Modeling impact on consumer packaged goods pricing resulting from the adoption of Extended Producer Responsibility for Packaging in Maine

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Disclaimer**:** *York University, nor the study author (Dr. Calvin Lakhan) has received any funding or financial support to conduct this research. The impetus for conducting this study is to better understand the economic impacts attributable to the adoption of extended producer responsibility, which is a poorly understood topic that has received limited academic attention. York University has not been directed to conduct this research on behalf of any particular stakeholder, and is not affiliated with any producer, industry association or advocacy group.*

1.0 Introduction

Increasingly, a diverse range of stakeholders including local governments, packaging producers, waste service providers etc. are recognizing the role that producer responsibility can play in promoting recycling and a sustainable waste management system. Given the conceptual premise of EPR, ensuring that producers who make a product, ultimately bear the financial and/or physical responsibility for managing it at end of life, it is easy to see why EPR is being championed.

However, the adoption of EPR is not without its challenges. While there is a groundswell of support in favor of EPR legislation with many jurisdictions looking to fast track its adoption, it is imperative that we press pause and take the time to understand the pre-requisites for effective EPR implementation.

The purpose of Extended Producer Responsibility is to shift the physical and financial responsibility of end of life waste management onto the producers (or first importers), of a particular good. Conceptually, it is difficult to find fault with the premise – generally speaking, people who make a product, should ultimately be responsible for how it gets managed post consumption.

However, in practice, what producers are financially obligated for is of critical importance when addressing what is literally a hundred million dollar question. At present, EPR for printed paper and packaging waste has focused on recycling – producers are obliged to pay for the costs associated with recycling post-consumer packaging waste. Where this becomes potentially problematic, is that recycling costs, particularly for composite and light-weight materials, are going up exponentially – recycling system costs for Ontario, British Columbia and other jurisdictions with EPR are increasing by double digits year over year. In the case of Ontario, recycling system costs have more than doubled in the past 15 years, while recycling rates have actually decreased.

While advocates of EPR say that producers should be paying these costs irrespective of what they might be, the reality is that these costs are absorbed by the consumer, in the form of increases in the cost of consumer packaged goods. Now more than ever, we need to clearly define what the goal of waste management system should be. Is it recycling at any cost? Often times, the environmental benefits of recycling certain packaging types (composite material, flexible, glass) are nominal, calling into question as to whether recycling rates are the barometer of a successful system.

This study seeks to better understand the relationship between producer responsibility fees and the price of consumer packaged goods. Using best available data, this study models a scenario intended to reflect the proposed producer obligation resulting from Maine's EPR legislation, and the corresponding impact on the price of consumer packaged goods.

It is important to note that Maine is presently considering two proposals pertaining to producer responsibility for household packaging waste – LD 1471 'An act to establish a stewardship program for packaging" and LD 1541 "An act to support and improve municipal recycling programs and save taxpayer money".

As noted by Resource Recycling Magazine:

Both bills establish extended producer responsibility (EPR) programs covering packaging of most material types, requiring producers to fund end-of-life management for those materials. But they contain key differences, particularly in how the EPR program would be managed and how producer payments would be calculated.

Under LD 1471, a stewardship organization would annually determine its budget for managing the program and meeting regulatory requirements, and it would adopt a fee schedule for how much each producer would need to pay. Under LD 1541, on the other hand, the state Department of Environmental Protection would set the fee schedule, which would be based on the per-ton costs associated with collecting and processing the producer's packaging material.

For the purpose of this study, only legislation as outlined in LD1541 is modeled. At present, there is no baseline data that can help this study model the potential costs attributed to the activities as outlined in the proposed LD 1471 legislation.

2.0 Methodology

This section describes the data used in this study and the modeling steps used to quantify the impact of EPR legislation on packaged goods pricing in Maine.

Please note the following:

Note #1: This modeling relies on data proxies/surrogates from other jurisdictions due the absence of Maine specific data. This is a significant limitation of this study, which highlights the necessity of baseline data collection prior to the adoption of any recycling legislation in Maine.

Note #2: For the purposes of modeling, we have converted short tons into metric tonnes, and express all costs in $USD.

2.1 Data used in this study includes:

1) Data modeled by the United States Environmental Protection Agency which estimates total quantities of printed paper and packaging generated/recycled in Maine.

2) Data modeled by the Consumer Brands Association regarding estimated data collection costs for Maine

3) All data pertaining to material specific recycling costs were obtained from the Stewardship Ontario Pay in Model (PIM) (https://stewardshipontario.ca/stewards-bluebox/fees-and-payments/fee-setting-flow-chart/the-pay-in-model/). The PIM is used in Ontario to calculate the overall producer obligation, as well as material specific fee rates for obligated packaged goods. It should be noted that costs taken from the PIM model may not apply to the cost of recycling in other jurisdictions. However, in the absence of state specific data, it is the only publicly available source that provides insights into the costs to manage individual materials within the recycling system.

