. This report has presented some key considerations and best practices from other jurisdictions to help reduce negative or disproportionate impacts on enterprises in the province.

A registry of national stewards from the Canadian Stewardship Services Alliance was employed to produce a comparative visualization of the industrial sectors impacted most by

EPR for packaging and printed paper in Canada, and to identify the industries that are implicated most in four of the five stewardship programs in Canada. All industry categories are found to contribute to the PPP waste stream across Canada. The industries who appear to contribute most to the PPP waste stream nationally are concentrated in manufacturing, in retail trade, and in wholesale trade.

Finally, characteristics of the small, medium and large business community in Nova Scotia were investigated. An analysis of Saskatchewan's current program shows that a very small proportion of the stewards financing that system is composed of local businesses based in the province, and the program is rather dominated by larger businesses based outside of that jurisdiction. Due to a comparable economic landscape between Saskatchewan and Nova Scotia, these findings could be considered relevant for the context of Nova Scotia.

Based on exemption thresholds that have been proposed by authorities in the province, *de minimus* conditions have been set at \$2M to determine obligated stewards. It was identified that, similar to national data, enterprises in retail trade and wholesale trade may be more directly impacted by the implementation of an EPR program for PPP in the province. Small businesses in the province far outweigh the quantity of medium and large enterprises. A small portion (8.3%) of highest grossing businesses in the province were indicated as potential stewards in the province. Further such research into how additional exemption thresholds may affect or relieve PPP-generating organizations in Nova Scotia is essential and recommended.

EPR programs have the capacity to lessen the burdens on communities facing high volumes of PPP materials in their waste management programs. With further harmonization of such programs across Canada, it could result in significant achievements in establishing long-lasting and tangible feedback loops between all central actors in the waste management hierarchy. By normalizing product stewardship obligations among industries using PPP materials in their supply chains and operations, such momentum could create the impetus for design-for-environment improvements, minimizing PPP waste altogether, and altering supply chain flows to create more sustainable product systems in communities around the world.

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