

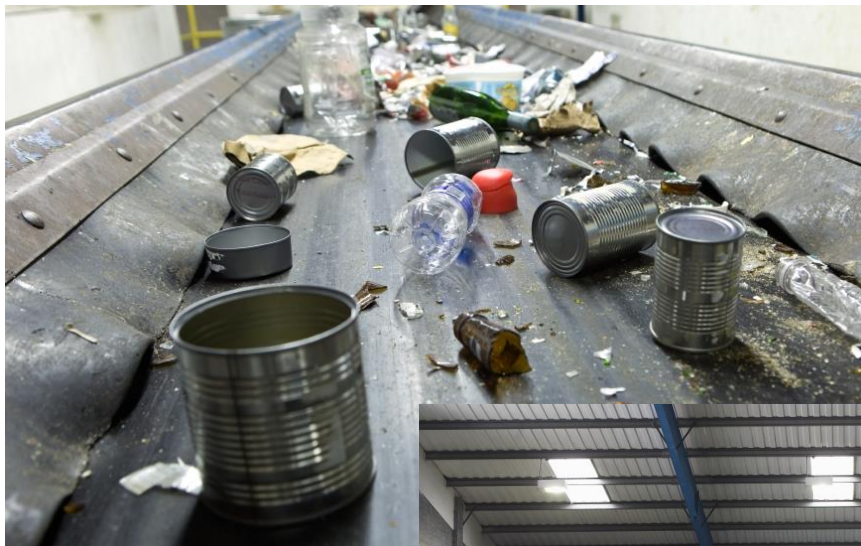


Reclay StewardEdge

Product Stewardship Solutions

Extended Producer Responsibility Cost-Benefit Study

Prepared by Reclay StewardEdge Inc.
for Recycling Reinvented



March, 2014



Acknowledgements

Recycling Reinvented would like to thank and acknowledge Nestlé Waters North America, New Belgium Brewing, and the Roy A. Hunt Foundation for their generous support, which made this study possible.



Contents

- Introduction 1**
- Summary of Working Paper 1: Assumptions 1**
- Summary of Working Paper 2: Cost-Benefit 2**
 - Key Conclusions for Residential Recycling 2
 - Key Conclusions for Away-from-Home Recycling 3
 - Key Conclusions for Recycling Processing Infrastructure 3
 - Key Conclusions for Consumer PPP Supply and Recycling Rate 4
 - Key Conclusions for Operating System Cost 4
- Summary of Working Paper 3: Fees & Market Development 4**
 - Market Development 5
 - Environmental Impact 5
 - Key Conclusions for PPP Recycling Program Costs 5
 - Fee Setting Principles 6
 - Notes on Assumptions and Limitations 8

Introduction

Recycling Reinvented, a 501(c)(3) nonprofit organization based in Minnesota, contracted with Reclay StewardEdge Inc. to complete a cost-benefit study on extended producer responsibility (EPR) for packaging and printed paper (PPP – which includes materials similar to those collected in household consumer recycling programs in the United States). Reclay StewardEdge was supported in this effort by Sound Resolutions and Morigan Materials Management Consulting (“Study Team”). The objective of the study was to compare current recycling costs and results in one state to potential costs and results for a model EPR system in that same state. Minnesota was chosen as the case study state due to the availability of many data sets and existing supportive policies such as a statewide volume-based pricing statute. In addition, Minnesota has significant recycling infrastructure and an above average recycling rate that allow for a relatively conservative estimate of the benefits that EPR may provide.

Recycling Reinvented invited over two dozen recycling and policy experts to be official internal reviewers of the study beginning with initial study assumptions to the final study conclusions. Many of the reviewers were known to not be supportive of Recycling Reinvented’s position on EPR, but were intentionally included to ensure a balanced review was included throughout the study process. The study was developed in phases, summarized in three working papers. Recycling Reinvented shared a draft of each working paper with the reviewer team, reviewed the draft with them in a webinar format, and requested written review comments from them, which were considered in preparing a final draft of each working paper. Each final working paper was then released to the media and the public and can be found at Recycling-Reinvented.org as well as MarketbasedRecycling.org. Recycling Reinvented asked for this open process in order to gain agreement among many diverse stakeholders that the methodology undertaken for the study was objective and valid. Recycling Reinvented pledged to this process without any certainty that the study results would support its position on EPR. Expert reviewers ranged from representatives of non-governmental organizations such as environmental groups and zero waste advocates; trade associations; consumer brands and their suppliers; retailers; academics; and state and local government.