4) An adapted version of the EMSI input-output model that has been regionalized for Maine (using best available data where possible). Input-output models are used to describe the interconnectedness of the industries, households, and government entities that occupy a given geographic area. The term "input/output" is used to describe how the output of one industry, will appear as an input in another industry, with the intent of tracking the "flow" of money through a given system. For our purposes, we are using an Input-Output model as a predictive tool to quantify the indirect and induced effects of adopting EPR legislation in Maine.

5) "Basket of Goods" costs based on locality (Large Urban, Urban Regional, Small Urban, Rural Regional). It should be noted that basket of goods costs for these regions were derived using Ontario specific data that were subsequently adapted to reflect different localities in Maine. This involved calculating the differences in cost of living between Ontario and Maine, standardizing what constitutes a "basket of goods", and converting all values from $CAD to $USD based on the current spot rate. The use of Ontario data in lieu of Maine specific data is a limitation of this study – it is recommended that analysis moving forward should use data collected from Maine (which was unavailable at the time of conducting this study)

6) Waste audits sampled from 23 communities in Maine between the periods of 2015-2020. Waste audits were used to calculate the composition of the types of packaged goods being generated and recycled in the state. The distribution of waste audits include 12 samples

taken from Cumberland County, 5 from Penobscot County, 3 from York County, 2 from Oxford County and 1 from Franklin County. Of the 23 samples, 3 were taken from multi-residential buildings. It should be noted that the number of waste audits used to estimate waste compositions is not statistically representative of the state as a whole. Unfortunately, there is very little publicly available data regarding waste audits in most jurisdictions, and it is highly unlikely that any area will have conducted enough waste audits to meet the threshold of statistically significant.

Modeling the impact of proposed EPR legislation on the price of consumer packaged goods is done in two phases.

Phase 1 involves calculating recycling system costs in Maine under the proposed EPR system for printed paper and packaging.

Phase 2 involves modeling indirect and induced impacts attributable to the adoption of EPR legislation using the adapted ESRI Input-Output model

2.2 Methodology Phase 1 Modeling

In order to calculate direct economic impacts of EPR legislation, we need to know the following:

1) What is the quantity of printed paper and packaging materials generated and recycled in Maine?
2) What is the composition of printed paper and packaging being collected and recycled in Maine?
3) What are the costs associated with collecting and recycling these materials?
4) What are the administrative, data collection and promotion and education costs attributable to operating a residential recycling program for printed paper and packaging?

As noted in a description of the data used in this study, data surrogates/proxies from other jurisdictions are used in lieu of Maine specific data. This is particularly true of data pertaining to material management costs.

2.21 How much material is being recycled?

According to data reported by the Joint Standing Committee on the Environment and Natural Resources, it is estimated that there were 263,443 short tons of material recycled in Maine in 2019, with an overall estimated recycling rate of 36.46% (referring to all recyclable material generated in the state, exclusive of construction and demolition waste). Using this presumed

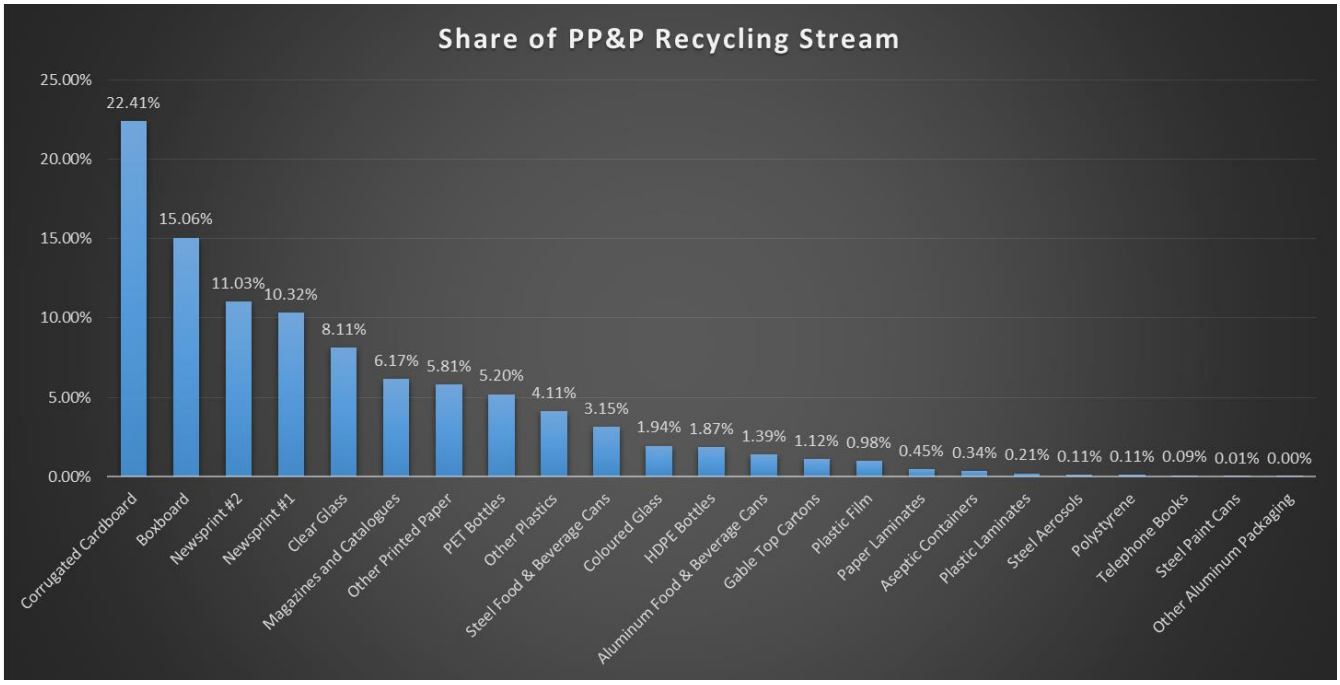
recycling rate, we estimate that total quantities of printed paper and packaging generated into the state is equal to approximately 722,553.48 T.

