

Environmental and Financial Analysis Comparison of Single-Use Plastic Bags and Reusable Bags Used for Collecting and Transporting Commercial Recycling

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OBJECTIVES

Waste Management's (WM) goal is to help commercial businesses move away from using single-use plastic trash bags to collect and transport recyclables to dumpsters by encouraging them to switch to a more sustainable and recycling-facility-friendly option. Recently, WM began selling a commercial reusable recycling bag on their website that offers commercial businesses a reusable substitute to disposable plastic trash bags.¹ This project would advance WM's goal by evaluating the environmental and financial costs and benefits of WM customers switching from using a single-use plastic trash bag to a reusable bag for collecting recyclables in communal containers. Overall, this project will assess how replacing single-use plastic trash bags with reusable bags can confer both environmental and financial benefits to WM's commercial customers. Through the project, students will:

- **Conduct Life-Cycle Assessments (LCA) for a commonly used single-use plastic trash bag and WM's commercial reusable recycling bag to determine if the reusable bag is more environmentally sustainable than the single-use plastic trash bag.**
- **Evaluate the financial costs and benefits of plastic trash bags and WM's reusable bag for commercial businesses.**
- **Create outward facing communication material that helps commercial businesses understand the environmental and economic benefits of switching from plastic trash bags to reusable bags in their recycling process.**

SIGNIFICANCE

Contamination in recycling is a major problem for U.S. recycling facilities. The average contamination rate in commercial recycling is around 25%, with most of the contamination caused by plastic.² One of the major sources of plastic contamination is from the single-use plastic bags that businesses use to collect recyclables, which are subsequently disposed of inside of a dumpster.³ Recycling facility equipment in the U.S. is not equipped to liberate recyclables placed in plastic bags, which means that many recyclables contained within plastic are sent to landfills. Plastic bags also jam recycling equipment and interfere with the machines' ability to separate recyclables, resulting in work stoppages. Single-use plastic bags also place the safety of the recycling workforce at risk as the staff are required to climb onto equipment to clean the plastic out.⁴ Plastic bags that do make it through the recycling equipment impact the quality of the sorted recyclables produced. Recyclables that become contaminated with plastic bags lose value and have less or no appeal to buyers. As a result of all of these negative impacts, recycling becomes more expensive and recyclable commodities become less valuable to end buyers.²

WM is currently selling a commercial reusable recycling bag⁵ to prevent contamination of recyclables, reduce work stoppages, and ensure recycling facility employee safety. However, further understanding of the environmental and economic impacts of single-use plastic bags and WM's reusable recycling bag is necessary for WM to effectively incentivize commercial businesses to stop using plastic bags to line their recycling containers. Furthermore, the development of a communication tool, such as a financial and environmental savings calculator, can help businesses evaluate the benefits of eliminating their use of single-use plastic bags in their recycling process. With this knowledge and communication tool, WM can help businesses choose the most sustainable and cost effective alternative to single-use plastic bags.

As the largest waste & recycling provider in North America, their example tends to have reverberating impacts across the industry. Other providers tend to follow WM's lead, which means that the results of this project could have wider impacts across the industry.

BACKGROUND

Contamination in the recycling industry began in the early 2000s when WM's recycling practices switched from sorting recyclables to a single-stream system, where all recyclable items are placed in one container to be sorted at a recycling facility. Because single-stream recycling was more convenient, recycling became more popular and the amount of people participating in recycling significantly increased. Unfortunately, this process allowed for high levels of contamination in recyclables and was 'acceptable' for many years because the recyclables market would pay for recycled material regardless of the quality.² However, in 2018, China, the world's largest recyclables buyer, clamped down on contamination by implementing the National Sword Policy, which banned the importation of contaminated recyclables.⁶ WM has responded by cleaning up the recyclables and plans to reduce contamination in its inbound stream.

WM has observed that commercial organizations are often the culprits of contamination of recyclables. Facilities management teams at these organizations use single-use plastic bags to collect recyclables because it is a convenient and efficient way to carry multiple recyclables to the recycling dumpster.⁷ Since 2015, WM has been working to both educate and develop solutions for customers to help them reduce contamination in the inbound stream.⁸ As a response to this issue, WM created a commercial reusable recycling bag that organizations can use to conveniently carry recyclables to a dumpster and reuse.⁵ Currently, WM is working towards evaluating the economic and environmental benefits of the reusable bag.

EQUITY

A component of this project is to find the cost savings from consumers switching from single-use plastic bags to using WM's reusable bags and create material that educates these consumers. This information can help consumers save money, incentivize participation, and help WM find further ways to incentivize participation. WM will also be able to use this information to find ways to provide reusable bags to lower income consumers.