The content of the three working papers is as follows:

- [Working Paper 1](#) outlined the assumptions for the scope of a model EPR system in Minnesota.
- [Working Paper 2](#) examined the costs and outcomes of the current recycling system, modeled a system that expands access to recycling and implements collection best practices for residential recycling, instituted a coordinated statewide program for away-from-home recycling, improved the efficiency of processing, and estimated the operating costs of the modeled EPR system.
- [Working Paper 3](#) estimated how the costs of a future system could be allocated to different types of producers by presenting one potential approach to EPR system financing. It also examined impacts (benefits) to existing markets for consumer PPP collected in Minnesota and calculated energy savings and carbon emission reductions benefits that would come from higher recycling levels under EPR.

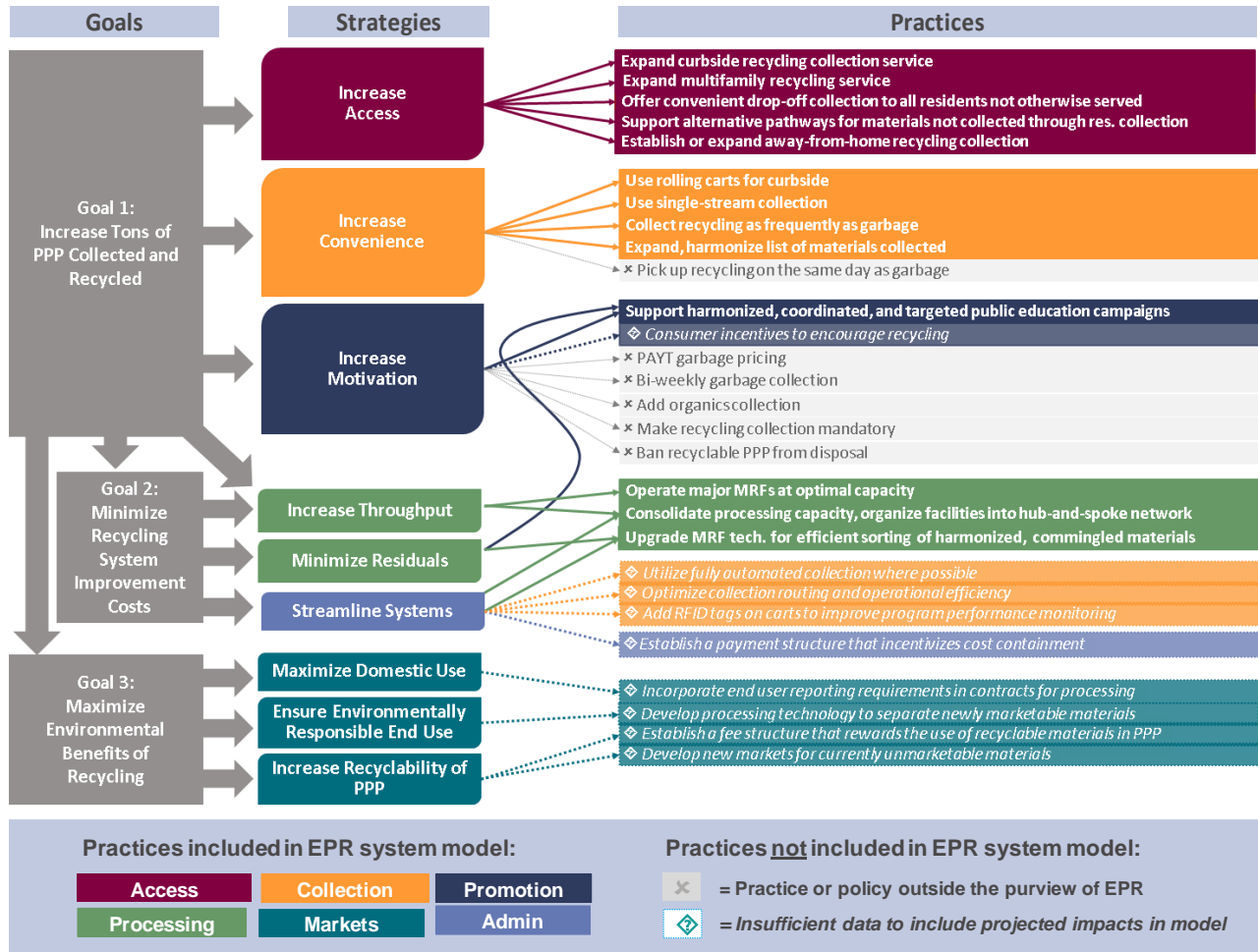
Summary of Working Paper 1: Assumptions

The first working paper identified many of the assumptions and variables that would shape the development of a computer model used to compare current PPP recycling in Minnesota to what PPP recycling may be like under EPR. The paper reviewed data sources and used 2011 data from the state since that was the latest year that full recycling data was available at the time this study was conducted. The model assumes that consumer brands (“producers”) would pay 100 percent of the cost of recycling consumer packaging and printed paper in place of local governments and ratepayers.

Appendix A of the first working paper also included a list of printed paper and packaging materials to be designated as consumer PPP that would be covered by a prospective EPR system – producers of these materials would be responsible for financing the EPR system, as discussed in the third working paper.

The first working paper also included a discussion of what tools would be used in the model to increase recycling while helping the system to become more efficient. It was also recognized that the model to be explored in the study is not the only way to create an EPR system or increase recycling. Figure 1 summarizes the practices evaluated for the model.

Figure 1. Practices Considered in EPR System Modeling to Achieve Recycling Reinvented’s Goals



The paper also identified constraints to the model and strengths and weaknesses of data sources.

Summary of Working Paper 2: Cost-Benefit