2.22 What is the composition of obligated recyclables recovered?

Using the collection of waste audits sampled from various localities in Maine, we are able to estimate the relative composition of printed paper and packaging presently found in the residential recycling stream. The results shown in figure 1 represent a weighted average based on the number of localities sampled. It should be noted that there is a statistically significant difference in the composition of waste when comparing localities (i.e. Single family homes in Portland generate a different composition of waste relative to single family homes in Bangor).It is the recommendation of this study that additional waste audits be conducted (across the state) to better understand the types and quantities of waste generated/recovered by locality.

As shown in Figure 1, a significant percentage of the recycling stream is made up of paper based fibers such as corrugated cardboard, boxboard and newsprint. While a time series analysis of how quantities of waste generated/recovered have changed over time was not possible given the relatively small number of audit samples, we do know that the proliferation of light weight and composite plastics is increasing, while quantities of newsprint and other printed paper are declining.

Figure 1: Composition of residential recycling stream for printed paper and packaging



2.23 How much does it cost to recycle?

Note: Net costs per tonne includes the costs of collecting, sorting and baling a recyclable material, net of the revenue generated from its sale.

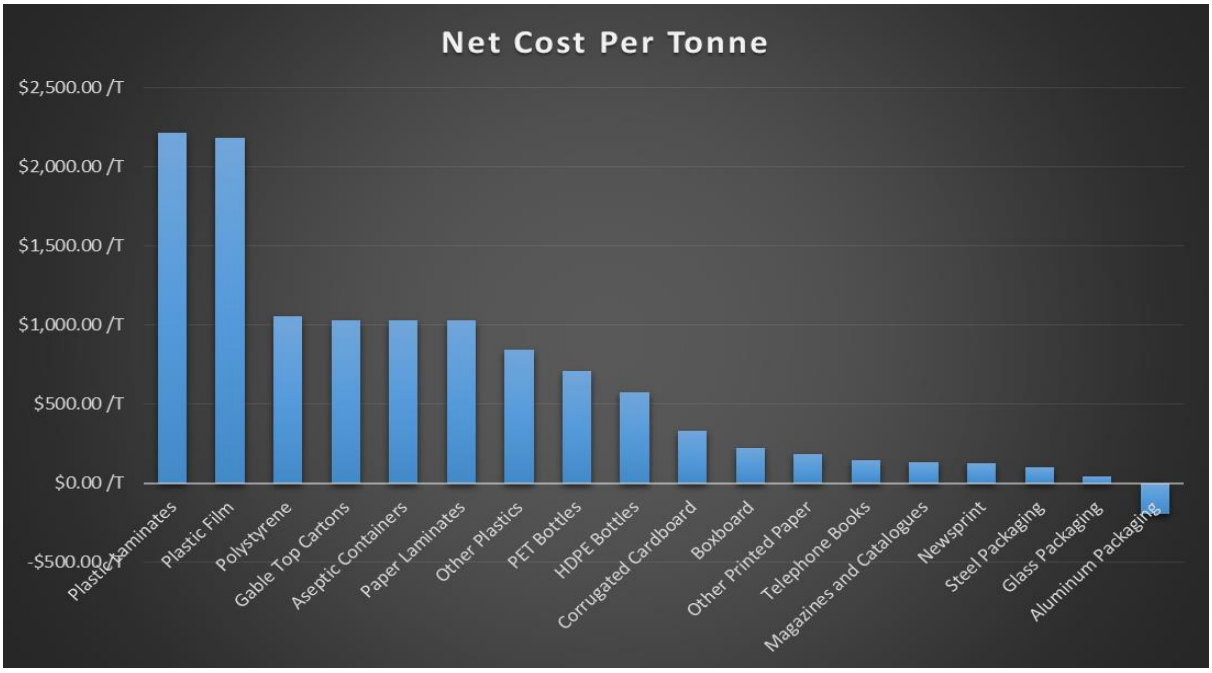
In order to calculate recycling system costs, we multiply the total quantity of printed paper and packaging recycled in Maine (2,187,681 metric tonnes) and multiply it by the relative composition of the residential recycling stream calculated from our waste audits. This provides a breakdown of total quantities of material recycled by material type (expressed in metric tonnes).