This project can also indirectly address issues associated with plastic pollution. WM can incentivize customers to eliminate their use of plastic bags, which can reduce the amount of plastic bags that end up in landfills and become polluted. If the plastic bag reduction impact becomes large enough, it can also reduce the amount of plastic bags generated. Overall, a reduction in use and production of plastic bags can reduce the magnitude of the negative externalities plastic generation and pollution has on communities that live near plastic production facilities and polluted areas.⁹

AVAILABLE DATA

Waste Management will provide the following data housed in their proprietary database:

- Recycling rates at facilities in 45 states
- Incidences of plastic bag contamination of recyclables at facilities
- Commercial recycling monthly pricing
- Commercial recycling participation data, demographics, and average single-use plastic bag use/contamination
- Waste Management branded polypropylene reusable bag manufacturer contacts and information, as well as economic cost of each bag to customer and proper use of each bag
- Rate of work stoppages caused by plastic bags and resulting impact data across facilities

Stacy Katz, WM Senior Manager, is able to provide additional data and resources as the project is developed.

POSSIBLE APPROACHES

- **Data Collection:** Students will collect data about the life-cycle of a single-use trash bag to use for the life-cycle assessment. There are some published life-cycle assessments of single-use plastic trash bags that students can reference.¹⁰ Student's can also contact plastic bag producers for more information. Students will also research current trends in single-use plastic trash bag pricing to use in the commercial economic analysis.
- **Life-Cycle Assessments (LCA):** With WM's recycling data, plastic bag contamination and facilities impact data, polypropylene reusable bag information, and student researched plastic bag life-cycle components, students will conduct a LCA comparison of single-use plastic bags and WM's commercial reusable recycling bag. Students will analyze the entire life cycle of the plastic bag (assuming that it is disposed of at the end-of-life stage) and will do the same for WM's bag (assuming that it is reused). The LCAs will be compared to determine the environmental impact of each type of bag.
- **Commercial Economic Analysis:** With WM's commercial recycling participation, demographics, average single-use plastic bag use/contamination, and monthly price data, as well as student estimation of average commercial spending on plastic bags for recycling, students will analyze the financial costs of single-use plastic bags and WM's reusable bag for the average commercial organization to determine which bag produces the most financial savings.
- **Communication Material:** Assess the results of the LCA comparison and financial analysis to determine what information should be included in outward facing communication to commercial organizations. Produce communication material or tool to help commercial businesses understand the financial and environmental benefits of eliminating their use of single-use plastic trash bags in recycling containers.

DELIVERABLES

Students will deliver a Life-Cycle Assessment (LCA) comparison of the single-use plastic trash bag and WM's commercial reusable recycling bag, as well as an economic analysis of the financial costs and benefits of plastic bags and WM's reusable bag for customers (commercial businesses). Students will also create a simple tool, such as an online calculator, that helps customers understand the environmental and economic impacts of using single-use plastic bags in their recycling containers.

INTERNSHIPS

WM is able to sponsor one 10- to 12-week paid summer internship at \$18.00 per hour at the minimum. The pay scale is still being finalized. Under current COVID-19 safety concerns, the internship will be remote. WM is prepared to host an in-person internship if it becomes safe to do so. Please see a description of the internship in the letter of support.

REFERENCES

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BUDGET AND JUSTIFICATION

It is not anticipated that the proposed project would require additional funding beyond the \$1,300 contributed by the Bren School.

CLIENT LETTER OF SUPPORT

January 15, 2021

Dear Group Project Committee,

This letter is to confirm that Waste Management completely supports being a corporate sponsor for the project: Environmental and Financial Analysis Comparison of Single-Use Plastic Bags and Reusable Bags Used for Collecting and Transporting Commercial Recycling.

Contamination in recycling is a major problem for U.S. recycling systems. One of the largest sources of contamination in the recycling is when recyclables and/or trash is placed inside of plastic bags and then left in the recycling dumpster. This happens often in commercial settings when facilities management teams use single-use plastic bags to collect recyclables. As a solution to this problem, we have designed a reusable bag to replace the single-use plastic bag that could be used for collecting and transporting the recyclables to the dumpster. We are trying to incentivize commercial businesses to move away from single-use plastic bags and move to reusables and are looking to verify that this is in fact a better environmental alternative.

The Group Project will help achieve our objectives by producing both a life-cycle and econometric analysis comparing the single-use plastic trash bags to reusable woven polypropylene bags. Furthermore, the development of a calculator to easily highlight both the environmental and economic benefits will help customers more easily quantify the benefits. We believe the deliverables of this project will help convince our commercial customers to move to a more sustainable solution.

If the project is selected, Waste Management commits to sponsor at least one paid Bren student as a summer intern, and provide data, additional funding, and/or any other resources necessary for the project. Funding for the internship is still being finalized, but the minimum compensation will be \$18 per hour. Due to COVID-19 restrictions the internship will most likely occur remotely, but it will be possible for in-person activities depending on the intern's location and the intern may be able to visit facilities in their vicinity. The internship will provide the student with exposure to the recycling industry and the challenges associated with processing contamination, as well as exposure to the rationale for the formulation of this project. The Internship will further the objectives of the Group Project and also provide the students with opportunities to develop professional skills including collaboration with multiple departments, communication, problem-solving, and project management. Stacy Katz will serve as a mentor to the student in a professional capacity.

We hope this project is selected and look forward to the possibility of working with Bren students.

Sincerely,

Stacy Katz
Senior Manager, Materials Management & Quality
Recycling Services, Waste Management