The second working paper assessed Minnesota’s current recycling rates for consumer PPP and the cost to consumers for recycling services, and then modeled how best practices in residential and away-from-home recycling could be implemented statewide through EPR, including the effects on recycling levels and costs.

Key Conclusions for Residential Recycling

Access: The modeled EPR system would scale up residential recycling services as follows:

- Expand direct collection service (curbside and multifamily) from 70 percent of Minnesota households to

- 87 percent under the modeled system.
- Expand single-stream recycling from approximately 60 percent of households (as of 2011) to 100 percent under the modeled system.
- Standardize and expand materials collection, including materials collected and the collection methods used, to reduce confusion among Minnesotans about how and what to recycle.

Education: Many communities in Minnesota spend less than the minimum recommended level of \$1 per household per year on recycling education. This working paper suggests a cost structure that includes \$2 per household on average in spending that includes a combination of basic education by local authorities, coordinated statewide campaigns to promote increased recycling, and targeted statewide campaigns that promote away-from-home recycling opportunities, litter avoidance, return of plastic bags and film to retail collection points, and awareness of the recyclability of materials that recycled at lower rates than other more commonly recycled materials.

Recycling results: After examining current recycling data, reviewing data from pilot projects and leading programs in Minnesota that have delivered measurable results under best practices conditions, and extrapolating these possible impacts to a statewide level, the working paper estimates that the current level of residential recycling collection of 407,000 tons of consumer PPP could increase to 544,000 tons, an increase of 34 percent. Factoring in material losses, the modeled system is estimated to increase net residential tons recycled from 375,000 tons to 495,000 tons, resulting in a 66 percent residential recycling rate for consumer PPP.

Key Conclusions for Away-from-Home Recycling

This study models a producer-financed away-from-home recycling program that supports recycling collection in public spaces and retail-based collection of plastic bags and film.

The public space recycling program will provide one recycling bin for every:

- 300 people in urban areas;
- 350 people in suburban areas; and
- 400 people in rural areas.