Using material specific recycling costs obtained from the Stewardship Ontario Pay in Model, we multiply a material's recycling net cost per tonne by the quantity of material generated (i.e. the net cost per tonne to recycle newsprint is $123.20 USD, and there are an estimated 56,245 tonnes recycled in Maine annually – as such, the total cost to recycle all newsprint is $123.20 multiplied by 56,245T).

Based on our data assumptions, the total net recycling system cost for all printed paper and packaging is $94,381,175.14 USD. This excludes costs related to program administration, data collection and promotion and education. It should be noted that while these estimates imply a level of precision (specific down to a decimal point), these are very much "best guesses using best available data" and are primarily intended to be directionally accurate.

Figure 2 below provides a breakdown of the net cost per tonne by material type ($USD). Note the variability in recycling system costs depending on the type of material being recycled (ranging from -$197/tonne for aluminum to $2212.52/tonne for plastic laminates). This emphasizes the point that not all recycling is created equal - while plastic film makes up only 2.68% of all material recycled, it accounts for almost 11% of all recycling system costs.

Figure 2: Net cost per tonne for recycling individual material types found in the residential recycling stream for printed paper and packaging



In order to calculate administrative, data collection and promotion and education costs, we use Ontario assumptions as a proxy for Maine.

In Ontario, we estimate that optimal promotion and education costs are $1 per household, per year. A $1 per household provision for recycling promotion and education was identified as a Best Practice in the Blue Box Best Practices Report published by KPMG. In Maine, there are 518,200 households, which means that annual promotion and education expenses are roughly $518,000.

Administrative expenses are estimated to be 5% of total net system costs annually. This 5% figure is consistent with how administrative expenses are calculated in other jurisdictions, such as Ontario and British Columbia. While administrative expenses are intended to capture annual data collection costs, it does not include the costs of baseline data collection (which can potentially be quite significant depending on how much data a particular jurisdiction has collected or has access to). If net system costs are modeled to be approximately $94,381,175.14 $USD, annual administrative expenses would be $4,719,058.76.

2.24 Cost of Landfilling

Proposed legislation under LD 1541 will obligate producers to pay for the costs of disposal incurred by a municipality for obligated packaging materials that are not recycled. Based on an estimated 459,110.48T of printed paper and packaging going to landfill, and an average tipping fee of $75.21/short ton, total landfilling costs are $34,529,699.20. Data regarding the average

landfilling tipping fee in Maine was obtained from the Environmental Research and Education Foundation Analysis of MSW Landfill Tipping Fees 2020 Report. It should be noted that the cost of landfilling is a function of available capacity. While the Joint Standing Committee on the Environment and Natural Resources has noted that there is sufficient landfill capacity in the state, future landfilling costs may need to reflect the costs of adding incremental capacity to the system (which can be quite significant).

Based on our modeling, the estimated annual producer obligation under Maine's proposed EPR legislation are:

Cost of material management: $94,381,175.14
Administrative expenses: $4,719,058.76.
Promotion and education expenses: $518,000
Total (annual) Recycling System Costs: $99,618,433.90
Total (annual) Producer Obligation under LD1541: $134,148,133.34

Stated alternatively, the direct economic impacts to producers attributable to proposed producer responsibility legislation range from $99.6 million to $134.15 million dollars annually (depending on which legislation is ultimately adopted by the state).

2.3 Methodology Phase 2 Modeling (Indirect and Induced Impacts)

Most conventional analysis would stop at the point of measuring direct economic impacts, and assume that this is the "bill" that producers will end up paying. However, this is a short sighted and incomplete interpretation of how producer responsibility actually affects the economy of a particular jurisdiction.

In order to estimate indirect and induced impacts attributable to an increase in recycling system costs, we use an input-output model, which in general terms, provides a detailed picture of the flow of products and resources within a given economic system and between that economy and actors outside of the system. Input-Output models are commonly used to estimate economic multipliers for specific industries and sectors, which in turn, form the basis for economic impact analysis that attempts to quantify the contribution/impact of specific industries to a local economy (or the effects of a given policy, event, or investment, expressed in terms of employment or investment).

Given that we have already modeled the direct impacts on packaged good pricing resulting from the proposed legislative changes in Maine (a direct increase of $99.6 million dollars per year), we perform the following steps to model indirect and induced impacts using our input-output model.

2.31 Step 1: Quantify the potential reduction in the municipal tax base resulting from the transfer of recycling and landfilling costs onto producers

One of the common claims made by advocates of producer responsibility is that it results in a reduction in the municipal tax base. When Maine officially announced its transition to EPR, many proponents falsely claimed that the adoption of producer responsibility would save tax payers tens of millions of dollars each year. However, the actual impact on the municipal tax base is much more muted. Municipalities (particularly in a post COVID world), grapple with significant budgetary shortfalls and are in all likelihood going to take the funds "saved" from transitioning to a 100% program and re- allocating those funds to other programs and services. Using British Columbia and Ontario as a proxy, there is no data to suggest the transition to 100% EPR has resulted in a tax savings for households.

There is an argument to be made that the reallocation of funds to support other municipal programs and services does benefits household, but the benefits that are accrued are indirect and do not directly offset the increase in packaging costs that are attributable to EPR.

In the absence of having any examples to provide context for the analysis, this model assumes that households will experience a 15% reduction in the taxes/levis that they were previously paying under existing legislation. This assumption was based on the anticipated reduction in waste collection levies in Ontario for municipalities who presently adopt a fee for service model for recyclable collection (i.e. Toronto). This is in direct contrast to municipalities who build waste collection costs into property taxes – as noted prior, data from both British Columbia and Ontario have shown that the adoption of EPR has had no impact on property taxes in either jurisdiction (in fact, both jurisdictions experienced significant year over year increases in property taxes, but this can be attributed to any number of exogenous factors unrelated to EPR policy)

2.32 Step 2: Determine how producers respond to the increased obligation

While there is no clear indication how producers in Maine will choose to respond to the added costs associated with EPR legislation, experiences from other jurisdictions suggest that they are likely not going to internalize the $99.6 million dollars in annual recycling system costs. Responses will manifest themselves in one of two ways a) costs are transferred to consumers and other participants in the supply chain (i.e. increased pricing for packaged goods), or b) contraction of the company resulting in job losses etc. (a less likely scenario, but one that does have a precedent). For the purposes of simplicity, our modeling assumes that increased costs will be passed onto consumers.

This was done for two reasons:

1) Producers can respond to EPR fees in any number of ways, and in the absence of knowing how exactly producers (from a diverse range of sectors) will respond, we needed to

provide boundaries for our analysis. It is not feasible nor practical to model every possible permutation, as no data has ever been gathered regarding producer responses to EPR

2) Based on the "Pay in Model" used in multiple Canadian jurisdictions (where the Pay in Model is used to calculate material specific fee rates for obligated stewards), by definition, any increase in net system costs are passed onto the consumer. This isn't a matter of debate or speculation, this is how the fee model actually works.

The fee schedule for individual materials is calibrated around the overall steward obligation (net system costs for the entire residential recycling program). If the overall net system cost increases by 10% (i.e. $200 million to $220 million), fees for obligated producers will be automatically adjusted to recover these costs. It is important to note that fee rates for individual materials will not increase by a uniform 10%. The PIM model is intended to incentivize recycling performance using a form of eco-fee modulation, with "more recyclable materials" paying a smaller feel relative to "less recyclable materials". As a result of this cost cross subsidization, certain material types (i.e. LDPE film) are disproportionately impacted by any increase in net system costs. Since these fees are built into a product's price at the point of purchase (eco-fees for packaging waste are not visible), consumers absorb the full increase in net system costs.

While not all jurisdictions adopt the same fee model that is used by Canadian jurisdictions, York University could only base it's analysis on best available data.

This is a potential limitation of this study, as producers may have limited ability to increase the price of certain items due to demand elasticity. The most likely response by producers is a combination of cost externalization, and reduced operational footprint.

2.33 Step 3: Examine how "basket of goods" costs varies across localities

Basket of goods costs vary significantly depending on locality, population density, proximity to markets etc. This analysis is used to determine the relative price elasticity of the consumer good basket across communities from different parts of Maine. Our analysis attempts to capture regional differences in the cost of consumer goods by using relative price elasticities for a range of consumer goods and packaged products. Price elasticity is an often neglected consideration, but our analysis in Canadian jurisdictions has shown that packaged good prices are very much a function of locality – as an example, price elasticity in rural communities is sometimes 200% greater than in urban communities. Due to relative price elasticities, our modeling shows that the increase in the price of consumer goods resulting from producer responsibility is more acute in certain communities. However, price elasticity in Maine is unlikely to be as extreme as we observe in places such as Ontario and British Columbia.