These recycling bins will be paired with and installed next to existing public trash bins. Examples of where these bins will be located include parks, pedestrian areas, public transit, libraries, schools, and government buildings. The bins will collect the same list of recyclables accepted in residential recycling programs.

Retail-based collection of plastic bags and film will be available for household film drop-off in at least 70 percent of grocery stores in the state and numerous additional retail locations, ensuring that 95 percent of Minnesota households have access to at least one collection location within 10 miles of their home.

Recycling results: The public space recycling program modeled is projected to result in 19,000 additional tons of consumer PPP recycled. In addition, expansion of retail collection infrastructure combined with the investment in statewide promotion and education is projected to result in a four-fold increase in retail-based plastic bag and film collection, increasing the tons of designated material collected from the approximately 500 tons estimated under the current system to 2,000 tons under the modeled EPR system.

Key Conclusions for Recycling Processing Infrastructure

Minnesota's recycling processing infrastructure includes many small processing facilities that are less efficient than larger facilities and not capable of processing the expanding quantity and variety of materials being collected by residential recycling programs. At the same time, the large materials recovery facilities that provide the majority of processing capacity in the state are capable of sorting materials collected single-

stream and have surplus capacity to process the additional materials that would be collected under EPR. This working paper estimates that adjustments to the state’s arrangement of processing infrastructure that EPR can provide could reduce processing costs for consumer PPP materials by \$16 to \$20 per ton.

Key Conclusions for Consumer PPP Supply and Recycling Rate

This working paper estimates that 977,000 tons of consumer PPP were supplied and discarded (disposed or recycled) in 2011 and that 452,000 tons were recycled and delivered to end markets (net of material losses throughout the system), achieving the equivalent of a 46 percent consumer PPP recycling rate. Under the modeled EPR system, the total tons of consumer PPP recycled would increase by nearly one-third, to 592,000 tons, resulting in a consumer PPP recycling rate of 61 percent of estimated total supply. Table 1 shows detailed estimates by material type for the increase in recycling that is projected.

Table 1 Estimated Increase in Consumer PPP Quantities Recycled by Material Type

Material Type	Existing Recycling (tons)	Increase in Recycling (tons)
Paper	294,000	105,000
Corrugated Cardboard and Kraft Bags	46,000	28,000
Newsprint (ONP)	154,000	19,000
Magazines, Catalogs and Telephone Books	17,000	6,000
High Grade Office	3,000	3,000
Mixed Recyclable Paper	74,000	44,000
Compostable and Non-Recyclable Paper	0	7,000
Plastic	40,000	16,000
PET Packaging	26,000	9,000
HDPE Packaging	11,000	4,000
Mixed Plastic Packaging	2,000	1,000
Bags and Film Plastic	1,000	2,000
Metal	37,000	7,000
Aluminum Containers	17,000	3,000
Steel Containers	20,000	4,000
Glass	81,000	11,000
Glass Containers	81,000	11,000
	452,000	139,000

Key Conclusions for Operating System Cost

The direct system operating cost (excluding administration and promotion and education) was estimated to be \$59.9 million under the residential and away-from-home recycling systems that would be funded through EPR.

Summary of Working Paper 3: Fees & Market Development

The third working paper examines economic and environmental benefits of the modeled EPR system, reviews the likely markets that would accept new tons of recyclable material under the model, and suggests a method for setting fees by material type.

Market Development

The paper assesses the existing markets for Minnesota's recyclable material and their ability to absorb additional tonnage that would result from the model. It also examines the trends and drivers affecting demand for these materials nationally and globally.

Paper: Old corrugated containers would have ample markets in the state, while mixed paper, old newspapers, old magazines, catalogs and directories would find markets both in the state and outside. Aseptic and gable top cartons have sufficient regional markets. Coated paper packaging in contact with moist food or beverages has few markets and would benefit from market development.