2.34 Step 4: Use our adapted Input/Output model to estimate indirect and induced economic impacts of EPR legislation

Using a combination of a logit-loglinear regression model and our regionalized input-output table, we attempt to determine both the total economic impact resulting from EPR legislation, as well as how prices of consumer packaged goods change. A log-linear analysis is necessary to isolate what percentage of the producer obligation ($99.6 million/$134.1 million) specifically manifests itself as price changes in the consumer basket of goods. While a full elaboration of this exercise is outside the scope of this report, it is best explained using the following example "If a bottled water producer faces an additional $10 million dollars in direct costs in response to EPR legislation, how much will it increase the unit price of bottled water that they sell?"

Log-linear analysis allows us to control for all of the factors that can potentially impact the price of a product (e.g. bottled water), and specifically isolate how changing the cost of a product input (e.g. plastic bottle packaging), affects the total price that consumers will end up paying. Given that the overall price of a good varies depending on how sensitive the price is to changes in the cost of inputs, our study modeled more than 30 different sectors and 660 different types of packaging most commonly consumed by households. As best we could, the intent was to model how cost of living for households in Maine would change in response to the adoption of EPR legislation. It should be noted that the price of consumer packaged goods are particularly sensitive to changes in the price of inputs. Differences in price elasticity were observed across material categories, i.e. plastic packaging is more sensitive to changes in the cost of manufacturing inputs, when compared to corrugate cardboard packaging.

2.35 Step 5: Determine how changes in the price of packaged goods varies across localities

As noted in step 3, we know that certain communities are more sensitive to changes in the prices of goods based on their relative elasticity measure. Using the output of Step 4, we then apply how price changes manifest in specific communities across Maine. It should be noted that the impact of changes to the basket of goods costs is not borne equally across communities. Rural communities face much higher price volatility in response to EPR legislation, when compared to densely populated urban areas (which appear to be better insulated to price shocks due to proximity to other markets and increased density of competing retailers).

Our analysis shows that regional differences in response to EPR legislation can vary by up to 10% (shown below):

County	Relative % Change in Basket of Good Pricing in response to increases in CPG manufacturing costs
Franklin County	110%
Somerset County	109%
Washington County	107%
Knox County	107%
Franklin County	105%
Sagadahoc County	103%
York County	101%
Cumberland County	101%

The price of packaged goods in Franklin and Somerset County are more sensitive to changes in the cost of manufacturing inputs when compared to Cumberland County. Of note, the state of Maine is modeled to have significantly lower community variation with respect to changes in the price of a basket of goods when compared with both New York State, Ontario and British Columbia. With that being said, these numbers should be interpreted with caution. This analysis is very much in its early stages, and additional data needs to be collected to more accurately model/predict the impact of EPR legislation across different areas in Maine.

2.36 Step 6: Back out savings resulting from a decrease in the municipal tax base

Once we have determined the potential change in the price of consumer basket, we then back out savings resulting from a potential decrease in the municipal tax base to arrive at our final estimates.

3.0 Results

Based on the aforementioned analysis modeling indirect and induced effects attributable to EPR legislation, we arrive at a final impact multiplier that ranges from 2.6x to 3.7x. The multiplier is intended to capture both the direct, indirect and induced impacts of adopting EPR legislation in Maine. Using these multipliers, a $99.6 million dollar direct cost to producers (resulting from EPR legislation) results in a $259 million to $368.52 million dollar impact on the economy of Maine. Should producers be required to pay for the costs of material disposal, the producer obligation increases to between $348.7 million and $496.17 million. Note: We express impact multipliers as a range to reflect a conservative (low end) and high end estimates with respect to price elasticities of various packaged goods. The change in price of a particular packaged good in response to EPR legislation falls within a range (based on a number of factors, such as locality) and is not one specific data point.

As noted earlier, the impact on packaged good prices is largely dependent on how producers intend to internalize these costs. Option 1 is to externalize costs to consumers and other actors

within the supply chain, Option 2 is to cut jobs/decrease economic activity, and Option 3 is some combination thereof – this report only models option 1.

Based on our modeling, the total impact on "basket of good" pricing (packaged goods) ranges from 3.91% (5.27%) on the low end, to 5.57% (7.51%) on the high end *values in brackets represent a scenario where producers are obligated to pay disposal costs. Stated alternatively, this translates into an additional $31.94 to $43.74 per month in grocery costs for the average family of four in Maine (Or $41.05 to $58.96 per month if producers are required to pay for disposal costs).

It should be noted that the modeled increase in the price of consumer packaged goods are independent of inflationary pressures. These costs increases are solely attributed to the adoption of EPR for packaged goods. While any potential increases in the cost of consumer packaged goods is something that requires careful consideration, it is of particular concern at this time, as inflation on groceries and other consumer goods are at historic highs. Year over year price increases for some sectors are in excess of 10%, with consumer packaged goods being among the most affected items. A recent survey conducted by Bloomberg found that some participants noted as much as a 15% to 20% increase in the price of groceries, with more than 40% of respondents saying that they purchase fewer items as a result of increased prices.

While there is little consensus regarding low interest rates, supply chain disruptions etc.), consumer purchasing power has declined by the most in a generation. As a result, any actions that could further exacerbate inflationary pressures must be approached with extreme caution, as households are already in an economically precarious situation as a result of the pandemic. It is critical that the full range of economic impacts attributable to EPR legislation are fully understood before its implementation. While advocates of EPR often cite potential price increases as being “inconsequential”, it is evident that any price increase, irrespective of magnitude, can have adverse economic impacts, particularly to vulnerable low income households.

While the aforementioned description of the modeling steps may seem complicated, in many ways, the results can be interpreted as though we are increasing input costs when manufacturing packaged goods. An alternative interpretation would be that packaging producers are reducing investment in the state, equal to the increase in the overall producer obligation.

What makes this issue particularly insidious is that households characterized as “low income” (household income less than $40,000 per year) consume almost 20% more pre-packaged goods (namely grains, produce and frozen meats), when compared to families whose household income exceed $100,000 a year. There is an inverse, statistically significant correlation between household income and % of prepackaged products of overall weekly purchases. Given that lower income groups are the greatest consumers of packaged goods (both in absolute terms, and as a relative % of the overall purchasing basket), any upwards pressure in the cost of food stuff could have potentially adverse impacts.

Ultimately, the decision to adopt producer responsibility legislation for packaging waste has an unintended effect that disproportionately affects are most vulnerable and marginalized families.

4.0 Combating the Critics

Advocates of EPR legislation often point to the fact that producer responsibility has existed for more than 30 years in countries across Europe and Asia, and there is no evidence to show that EPR has an impact on packaging prices. However, the claim that there is no evidence that EPR legislation increases consumer packaged goods costs is based on a faulty premise – the absence of evidence is not proof of outcome. There is a relative paucity of studies that specifically examine the economic impact of EPR for packaging waste, with the RRS study being the only study published in the last decade (and the study had numerous methodological flaws). There is no evidence of EPR impact on packaging costs largely because no research has been conducted in this area, in part because it is extraordinarily difficult to isolate the impacts of EPR legislation on costs "after the fact".

Looking at CPG basket of goods costs and purchasing power indexes for jurisdictions who have some form of producer responsibility for packaging waste, we observe a significant increase in the price of consumer goods (and a decrease in consumer purchasing power) over time. Attributing this increase to any one specific activity or policy is extraordinarily difficult to do - There are literally hundreds of variables that affect the price of goods across localities (even for the same product and retailer). Demographics, infrastructure, relative purchasing power, proximity to markets, density of competing retailers etc. all effect price. In order for a study to make any credible claims regarding the relationship between EPR and packaged goods costs, they would have to control for all of these factors (i.e. using statistical techniques such as multivariate regression to specifically isolate the effects of EPR on packaging prices). Given that many of these explanatory variables are collinear, they would also need to establish controls for interdependency among explanatory variables. In short, it is extraordinarily difficult to do, which is why there is a dearth of credible research in the area.

The ability to model the potential economic of impacts of EPR legislation prior to its adoption affords greater control of study variables, and in many ways, provides more meaningful and credible insights.

It is the absence of research in this area that necessitates further investigation – the statement ("we have more than 30 years of data to evaluate the impact EPR for packaging has on the price of consumer goods") is patently false. Whatever data exists is not in a form that readily allows for modeling the impact of EPR legislation on packaged goods pricing. Once again, the absence of evidence is largely because nobody has asked the question – it is not indicative of proof of outcome, and presenting it as such is disingenuous.

5.0 Conclusion – Should Recycling Even be Our End Goal?

While the focus of this study has been on modeling the potential impacts of EPR legislation on the price of consumer goods, we need to take a step back and ask "What is the goal of our waste management system?" For the better part of 30 years, recycling has been prioritized as a preferred end of life management strategy for packaging waste. Even when we look at the language found in Maine's proposed legislation – producer responsibility is intended to increase recycling rates, recycled content requirements, recycling end markets etc. However, should recycling be our end goal and the barometer by which we measure the success of a waste management system? In short – No. One needs to look no further than the waste management hierarchy to see that recycling is actually our least preferred waste management outcome (when compared to waste reduction and reuse).

Issue 1: Our recycling system is no longer compatible with the types of packaging generated into the market.

The foremost issue is that our recycling infrastructure is simply not compatible with the types of packaging that are being used today. Our recycling system was largely designed around the recovery of very specific materials: newsprint, cardboard, boxboard, aluminum cans etc. The public readily recognizes these items as being recyclable, and generally speaking, they can be economically and efficiently collected and sorted as part of conventional recycling systems.

However, the packaging of today is increasingly comprised of light weight, multi-resin plastics – in many instances, these packages are actually not recyclable. When policy makers at all levels of government are telling the public to put it all in the recycling bin, it fails to acknowledge the very real technical and economic constraints of conventional recycling systems.