Plastic: Although there is not a polyethylene terephthalate (PET) end market in Minnesota, there are markets in other states in the Midwest; furthermore, PET reclamation capacity in the U.S. is underutilized. A considerable amount of high-density polyethylene (HDPE) collected in Minnesota leaves the state but there are wanting end markets in the state. Markets for polypropylene exist both in Minnesota and elsewhere in the U.S., but polypropylene is not commonly separated from other mixed plastics, making it hard to extract its value. Mixed plastics have had difficult market conditions during 2013, and could benefit from additional market development. Polyethylene film has been in demand from plastic decking manufacturers who could accept more clean and dry polyethylene film.

Metal: Aluminum markets are out of state but can accept as much material as is available. Steel mills, including at least one in Minnesota, can accept additional steel cans for recycling.

Glass: Additional tons of container glass can be processed by glass beneficiation plants in the Twin Cities for use in container glass and other uses.

The paper acknowledges the trade-offs involved in current and future use of single-stream collection methods including the potential to adversely impact material quality and use by certain end markets. It also identifies tools that producers can employ to improve material quality, including consistent promotion and education activities, setting quality control standards in contracts with vendors, and additional technology.

Environmental Impact

The cost-benefit study does not have environmental benefits as a major component, since environmental benefits from recycling are relatively well documented. However, the U.S. Environmental Protection Agency's Warm Model was used to calculate potential greenhouse gas emission reductions resulting from the increase in recycling from the model. Those yearly reductions are estimated to be 333,535 metric tons of carbon dioxide equivalent, or the equivalent energy required to fuel 69,500 passenger vehicles annually.

Key Conclusions for PPP Recycling Program Costs

The third working paper estimates total system costs of the model, which in addition to the operational cost estimated provided in the second working paper, includes budgetary line items to administer, improve, and oversee the system. Like that of the system's direct operating cost, these additional line items of cost were assumed to be 100 percent funded by producers. A producer responsibility organization (PRO) would represent producers collectively in overseeing the various program areas including that of the direct recycling system.

The total annual net cost that producers would finance would be \$74.2 million, as outlined below.

- \$59.9 million for the residential and public spaces programs;
- \$4.2 million for promotion and education, further allocated as follows:
 - \$1.7 million for general promotion and education;

- \$1.5 million for enhanced promotion and education for specific materials; and
- \$1.0 million for public spaces recycling promotion and litter reduction.
- \$2.0 million for market development;
- \$1.0 million for continuous improvement;
- \$3.5 million for administrative costs of the PRO;
- \$0.35 million for reimbursable administrative and regulatory costs of the Minnesota Pollution Control Agency; and
- \$3.25 million for local governments to administer recycling collection contracts.

The total estimated cost of the EPR system is \$74.2 million, or an average of \$117 per ton of PPP recycled under the program. Total costs and spending levels under the current system are unknown but estimates of system costs for residential recycling in 2011 are estimated to range between \$61 million and \$74 million, or \$149 to \$182 per ton collected. These estimates suggest that the modeled EPR system could result in a substantial increase in projected tons of consumer PPP collected within approximately the same spending range as under the current system.

Fee Setting Principles

To guide the development of a uniquely American approach to fee setting, the following principles were identified:

- All designated materials will pay fees regardless of:
 - Whether a material is collected in producer-financed recycling programs or not; or
 - Regardless of the sector in which consumer packaging is discarded (e.g., residential, public spaces, and industrial/commercial/institutional locations).
- Producers should be provided with incentives to choose packaging that is recyclable, and that has high recycling rates.

These principles were carried out in several steps.

Step 1 - Separate PPP into material/product fee categories.

This step was closely matched to categories of material types in Minnesota's existing recycling reporting system in order to use existing data on generation of materials within categories.

Step 2 - Exempt producers who place small quantities of PPP on the market.

It is suggested that producers whose sales of PPP are very small and whose potential revenue to the system would also be small should be provided an exemption from detailed reporting and payment of fees. For example, an exemption for producers with PPP sales of \$750,000 or less would remove an estimated 34,000 small producers from the EPR system, thus reducing administrative expenses for these producers as well as the PRO. Packaging placed on the market by these producers is estimated to be only five percent of all PPP sales.

Step 3 - Allocate total system costs to material/product fee categories.