Issue 2: Not all recycling is created equal (Economically or Environmentally)

Recycling something like an aluminum can is fundamentally different than recycling glass cullet, both with respect to what it costs and the corresponding environmental impact. There is a tendency for policy makers and consumers to erroneously assume that all recycling is "good" and they do not necessarily understand or appreciate that some materials are better suited for recycling than others.

As noted above, many of the new packaging materials being put out into the market are either virtually impossible to recycle, or prohibitively expensive to do so. To make matters worse, the environmental benefits attributable to recycling many of these composite and lightweight materials are negligible. This calls into question whether it makes sense to spend enormous amounts on recycling given what we are getting in return.

Some materials are perfectly suited for mechanical recycling (i.e. paper based materials, PET, aluminum etc.), as they are characterized by high recovery rates and robust end markets.

Conversely, other packaging types such as polystyrene, PVC and film have limited/no end use applications and exorbitant recovery costs that are neither economically tenable or environmentally sustainable.

Issue #3: Just because you put it in the recycling bin, doesn't mean it gets recycled

One of the issues for consumers is that recycling is often "out of sight, out of mind" – our responsibility as citizens is to put it in the recycling bin - what happens to this material after is largely out of our hands. That is why recycling is the ultimate "feel good" activity – participation has a very low barrier to entry, and we are both encouraged and celebrated for "putting it in the bin". Unfortunately, what we put in the recycling bin versus what actually gets recycled is often worlds apart – contamination levels in many single stream recycling systems exceeds 30%. In many instances, the things we put in our recycling bins are screened as residue (either due to food contamination, incompatibility with sorting infrastructure, or incompatibility with a programs range of accepted materials) and landfilled.

Issue #4: Recycling legislation/policy is not a magic wand.

Proponents of extended producer responsibility legislation often claim that its adoption will encourage producers to adopt more recyclable packaging over time, spurring industry to develop new and innovative ways to recycle difficult to manage materials. In fact, there are few people who will disagree with the assessment that existing recycling infrastructure is poorly equipped to recover light weight/composite material, necessitating additional investments.

Unfortunately, no amount of legislation will magically create self-sustaining end markets and end use applications for certain materials. This isn't a matter of "if you build it, they will come". At the end of the day, recyclables are a commodity like anything else, and unless a market can find an economic use for a particular material, mandatory recycling legislation will achieve little other than drive up the costs of operating the recycling system. As an anecdote, both LDPE film and expanded Polystyrene have had *negative* revenues for much of 2020/2021 – stated another way, collectors are having to pay people to take it away, as end market demand is virtually non-existent. Paper laminates is a good example of how EPR policy and investments in recycling infrastructure/end markets does not necessarily yield a positive outcome. For the millions of dollars that paper laminate stewards have poured into the Ontario Blue Box program over the past 18 years, little has been shown for it. Recycling rates remain less than 5% and the cost of recycling has ballooned to almost $2000/tonne.

When reviewing the proposed list of obligated packaging materials under various EPR programs being proposed, we need to ask the question "how are these materials going to be recycled". While it is great that major CPG companies are pledging to use 100% recyclable packaging by the year 2025, little thought has been given to how this is going to happen and whether that is even a desirable end goal. More recycling isn't always a good thing.

Issue #5: We have more than one tool in our tool box

In many ways, earlier successes with mechanical recycling has made both policy makers and the public complacent – we have achieved and continue to achieve great things through recycling, but it is time for policy makers to understand that we have more than one tool in our tool box. The public often conflates recycling with sustainability, and characterizes anything that can't be recycled as being bad. However, we can't keep on doing the same thing, and expecting a different result – that is the definition of insanity. Our reality is that recycling system costs are going up, the recyclability of packages are going down, and the environmental benefits of recycling are becoming increasingly questionable (depending on the material being recycled).

Jurisdictions such as Maine and New York need to think "Outside of the Blue Box" and consider new technologies like chemical recycling, pyrolysis, syngas etc. that are all capable of diverting difficult to recycle composite and lightweight materials, often at a lower cost than mechanical recycling. One of the greatest challenges to a more sustainable future waste management system is that the sector is reticent to change. Moving forward, we need to focus on solutions that are flexible and adaptable to changes that inevitably occur over time. Legislation should be outcome based, i.e. "We need to keep packaging waste out of landfills", but give producers and service providers the latitude to develop their own solutions to divert materials. Policy makers need to understand that there is no one size fits all solution or tool – site and situation specific factors will make some diversion strategies preferable to others depending on the circumstances. What is of critical importance is that we explore emerging alternatives to mechanical recycling and adopt legislation that allows for both producers and municipalities to be flexible and dynamic, evolving in tandem with the evolution of packaging types and packaging design.