Fee allocations by material type used several criteria, including the physical volume of the material and its recycling rate. Administrative costs were spread among all materials. Finally, fees for each material type were offset by the recycled material revenues that each material type would bring in. Table 2 shows the fee per ton by material type that was calculated using this approach.

Table 2 Producer Fee Rates per Ton of PPP Placed on the Market in Minnesota

Material Type	Fee Rates (\$ per ton)
Paper	36
Corrugated Cardboard and Kraft Bags	71
Newsprint (ONP)	2
Magazines, Catalogs and Telephone Books	48
High Grade Office	38
Mixed Recyclable Paper	33
Compostable and Non-Recyclable Paper	115
Plastic	296
PET Packaging	252
HDPE Packaging	62
Mixed Plastic Packaging	305
Bags and Film Plastic	466
Metal	-126
Aluminum Containers	-235
Steel Containers	-38
Glass	30
Glass Containers	31

80

The following table shows the likely cost per unit for several examples of PPP.

Table 3 Producer Fee Rates per Ton of PPP Placed on the Market in Minnesota

Material Type	Fee Rates (\$)
Paper	
Mail order box (shoebox size)	0.0128
Newspaper insert	<0.0001
Magazine (68 pages)	0.0072
Credit card statement and envelope	0.0009
Cereal box (16 oz.) and poly liner	0.0087
Coffee cup (10 oz.) and polystyrene lid	0.0021
Plastic	
PET water bottle (0.5 liter) and HDPE cap	0.0061
HDPE milk jug (1 gal.) and HDPE cap	0.0044
Polypropylene sour cream (16 ounce) and lid	0.0084
Linear low-density polyethylene shopping bag	0.0051
Metal	
Soft drink can (12 oz.)	-0.0034
Tomato juice can (46 oz.)	-0.0059
Glass	
Beer bottle (12 oz.) and steel cap	0.0093

There are many possible approaches to setting fees, only one example of which was presented in the third working paper – ultimately, the approach to setting fees will be decided by the producer responsibility organization after considering stakeholder input and program and policy objectives. The example approach

illustrated in the analysis was based on an objective to incentivize producers to use packaging that is recycled at high rates and which can reduce system costs. The result as shown in Tables 2 and 3 is that fees for metal packaging are calculated as negative values, meaning an incentive payment would be made to producers who package their products in metal. Incentive payments are not common in other countries with extended producer responsibility for packaging. Other policy objectives and fee setting approaches will result in different fee rates than the example ones shown above.

Notes on Assumptions and Limitations

- It is assumed that an EPR system such as the one modeled here would be rolled out over several years. However, to simplify the analysis, the modeled system represents a mature and fully implemented EPR system so that its cost and operating results can be directly compared to the results of the mature system that currently exists in Minnesota. It should be noted that the transition to a system under EPR will include some start-up costs, such as the cost of retiring the financed debt of capital assets that would no longer be used under the EPR system. Working Paper 3 estimated these one-time transition costs to be less than \$61 million, which would be paid back in less than six years from the savings that result from the increased efficiency of the system under EPR.
- Costs incurred by producers under an EPR system not directly related to recycling program operations (such as for producer responsibility organization administration, enforcement, and market development) were estimated and described in the third working paper of this study and are included in producer funding amounts.
- Potential reductions in service fees paid by households have not been estimated because the fees currently paid by households for curbside recycling in Minnesota vary tremendously in amount and financing method and cannot be reasonably generalized. Furthermore, methods of current financing for waste management, recycling, and waste prevention programs often combine costs into a single price so that the portions used specifically for PPP recycling cannot be isolated. How these fees would change, if at all, under EPR for PPP is unknown. However, households that pay directly for unsubsidized residential recycling collection, either through private subscription or a utility bill, would likely see an immediate reduction in service fees charged since the cost of recycling would then be embedded in the price of the products that are consumed, potentially at the rates discussed more fully in Working Paper 3.
- There is no assumption of increasing or decreasing current State recycling grants to county governments in Minnesota, or of any other changes to the State's Solid Waste Management Tax.